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Chapter Two

Sales Expectations and Realizations

INTRODUCTION

Investment is forward looking. Given certain initial conditions relating to existing stocks of capital and other resources, entrepreneurial decisions should properly depend not upon the past but upon expectations of the future. If demand for output is to have prime place in an investment function, it is not past demand but expected future demand that is relevant. Whatever attention is paid to past sales or past sales changes, these are relevant in principle only to the extent that they relate to expected future sales or changes in demand.

Analysts usually react to lack of information on sales expectations by assuming that expected future sales are equal to current sales or to some positive, monotonic function of current and past sales. There is, explicitly or implicitly, the notion of adaptive expectations by which decisionmakers adjust their expectations of the future to the difference between current realizations and previously held expectations. In models where output is taken to be an exogenous variable, expected future output is a similar function of current and past output. Yet a substantial body of data and analysis, going back at least to the work on the railroad shippers' forecasts in the 1950s,[1] suggests that such assumptions are unwarranted. Evidence has actually been found of so-called "regressivity" of expectations: when

Note: A draft of this chapter was presented to the Eleventh Conference of CIRET (Centre for International Research on Economic Tendency Surveys) in London in September 1973.

[1] Ferber (1953a, 1953b) and Modigliani and Sauerlender (1955).

sales have gone up they are expected to decline; when they have gone down they are expected to rise.

We shall in this connection consider a hypothesis[2] that sales expectations comprise two components: an extrapolation of the long-run trend, which is gradually modified by past and current experience, and a tendency to view departures from trend as largely transitory. The latter component contributes to short-run regressivity in expectations; departures from previously anticipated trend would tend to generate an expectation of return to trend. Persistence of such departures, however, would change the expectation of the trend itself.

The key sales expectation variables of the McGraw-Hill "spring" surveys, generally in March, relating to actual capital expenditures of the recently completed year (t) and planned expenditures of the current year ($t + 1$) and subsequent years, are: "How much do you think the physical volume of sales of your company will increase or decrease between (1) [t and $t + 1$] and (2) [$t + 1$ and $t + 4$]?"[3] We designate the first (one year) sales anticipations as "short-run" and the second (three year) sales change expectations as "long-run." Both survey questions call for answers in percentage terms. In our analysis of expectations relations we generally cast both variables as relative annual rates.[4]

SHORT-RUN SALES CHANGE EXPECTATIONS

We may begin by estimating the relation between short-run expectations of changes in sales and actual previous sales changes. When these short-run expectations are made a linear function of current and six previous actual changes, further evidence is found of the regressivity of short-run expectations. Pooled firm time series, as reported in Table 2-1, show regression coefficients of −0.042 and −0.086 for current and immediately previous actual sales change ratios. Coefficients of further lagged sales changes bounce around inconclusively, although there is an inexplicable positive coefficient

[2] Which I advanced a number of years ago in Eisner (1958c).

[3] Except for 1956, when the long-run expectations question related to the change in sales from 1955 to 1959, thus between t and $t + 4$ rather than between $t + 1$ and $t + 4$. Long-run expectations also specified a four year period for years prior to 1956, involved in some of the realization function analysis below.

[4] Forms and definitions of variables used in this chapter and acceptable intervals for basic variables (discussed in Chapter 4) are shown in the appendix at the end of this chapter.

Table 2-1. S
Time Series,

(1) Variable or Statistic	(2)
Constant	.07 (.00
Δs^*_t	−.04 (.01
Δs^*_{t-1}	−.08 (.01
Δs^*_{t-2}	−.00 (.01
Δs^*_{t-3}	.07 (.01
Δs^*_{t-4}	−.01 (.01
Δs^*_{t-5}	−.01 (.01
Δs^*_{t-6}	−.03 (.01
$\bar{s}^t$	
$\sum_{i=1}^{7} b_i$	−.12 (.04
$\sum_{i=1}^{8} b_i$	
$n(-207)$[b]	331
$\hat{R}^2$ [c]	.04
F	19.

[a] 1955-1968 in regr

[b] n = number of o observations elimi −227 in regression

[c] $\hat{R}^2$ = adjusted or

Table 2-1. Short-Run Sales Change Expectations, Firm and Industry Time Series, 1956-1968[a]

$$s^t_{t+1} = b_0 + \sum_{i=1}^{7} b_i \, \Delta s^*_{t+1-i} + b_8 \, \tilde{s}^t + u_t$$

(1) Variable or Statistic	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Regression Coefficients and Standard Errors						
		Firm Time Series				Industry Time Series		
Constant	.074	.040	.048	.047	.050	.013	.015	.005
	(.003)	(.003)	(.004)	(.003)	(.008)	(.021)	(.019)	(.022)
Δs^*_t	−.042	–	−.033	−.036	−.017	–	.029	.054
	(.013)	–	(.013)	(.013)	(.050)	–	(.054)	(.056)
Δs^*_{t-1}	−.086	–	−.092	−.097	−.126	–	−.152	−.172
	(.012)	–	(.013)	(.012)	(.044)	–	(.053)	(.057)
Δs^*_{t-2}	−.000	–	−.019	–	.049	–	.021	–
	(.012)	–	(.012)	–	(.043)	–	(.045)	–
Δs^*_{t-3}	.070	–	.058	–	.302	–	.253	–
	(.012)	–	(.012)	–	(.045)	–	(.049)	–
Δs^*_{t-4}	−.015	–	−.042	–	.042	–	−.009	–
	(.012)	–	(.012)	–	(.045)	–	(.052)	–
Δs^*_{t-5}	−.016	–	−.014	–	.086	–	.066	–
	(.011)	–	(.011)	–	(.042)	–	(.048)	–
Δs^*_{t-6}	−.034	–	−.026	–	−.013	–	−.030	–
	(.010)	–	(.010)	–	(.037)	–	(.041)	–
$\tilde{s}^t$	–	.421	.445	.429	–	.889	.726	1.133
	–	(.045)	(.044)	(.044)	–	(.349)	(.340)	(.351)
$\sum_{i=1}^{7} b_i$	−.124	–	−.168	−.133	.323	–	.177	−.118
	(.042)	–	(.043)	(.019)	(.149)	–	(.162)	(.078)
$\sum_{i=1}^{8} b_i$	–	–	.277	.296	–	–	.903	1.016
	–	–	(.059)	(.048)	–	–	(.320)	(.361)
$n(-207)$[b]	3319	3066	3066	3066	131	124	124	124
$\hat{R}^2$ [c]	.043	.033	.074	.056	.360	.046	.312	.108
F	19.2	88.2	26.8	51.7	10.6	6.5	7.4	5.6

[a] 1955-1968 in regressions without $\tilde{s}^t$.

[b] n = number of observations; the figure in parentheses is the number of individual firm observations eliminated because of extreme values for one of the variables. This figure is −227 in regressions without $\tilde{s}^t$.

[c] $\hat{R}^2$ = adjusted or unbiased coefficient of determination.

of 0.070 for sales changes lagged three years. The sum of the past sales change coefficients for all seven years is —0.124. With an estimated standard error of 0.042, this would appear to be a significantly negative statistic from the 3,319 observations in the pooled firm time series. That is to say, to the extent that firms' sales recently increased (particularly in the last year or two), they are expected to decrease by some 12 or 13 percent of the sum of these recent increases.

In fact, regressive expectations are consistent with experience. Regressions of current actual sales changes on previous actual changes yield sharply negative coefficients, robustly negative even against the introduction of expectations of the current change. The latter show positive coefficients, from over 0.5 to almost unity. (Detailed results may be seen in Tables M2-13 and M2-14.)

A look at column (3) of Table 2-1 shows that there is some positive continuity in sales change expectations. For in the individual firm time series, short-run sales expectations, s^t_{t+1}, are positively related, with a regression coefficient of 0.421, to $\bar{s}^t$, the expectations of the subsequent longer run rate of sales change. We may perhaps take this as evidence that short-run sales expectations are part of a long-run perceived trend indicated in the long-run expectations. In columns (4) and (5), however, we note that the "regressive" relation to recent past sales changes persists when short-run expectations are made a function of both long-run expectations and past changes.

It is also worth noting that all of the coefficients of determination ($\hat{R}^2$) in the firm time series are low. This may well be a further reflection of the fact that individual firms view their own year-to-year sales fluctuations as largely transitory and unrelated to expectations of the future. The latter may be connected more closely with industrywide movements, where the random experiences of individual firms tend to cancel each other out. In that case, regressions of observations consisting of industry year means may be expected to evidence a more positive relation, reflecting the association between more dominantly permanent industry experience and average industry expectations. This is indeed strikingly confirmed in the industry time series shown in column (6) of Table 2-1. We now note an adjusted coefficient of determination of 0.360 and a positive sum of past sales change coefficients of 0.323. Again, however, the coefficients of current and immediately past sales changes are negative, and much of the positive total is to be attributed to the still inexplicably high coefficient (0.302) of Δs^*_{t-3}.

The washing out of transitory or random noise may also explain the higher, near unity coefficients of the long-run sales variable

shown in columns (7), (8), and (9). These industry time series regressions suggest that short-run sales expectations are in approximately the same direction as long-run sales expectations; the persistent negative relation with immediately past sales changes again appears to express expected correction of deviations from trend.

Cross-sectional regressions may be expected to reflect even more a covariance of permanent elements in sales changes and expectations. Interfirm variance in year-to-year changes in sales and expectations, comprising in part transitory differences between firms in any one year, based on year-to-year, transitory variance, will also reflect the longer term differences in firm experiences. More rapidly growing firms are likely to expect to continue growing more rapidly than less rapidly growing firms, and vice versa.

While the coefficient of determination is again very low (0.008), Table 2-2 shows a trace of evidence in the firm cross sections of positive covariance for such "permanent" components of sales changes and expectations. The sum of coefficients of past sales changes in column (2) is minute but positive, although the coefficients of immediately past sales changes are again slightly negative. The trend relation suggested in the positive coefficient of long-run sales change expectations (columns [3], [4], and [5]) persists.

In industry cross section regressions, with still more of the transitory elements in year-to-year sales experiences of individual firms washed out, we should expect a quintessence of the permanent components and more positive covariation between past sales changes and expectations. The regression shown in column (6) of Table 2-2 confirms this expectation, with a sum of coefficients of past sales changes of 0.487, suggesting that short-run sales change expectations of an industry are about half of a weighted average of past sales changes. The long-run sales expectations variable emerges with an apparently robust coefficient of unity or slightly above. Since the sum of coefficients of past sales changes drops close to zero when long-run expectations are introduced into the regression, it would appear that the past sales changes do indeed serve as a proxy, however imperfect, for long-run expectations.

The firm time series within individual industry groups, in Table 2-3, confirms the general pattern of regressivity between short-run expectations and past sales changes. The only industry showing a clearly positive relation between short-run expectations and past sales changes is utilities, and this exception is not surprising. In much of the industry, essentially power companies, one would expect surges of demand to be serially correlated, so that when firms experience increasing sales they tend to expect the growth, at least in

Table 2-2. Short-Run Sales Change Expectations, Firm and Industry Cross Sections, 1956-1968[a]

$$s^t_{t+1} = b_0 + \sum_{i=1}^{7} b_i \Delta s^*_{t+1-i} + b_8 \tilde{s}^t + u_t$$

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variable or Statistic	*Regression Coefficients and Standard Errors*							
	Firm Cross Section Within Industries				*Industry Cross Section*			
Constant	.065 (.002)	.039 (.002)	.039 (.003)	.042 (.003)	.042 (.006)	−.001− (.010)	−.003 (.009)	.000 (.010)
Δs^*_t	−.010 (.012)	– –	−.009 (.012)	−.010 (.012)	.061 (.063)	– –	.067 (.058)	.077 (.059)
Δs^*_{t-1}	−.015 (.012)	– –	−.031 (.012)	−.034 (.012)	−.093 (.065)	– –	−.112 (.058)	−.113 (.061)
Δs^*_{t-2}	.030 (.012)	– –	.023 (.012)	– –	.077 (.062)	– –	−.020 (.056)	– –
Δs^*_{t-3}	.042 (.011)	– –	.032 (.012)	– –	.292 (.058)	– –	.210 (.054)	– –
Δs^*_{t-4}	.024 (.011)	– –	.008 (.011)	– –	.049 (.053)	– –	−.046 (.052)	– –
Δs^*_{t-5}	−.015 (.011)	– –	−.006 (.011)	– –	.133 (.048)	– –	.057 (.045)	– –
Δs^*_{t-6}	.006 (.010)	– –	−.000 (.010)	– –	−.033 (.049)	– –	−.079 (.045)	– –
$\tilde{s}^t$	– –	.442 (.035)	.437 (.035)	.448 (.035)	– –	1.113 (.163)	1.102 (.174)	1.138 (.169)
$\sum_{i=1}^{7} b_i$	.061 (.029)	– –	.018 (.030)	−.043 (.017)	.487 (.115)	– –	.076 (.114)	−.035 (.080)
$\sum_{i=1}^{8} b_i$	– –	– –	.455 (.043)	.405 (.038)	– –	– –	1.179 (.156)	1.102 (.164)
$n(-207)$[b]	3388	3150	3150	3150	131	124	124	124
$\bar{R}^2$	.008	.050	.055	.052	.258	.290	.415	.307
F	4.7	161.2	22.9	56.7	6.8	46.4	10.8	17.4
F (for differences between industry and firm)[c]					12.44	36.50	10.24	15.41
Numerator degree of freedom					7	1	8	3

dustry

(8)	*(9)*
s Section	
−.003	.000
(.009)	(.010)
.067	.077
(.058)	(.059)
−.112	−.113
(.058)	(.061)
−.020	–
(.056)	–
.210	–
(.054)	–
−.046	–
(.052)	–
.057	–
(.045)	–
−.079	–
(.045)	–
1.102	1.138
(.174)	(.169)
.076	−.035
(.114)	(.080)
1.179	1.102
(.156)	(.164)
124	124
.415	.307
10.8	17.4
10.24	15.41
8	3

Table 2-2 continued

	(6)	*(7)*	*(8)*	*(9)*
Denominator degrees of freedom	3364	3138	3124	3134
$F_{.01}$ (99 percent confidence level)	2.64	6.63	2.51	3.78

[a]1955-1968 in regressions without $\tilde{s}^t$.

[b](−227) in regressions without $\tilde{s}^t$.

[c]Involving sum of squared residuals for firm cross section across industries minus those for firm cross section within industries minus those for industry cross section.

some part, to continue. Note, further, that the positive relation between short-run and long-run sales expectations is manifested in all eleven industry groups. The F test does indicate significant differences, however, among the regression planes of the various industries.

The cross section regressions by years, shown in Table 2-4, suggest a shift to a more positive relation between expected sales changes and past changes in recent years. One might hazard a guess that in years of fuller employment and operations closer to capacity, differences among firms in expected sales changes related more closely to basic growth of the firms. Again, the differences among regressions are statistically significant.

An attempt to estimate an adaptive sales change expectation model had negative results. The expected sales change ratio was specified as a linear function of the previous expectation ratio and current realizations, or the difference between the current actual change and that which had been expected:

$$s_{t+1}^t = b_0 + b_1 s_t^{t-1} + b_2 (S_t - S_t^{t-1})/S_{t-1} + u_t. \qquad (2.1)$$

In the time series, however, b_1 proved negative, −0.145 with a standard error of 0.019 for individual firms, and −0.196 (standard error of 0.103) for industries (see Table M2-5). The value of b_2 was −0.005 for individual firms and 0.129 for industries, with a standard error of 0.058. The cross sections yielded small positive values for b_1 (0.085 and 0.202), but virtually zero coefficients (−0.014 and 0.014) for b_2.

Table 2-3. Short-Run Sales Change Expectations as a Function of Past Sales Changes and Long-Run Expected Sales Changes, Firm Time Series, by Industry and for All Industries, 1956-1968

$$s^t_{t+1} = b_0 + \sum_{i=1}^{7} b_i \Delta s^*_{t+1-i} + b_8 \tilde{s}^t + u_t$$

(1) Variable or Statistic	(2) Primary Metals	(3) Metal Working	(4) Chemical Processing	(5) All Other Manufacturing	(6) Mining	(7) Util-ities	(8) Petro-leum
Constant	.046 (.016)	.062 (.008)	.051 (.008)	.027 (.006)	.047 (.019)	.040 (.007)	.015 (.016)
Δs^*_t	−.225 (.059)	−.007 (.024)	−.073 (.028)	−.005 (.026)	−.041 (.097)	.061 (.024)	.102 (.060)
$\tilde{s}^t$	.554 (.213)	.322 (.084)	.362 (.096)	.632 (.078)	.327 (.257)	.180 (.090)	.775 (.306)
$\sum_{i=1}^{7} b_i$	−.518 (.198)	−.197 (.077)	−.125 (.095)	−.060 (.082)	−.034 (.359)	.269 (.099)	−.038 (.232)
$\sum_{i=1}^{8} b_i$	.036 (.293)	.125 (.110)	.237 (.130)	.573 (.109)	.293 (.447)	.450 (.123)	.737 (.370)
Number of firms	29	134	76	103	15	33	19
Number of observations	232 (−21)	884 (−100)	521 (−23)	636 (−16)	77 (−13)	193 (−10)	102
r.d.f.[a]	195	742	437	525	54	152	75
$\hat{R}^2$	.161	.103	.062	.123	−.041	.072	.034
F	5.9	11.8	4.7	10.3	0.7	2.5	1.4

$F(80,2484) = 2.01$, for differences between industries; $F_{.01} = 1.40$

[a]Residual degrees of freedom.

LONG-RUN SALES CHANGE EXPECTATIONS

Expectation of long-run sales changes reveals little of the regressivity with respect to past sales changes noted for short-run expectations, but positive coefficients of past sales changes remain generally very small. Long-run sales change expectations are also found to be a positive function of short-run expectations, but again with exceedingly small coefficients, uniformly below 0.1. Coefficients of determination in the time series, even industry time series, remain low,

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[5]Table M2-5

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ng	(6) Mining	(7) Utilities	(8) Petroleum	(9) Railroads	(10) Insurance and Banks	(11) Stores	(12) Transportation	(13) All Industries
	.047 (.019)	.040 (.007)	.015 (.016)	.025 (.011)	.028 (.015)	.042 (.009)	.057 (.049)	.048 (.004)
	−.041 (.097)	.061 (.024)	.102 (.060)	−.198 (.062)	.027 (.046)	−.043 (.044)	−.103 (.155)	−.033 (.013)
	.327 (.257)	.180 (.090)	.775 (.306)	.445 (.348)	.753 (.129)	.444 (.128)	1.163 (.449)	.445 (.044)
	−.034 (.359)	.269 (.099)	−.038 (.232)	−.034 (.190)	−.004 (.209)	.063 (.113)	−.716 (.550)	−.168 (.043)
	.293 (.447)	.450 (.123)	.737 (.370)	.411 (.391)	.749 (.245)	.507 (.163)	.897 (.511)	.277 (.059)
	15	33	19	11	22	41	11	494
−16)	77 (−13)	193 (−10)	102 (−2)	53 (−6)	106 (−9)	196 (−7)	66 (−0)	3066(−20)
	54	152	75	34	76	147	47	2564
	−.041	.072	.034	.282	.296	.058	.119	.074
	0.7	2.5	1.4	3.1	5.2	2.2	1.9	26.8
.40								

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with a top statistic of 0.216 for the regression including both short-run sales expectations and all seven years of current and past actual sales changes, as seen in Table 2-6.[5]

What this suggests is that whatever long-run sales change expectations are based upon, they are not closely related to past or current experience. It is, of course, possible that reported sales change expectations are themselves poor measures of the actual expectations that are integral to business decisionmaking, in investment and in

[5] Table M2-5 appears only in microfiche.

Table 2-4. Short-Run Sales Change Expectations as a Function of Past Sales Changes and Long-Run Expected Sales Changes, Firm Cross Sections by Year and for All Years, 1956-1968

$$s^t_{t+1} = b_0 + \sum_{i=1}^{7} b_i \, \Delta s^*_{t+1-i} + b_8 \, \tilde{s}^t + u_t$$

(1) Variable or Statistic	(2) 1956	(3) 1957	(4) 1958	(5) 1959	(6) 1960	(7) 1961	(8) 1962	(9) 1963	(10) 1964	(11) 1965	(12) 1966	(13) 1967	(14) 1968	(15) All Years
Constant	.026	.023	.069	.030	.032	.036	.013	.014	.014	.032	.001	.027	.039	.034
	(.010)	(.014)	(.009)	(.011)	(.012)	(.008)	(.006)	(.008)	(.007)	(.008)	(.012)	(.010)	(.009)	(.003)
Δs^*_t	.012	.058	−.037	−.112	−.060	−.123	.033	.017	.006	.116	.117	−.010	.003	.001
	(.037)	(.063)	(.041)	(.051)	(.052)	(.033)	(.030)	(.040)	(.037)	(.045)	(.048)	(.044)	(.055)	(.012)
$\tilde{s}^t$	.599	.037	.207	.637	.319	.731	.751	.658	.845	.503	.920	.539	.563	.503
	(.114)	(.145)	(.096)	(.151)	(.165)	(.113)	(.086)	(.124)	(.097)	(.114)	(.154)	(.104)	(.098)	(.034)
$\sum_{i=1}^{7} b_i$	.158	−.065	−.137	−.223	.122	−.217	.040	.158	.123	.241	.223	.367	.039	.051
	(.085)	(.137)	(.093)	(.110)	(.131)	(.077)	(.063)	(.088)	(.078)	(.088)	(.130)	(.117)	(.106)	(.028)
$\sum_{i=1}^{8} b_i$	.757	−.028	.070	.414	.441	.513	.792	.816	.968	.744	1.140	.906	.603	.554
	(.126)	(.095)	(.133)	(.189)	(.191)	(.125)	(.099)	(.134)	(.112)	(.122)	(.167)	(.131)	(.115)	(.041)
n	328	249	294	196	210	297	285	263	247	242	242	148	152	3153
	(−37)	(−23)	(−28)	(−19)	(−18)	(−15)	(−13)	(−12)	(−8)	(−11)	(−11)	(−7)	(−5)	(−207)
r.d.f.	319	240	285	187	201	288	276	254	238	233	233	139	143	3132
$\hat{R}^2$	.137	.049	.165	.507	.066	.184	.230	.128	.255	.155	.196	.261	.305	.075
F	7.5	2.6	8.2	9.4	2.8	9.3	11.6	5.8	11.5	6.5	8.3	7.5	9.3	33.0

$F(96,3036) = 4.05$, for differences between years; $F_{.01} = 1.37$[a]

[a] $F_{.01}$, and other probability levels of F where indicated, are sometimes approximate, linear interpolations from published tables.

Table 2-6. Series, 1956

(1) Variable or Statistic
Constant (or mean $\tilde{s}^t$)
Δs^*_t
s^t_{t+1}
$\sum_{i=1}^{7} b_i$
$\sum_{i=1}^{8} b_i$
$n(-207)$
$\hat{R}^2$
F

Note: Table M2-5

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Table 2-6. Long-Run Sales Change Expectations, Firm and Industry Time Series, 1956-1968

$$\tilde{s}^t = b_0 + \sum_{i=1}^{7} b_i \Delta s^*_{t+1-i} + b_8 s^t_{t+1} + u_t$$

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Variable or Statistic	*Regression Coefficients and Standard Errors*						*Means and Standard Deviations*
	Firm Time Series			*Industry Time Series*			
Constant (or mean $\tilde{s}$)	.057 (.001)	.055 (.001)	.050 (.001)	.051 (.003)	.056 (.002)	.048 (.003)	.060 (.039)
Δs^*_t	−.007 (.006)	– –	−.004 (.006)	−.030 (.015)	– –	−.030 (.015)	.054 (.117)
s^t_{t+1}	– –	.079 (.008)	.086 (.009)	– –	.062 (.024)	.057 (.027)	.066 (.080)
$\sum_{i=1}^{7} b_i$	.061 (.019)	– –	.073 (.019)	.170 (.043)	– –	.153 (.043)	– –
$\sum_{i=1}^{8} b_i$	– –	– –	.159 (.021)	– –	– –	.211 (.046)	– –
$n(-207)$	3066	3066	3066	124	124	124	
$\hat{R}^2$	.010	.033	.048	.189	.046	.216	
F	4.9	88.2	17.1	4.8	6.5	4.9	

Note: Table M2-5 appears only in microfiche.

other areas. At this point, we can only report further cause to be wary of models in which unobservable expected changes in sales, demand, or output are projected from observable past data. The cross-sectional results reported in Table 2-7, while again showing more of the positive covariance to be expected from proportionately larger permanent components of sales change and expectation variance, still suggest a fairly imperfect relation between long-run expectations and past sales changes. However, when both short-run expectations and past sales changes are introduced into the regression, we do bring the sum of all sales change coefficients close to one-half (0.461) and the coefficient of determination to 0.438.[6]

[6] K.C. Kuhlo, in an unpublished comment, suggests that equations relating one sales expectation variable to exogeneous actual sales changes may be viewed as reduced forms for simultaneous equations in which sales expectation variables appear as both dependent and independent variables. Estimates derived by substituting into these "structural" relations in fact turn out virtually identical with the "reduced form" equation for long-run sales expectations. They differ slightly, by less than standard errors in the reduced form equations, in the case of short-run expectations.

Table 2-7. Long-Run Sales Change Expectations, Firm and Industry Cross Sections, 1956-1968

$$\tilde{s}^t = b_0 + \sum_{i=1}^{7} b_i \Delta s^*_{t+1-i} + b_8 s^t_{t+1} + u_t$$

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Regression Coefficients and Standard Errors						
Variable or Statistic	*Firm Cross Section Within Industries*			*Industry Cross Section*			*Means and Standard Deviations*
Constant (or mean $\tilde{s}$)	.054 (.001)	.052 (.001)	.047 (.001)	.043 (.003)	.042 (.003)	.032 (.003)	.060 (.040)
Δs^*_t	.008 (.006)	– –	.009 (.006)	.037 (.032)	– –	.010 (.028)	.053 (.118)
s^t_{t+1}	– –	.114 (.009)	.112 (.009)	– –	.267 (.039)	.254 (.040)	.066 (.081)
$\sum_{i=1}^{7} b_i$	.105 (.015)	– –	.098 (.015)	.315 (.056)	– –	.208 (.051)	
$\sum_{i=1}^{8} b_i$	– –	– –	.210 (.017)	– –	– –	.461 (.053)	
$n(-207)$	3150	3150	3150	124	124	124	
$\hat{R}^2$	.019	.050	.066	.227	.290	.438	
F	9.2	161.2	27.9	5.7	46.4	11.8	
F for differences between industry and firm regressions				5.84	30.32	6.49	
Numerator degrees of freedom				7	1	8	
Denominator degrees of freedom				3126	3138	3124	
$F_{.01}$				2.64	6.63	2.51	

SHORT-RUN REALIZATIONS

How accurate are the reported sales change expectations? This question is of immediate interest to those who want to use expectational data for forecasting purposes. Moreover, measures of the accuracy of expectations also throw light on the role which these reported expectations may be playing in business behavior. To the extent that they prove highly inaccurate as forecasts of

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	(8)
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2	.060
3)	(.040)
0	.053
8)	(.118)
4	.066
0)	(.081)
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actual sales, businesses might be expected to discount them in their own decision processes.

One direct measure of the accuracy of short-run sales expectations is the arithmetic difference between the relative rate of change in deflated sales and the corresponding expected sales change variable, which relates presumably to the "physical volume of sales." Let me hasten to observe that a difficulty with this measure is that our price deflator may be introducing substantial errors. Aside from the well-known general problems in constructing price indexes, we have here the effect of excessive aggregation. The deflators relate to broad industry groups rather than to the products and product mixes of the particular firms observed.

With some 4,400 observations in the 704 firms reported upon in Table 2-8, the error in short-run sales realizations was only —0.001. Since average actual percentage change in deflated sales was in the neighborhood of +6.5 percent, mean expected sales changes, off by only 0.1 of a percentage point, were less than 2 percent off target, which might be taken as pretty substantial accuracy.

Unfortunately, such an inference would be misleading. For within that correspondence of overall means there is a huge firm-to-firm variance. This can be noted immediately in the standard deviation of 0.197 for the sales realizations variable. For roughly a third of the observations, it may be inferred, the errors in sales expectations were on the order of more than 20 percentage points!

Looking at the mean value of the realization variable by industry, we find that in many of the industry groups, particularly the larger ones, the mean realization figure is indeed close to zero. But the standard deviations within industries are clearly high and the differences in means from year to year within industries are also substantial. Again, looking at the "all industries" column, we see means for a number of years close to zero, some significant year-to-year variations, and high standard deviations for observations of each year taken separately.

A general view of the accuracy of short-run sales expectations may be obtained by examining "inequality coefficients" as defined by H. Theil.[7] In their most recent form, these are taken as the square root of the ratio of the sum of the squares of the differences between sales changes and sales change expectations and the sum of the squares of sales changes themselves. Hence, an inequality coefficient, U, greater than unity indicates that expected sales changes would have been more accurate as forecasts if they had been identical to zero. While in one industry, primary metals, where U is greater than one in nine of

[7] Henri Theil (1966), pp. 31-38.

Table 2-8. Short-Run Sales Realizations: Actual minus Expected Ratios of Changes in the Physical Volume of Sales, s_t^S, Means and Standard Deviations, by Industry and by Year, 1955-1968

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Year	*Primary Metals*	*Metal Working*	*Chemical Processing*	*All Other Manufacturing*	*Mining*	*Utilities*	*Petroleum*	*Railroads*	*Insurance and Banks*	*Stores*	*Transportation*	*All Industries*
1955	.103	.066	.053	.001	−.094	–	.014	–	–	–	–	.044
	(.116)	(.443)	(.151)	(.143)	(.285)	–	(.081)	–	–	–	–	(.303)
1956	−.076	−.006	−.012	−.036	−.199	–	−.030	–	–	.014	–	−.026
	(.052)	(.168)	(.103)	(.141)	(.529)	–	(.022)	–	–	(.000)[a]	–	(.156)
1957	−.041	−.078	−.047	−.049	−.055	–	−.012	–	–	.028	–	−.058
	(.145)	(.185)	(.135)	(.122)	(.169)	–	(.133)	–	–	(.000)[a]	–	(.156)
1958	−.032	−.059	−.037	−.027	−.063	–	.041	–	–	–	–	−.039
	(.211)	(.150)	(.106)	(.100)	(.044)	–	(.104)	–	–	–	–	(.135)
1959	−.083	.026	.049	−.003	−.055	−.012	−.004	.065	.219	.035	−.013	.018
	(.175)	(.130)	(.220)	(.083)	(.162)	(.234)	(.064)	(.472)	(.707)	(.104)	(.081)	(.219)
1960	−.190	−.051	−.036	−.024	−.025	–	−.020	–	–	–	–	−.052
	(.148)	(.128)	(.086)	(.086)	(.077)	–	(.034)	–	–	–	–	(.118)
1961	.020	−.050	.002	.014	.025	–	.011	–	–	–	–	−.014
	(.264)	(.142)	(.067)	(.107)	(.028)	–	(.082)	–	–	–	–	(.139)
1962	−.049	.013	.009	−.016	.054	−.002	.081	−.010	.008	−.001	−.070	.001
	(.106)	(.115)	(.089)	(.053)	(.117)	(.018)	(.076)	(.065)	(.045)	(.109)	(.128)	(.094)
1963	.008	.078	.034	−.022	.010	−.011	.017	.062	.132	.006	.057	.033
	(.078)	(.362)	(.125)	(.086)	(.131)	(.034)	(.254)	(.038)	(.595)	(.077)	(.019)	(.247)
1964	.052	.065	.021	.004	.001	.013	.387	.035	−.025	−.002	−.011	.034
	(.071)	(.143)	(.047)	(.091)	(.078)	(.017)	(.126)	(.065)	(.072)	(.068)	(.052)	(.269)
1965	.040	.084	.053	.061	−.070	−.000	.025	−.078	−.057	−.002	.032	.040
	(.094)	(.207)	(.124)	(.307)	(.344)	(.246)	(.026)	(.406)	(.225)	(.077)	(.051)	(.224)
1966	−.008	.024	.005	−.001	.188	−.022	.032	.238	.039	−.024	.079	.025
	(.086)	(.150)	(.088)	(.096)	(.475)	(.088)	(.036)	(.819)	(.053)	(.084)	(.196)	(.226)
1967	−.065	.008	−.051	.003	−.169	−.066	.044	−.015	−.045	.036	−.092	−.022

1962	−.049	.013	.009	−.016	.054	−.002	.081	−.010	.008	−.001	−.070	.001
	(.106)	(.115)	(.089)	(.053)	(.117)	(.018)	(.076)	(.065)	(.045)	(.109)	(.128)	(.094)
1963	.008	.078	.034	−.022	.010	−.011	.017	.062	.132	.006	.057	.033
	(.078)	(.362)	(.125)	(.086)	(.131)	(.034)	(.254)	(.038)	(.595)	(.077)	(.019)	(.247)
1964	.052	.065	.021	.004	.001	.013	.387	.035	−.025	−.002	−.011	.034
	(.071)	(.143)	(.047)	(.091)	(.078)	(.017)	(.126)	(.065)	(.072)	(.068)	(.052)	(.269)
1965	.040	.084	.053	.061	−.070	−.000	.025	−.078	−.057	−.002	.032	.040
	(.094)	(.207)	(.124)	(.307)	(.344)	(.246)	(.026)	(.406)	(.225)	(.077)	(.051)	(.224)
1966	−.008	.024	.005	−.001	.188	−.022	.032	.238	.039	−.024	.079	.025
	(.086)	(.150)	(.088)	(.096)	(.475)	(.088)	(.036)	(.819)	(.053)	(.084)	(.196)	(.226)
1967	−.065	.008	−.051	.003	−.169	−.066	.044	−.015	−.045	.036	−.092	−.022
	(.072)	(.120)	(.085)	(.138)	(.201)	(.092)	(.061)	(.051)	(.035)	(.056)	(.139)	(.111)
1968	−.051	−.030	.019	−.035	.011	.063	.061	−.033	.014	−.027	−.020	−.009
	(.079)	(.103)	(.099)	(.088)	(.024)	(.020)	(.048)	(.029)	(.053)	(.036)	(.041)	(.086)
All Years	−.029	.000	.002	−.012	−.026	−.004	.045	.061	.029	.001	.005	−.001
	(.153)	(.216)	(.124)	(.130)	(.271)	(.131)	(.378)	(.394)	(.314)	(.085)	(.111)	(.197)
Number of Firms	37	212	96	136	24	40	33	24	34	52	16	704

[a]Only one firm in sample in this industry in this year.

the fourteen years, the no change sales expectation would have proved more accurate, this was not true in most industries for most years, as can be seen readily in Table 2-9. The inequality coefficient was below unity in nine of the eleven industries (all except primary metals and mining) and in twelve of fourteen years (all except 1957 and 1961). The inequality coefficient for all observations in all years and industries was 0.903. Although below unity, this hardly suggests any great accuracy in the sales change expectations of individual firms.

That a good deal of the error in anticipations by individual firms washes out in averaging is seen in the inequality coefficient of 0.580 calculated from the observations of industry year means (Table 2-10). The inequality coefficient was somewhat higher, 0.617, when calculated from industry mean observations, and still higher, 0.708, when calculated from year mean observations. These latter figures suggest that in aggregation of industries and years more of the changes in actual sales wash out than in the differences between sales and expectations.

Breakdown of the inequality coefficients (following Theil) into bias, variance, and covariance proportions reveals, as might have been anticipated from the overall accuracy of the means, that the bias proportions were generally very low. The variance proportions, while larger, were still not usually overwhelming. This indicates that the variance in anticipated sales changes was generally of about the same magnitude as the variance in actual sales changes. Rather, the bulk of the error in anticipations stems from the covariance proportion (see column [5] of Table 2-10), which implies that the residuals around a line of regression of actual on expected sales changes would have been large.

This is readily confirmed in the regressions reported in Table 2-11, where we see modest coefficients of determination of actual on expected sales changes. Actual sales changes did vary with expected sales changes, in time series and cross sections, for individual firms and for industry means, and the regression coefficients were substantial, although generally significantly below unity. But the squared residuals in the individual firm regressions were large.

In firm time series regressions including expectations and past sales changes with current actual sales change as the dependent variable, the coefficient of the corresponding previous expectations variable was well below unity, about 0.6. Further, lagged sales change variables entered with substantially negative coefficients, as shown in Table M2-13. In industry time series, the sales expectation variable did show coefficients close to unity and past sales change coefficients

Table 2-9. Short-Run Sales Realizations: Inequality Coefficients (U), by Year and Industry

$$U = \left[\frac{\Sigma(a-p)^2}{\Sigma a^2}\right]^{\frac{1}{2}}, \text{ where } a = \frac{S_t - S_{t-1}}{S_{t-1}}, \quad p = s_t^{t-1} = \frac{S_t^{t-1} - S_{t-1}}{S_{t-1}}, \quad \text{and } a - p = s_t^S$$

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

Table 2-9. Short-Run Sales Realizations: Inequality Coefficients (U), by Year and Industry

$$U = \left[\frac{\Sigma(a-p)^2}{\Sigma a^2}\right]^{1/2}, \text{ where } a = \frac{S_t - S_{t-1}}{S_{t-1}}, \quad p = s_t^{t-1} = \frac{S_t^{t-1} - S_{t-1}}{S_{t-1}}, \quad \text{and } a - p = s_t^s$$

(1) Year	(2) Primary Metals	(3) Metal Working	(4) Chemical Processing	(5) All Other Manufacturing	(6) Mining	(7) Utilities	(8) Petroleum	(9) Railroads	(10) Insurance and Banks	(11) Stores	(12) Transportation	(13) All Industries
1955	.614	.914	.723	.969	.876	–	.813	–	–	–	–	.888
1956	1.208	.704	.758	1.207	1.445	–	.734	–	–	.326	–	.898
1957	1.039	.951	1.161	1.337	1.259	–	1.110	–	–	1.242	–	1.035
1958	1.272	.747	.892	1.047	.888	–	.975	–	–	–	–	.851
1959	1.019	.595	.856	.691	.783	0.989	.727	.983	.957	.620	.418	.854
1960	1.663	.712	.890	1.107	.466	–	1.055	–	–	–	–	.884
1961	1.135	1.120	.748	.796	.299	–	.932	–	–	–	–	1.021
1962	1.011	.688	.722	.687	.794	.254	.780	.935	.592	.808	1.087	.745
1963	.931	.911	.854	1.053	.930	.594	.961	1.048	.972	.742	.389	.923
1964	.940	.689	.518	.726	.741	.315	.995	.576	1.025	.671	.494	.928
1965	.666	.838	.770	.923	1.388	.985	.605	.993	1.005	.670	.382	.911
1966	.800	.726	.731	.814	.897	.950	.596	.979	.425	.812	.721	.891
1967	1.136	.763	1.325	.945	1.469	1.148	.689	1.066	1.440	.446	.579	.888
1968	1.158	.915	.698	1.089	.496	.502	.714	1.933	.465	.468	.373	.795
All Years	1.042	.842	.829	.957	1.070	.922	.989	.978	.948	.679	.623	.903

Table 2-10. Short-Run Sales Realizations: Inequality Coefficients (U) and Bias (U^m), Variance (U^s), and Covariance (U^c) Proportions, Individual Firms by Industry and Year, Overall and Groups

(1) *Individual Firms*	*(2)* U	*(3)* U^m	*(4)* U^s	*(5)* U^c
By industry				
Primary metals	1.042	.034	.015	.951
Metal working	.842	.000	.220	.780
Chemical processing	.829	.000	.287	.713
All other manufacturing	.957	.009	.161	.830
Mining	1.070	.009	.012	.979
Utilities	.922	.001	.671	.328
Petroleum	.989	.014	.818	.167
Railroads	.978	.023	.741	.236
Insurance and banks	.948	.008	.813	.179
Stores	.679	.000	.035	.965
Transportation and communication other than railroads	.623	.002	.009	.989
By year				
1955	.888	.021	.388	.591
1956	.898	.024	.010	.966
1957	1.035	.121	.020	.858
1958	.851	.079	.027	.894
1959	.854	.007	.337	.656
1960	.884	.163	.013	.824
1961	1.021	.010	.098	.892
1962	.745	.000	.003	.997
1963	.923	.018	.572	.410
1964	.928	.020	.605	.375
1965	.911	.031	.497	.472
1966	.891	.012	.543	.445
1967	.888	.037	.143	.820
1968	.795	.012	.077	.911
All years and industries	.903	.000	.236	.764
Group means				
Industry years	.580	.000	.180	.820
Industries	.617	.000	.005	.995
Years	.708	.000	.016	.984

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

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

where $a = \dfrac{S_t - S_{t-1}}{S_{t-1}}$ and $p = s_t^{t-1}$,

so that $a - p = s_t^s$.

Table 2-11. Function of E and Cross Sec

(1) *Variable or Statistic*
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Table 2-11. Short-Run Sales Realizations: Actual Sales Change Ratios as a Function of Expected Sales Change Ratios, Firm and Industry Time Series and Cross Sections, 1955-1968

$$\frac{S_t - S_{t-1}}{S_{t-1}} = b_0 + b_1 s_t^{t-1} + u_t$$

(1)	*(2)*	*(3)*	*(4)*	*(5)*
	Regression Coefficients and Standard Errors			
	Firm		*Industry*	
Variable or Statistic	*Time Series*	*Cross Section*	*Time Series*	*Cross Section*
Constant	.018 (.004)	.026 (.003)	.008 (.038)	.021 (.021)
s_t^{t-1}	.733 (.030)	.624 (.028)	.873 (.125)	.687 (.131)
$n(-9)$	4249	4329	126	126
r.d.f.	3626	4204	114	111
$\hat{R}^2$	.141	.106	.294	.192
F	598	500	49	28

were not as sharply negative. Both findings probably expressed the washing out of individual firm disturbances, which contribute to regressivity as well as inaccuracy of expectations. Similarly, the cross section regressions, in Table M2-14, appear to evidence a relatively lesser role for short-term disturbances.

Thus far, we have been dealing exclusively with relative sales changes, that is, the expected percent changes (converted to pure decimals) of the survey responses and their counterparts in actual sales. This gives no larger weighting to large firms than to small firms, but, instead, offers major weight to observations in which relative sales changes or sales change expectations differ substantially from each other or from their means. Table 2-12 shows results of regressions in which the relative changes are converted to millions of deflated dollars. Here large weight will be given to large dollar differences, and implicitly to large firms, where dollar differences tend to be larger.

Regression coefficients of actual on expected sales changes are

Table 2-12. Short-Run Sales Realizations: Actual Sales Changes[a] as a Function of Expected Sales Changes, Firm and Industry Time Series and Cross Sections, 1955-1968

$$S_t - S_{t-1} = b_0 + b_1 (S_t^{t-1} - S_{t-1}) + u_t$$

(1)	(2)	(3)	(4)	(5)
	Regression Coefficients and Standard Errors			
	Firm		Industry	
Variable or Statistic	Time Series	Cross Section within Industries	Time Series	Cross Section
Constant	.484 (1.199)	1.047 (1.141)	−1.836 (13.367)	−7.850 (8.500)
$S_t^{t-1} - S_{t-1}$	1.000 (.027)	.988 (.020)	1.132 (.114)	1.431 (.109)
$n(-9)$	4249	4329	126	126
r.d.f.	3626	4204	114	111
$\bar{R}^2$	.281	.369	.460	.607
F	1421	2460	99	174

[a]Millions of dollars.

now almost exactly uniform in both firm time series and firm cross sections within industries. Coefficients of determination are markedly higher, 0.281 and 0.369, respectively, and still higher in the industry time series and cross sections. It is apparent that some, but not all, of the inaccuracy of short-run sales expectations relates to the ratios rather than actual dollars of the sales. Larger firms, or at least firms with larger year-to-year changes in the physical volume of sales, are apparently more consistent, as measured by fits of regression lines, in their anticipations of sales changes.

LONG-RUN SALES REALIZATIONS

Analysis of long-run sales realizations is complicated by the change in the question McGraw-Hill surveys posed from 1956 on. In the earlier years, the question had asked for expected sales change over the subsequent four year period (t to $t + 4$, or s_{t+4}^t). This included the year immediately ahead, which was also covered in the short-run expectations question. From 1956 on, the long-run sales expectation

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[8]Tables M2-13

question covered sales changes over the three years subsequent to the one year specified in the short-run question ($t + 1$ to $t + 4$, or $s^t_{t+1,t+4}$). There may be some doubt as to whether respondents in later years did answer the questions literally and report expectations of differences in sales for years three years apart rather than over the entire four year period, as they had been asked in earlier years.

For actual sales changes up to 1959, our comparisons are straightforward. We merely relate the relative sales change over the four years leading up to the current year, t, to the reported expected sales change four years earlier, s_t^{t-4}. The long-run sales "realization" variable, defined as their difference, is denoted s_t^{g4}. For the years from 1960 through 1968, we have matched first the actual sales change over the three year period leading up to the current year with the presumably corresponding three year expected change reported four years previously, $s^{t-4}_{t-3,t}$, with sales realizations denoted s_t^{g3}. Alternatively, for comparability with the earlier years, we have constructed a four year expected sales change variable by combining the anticipated one year changes reported for the current year and the anticipated changes for the three subsequent years, $(1 + s_{t-3}^{t-4})(1 + s^{t-4}_{t-3,t}) - 1$. The realization variable is here written s_t^{g4}.

In Table 2-15,[8] means and standard deviations of the differences between the actual and anticipated three year sales changes for the intervals ending in the years 1960 through 1968 are reported by year and by industry. (Detailed results by year and industry are available in Table M2-15.) As in the case of short-run realizations, we find that the mean for all observations in all the years and industries is close to zero. For this long-run case, the mean actual sales change ratio was 1.1 percentage points above the mean expected sales change ratio. And, since for three year sales changes the average ratio was some 20 percent, accuracy appears high. But, again, the overall mean hides substantial inaccuracy of individual firm expectations, measured in a standard deviation of 27.7 percent. The standard deviations are high in all industries except utilities. In the long-run case, it may be noted, further, that the mean error in anticipations was substantial in individual intervals, as much as −12.3 percent for the period ending in 1960 and +15.1 percent for the period ending in 1966, to indicate the extremes. The pattern is not markedly different where the realizations variable is taken over the four year period for all the years from 1956 through 1968, with long-run expectations for the intervals ending from 1960 to 1968 a combination of the one year and subsequent three year expected changes.

Corresponding inequality coefficients are found in Table M2-16.

[8] Tables M2-13 and M2-14 appear only in microfiche.

Table 2-15. Long-Run Sales Realizations: Actual minus Expected Ratios of Changes in the Physical Volume of Sales, by Industry and by Year, over Three and over Four Years, Means and Standard Deviation

(1) Industry (All years)	(2) s_t^{g3}	(3) s_t^{g4} and $s_t^{g4'}$	(4) Years (All industries)	(5) s_t^{g3}	(6) s_t^{g4} and $s_t^{g4'}$
Primary metals	−.077 (.252)	−.122 (.287)	1956	– –	.092 (.326)
Metal-working	.010 (.340)	.001 (.392)	1957	– –	.046 (.339)
Chemical processing	.018 (.239)	.026 (.282)	1958	– –	−.057 (.320)
All other manufacturing	.005 (.239)	−.003 (.278)	1959	– –	−.090 (.275)
Mining	−.042 (.307)	−.056 (.387)	1960	−.123 (.257)	−.187 (.313)
Utilities	−.007 (.111)	−.024 (.114)	1961	−.063 (.259)	−.095 (.309)
Petroleum	.123 (.196)	.144 (.236)	1962	−.055 (.228)	−.051 (.307)
Railroads	.059 (.164)	.062 (.171)	1963	.013 (.220)	−.057 (.264)
Insurance and banks	.051 (.190)	.045 (.257)	1964	.079 (.234)	.062 (.287)
Stores	.038 (.200)	.064 (.260)	1965	.095 (.242)	.105 (.305)
Transportation and communications other than RR	.242 (.338)	.267 (.429)	1966	.151 (.262)	.184 (.322)
			1967	.075 (.247)	.118 (.321)
All industries and all years	.011 (.277)	.005 (.324)	1968	.055 (.223)	.090 (.279)

Note: For three year periods, s_t^{g3} is for 1960 to 1968; for four year periods, s_t^{g4} is for 1956 to 1959, and $s_t^{g4'}$ is for 1960 to 1968. Tables M2-13 and M2-14 appear only in microfiche.

Most coefficients are below unity, but by no means all. Inaccuracies are greatest in primary metals and in mining and, generally, in earlier years. Inequality coefficients overall and for industry year means and industry means, but not for year means (Table 2-17),[9] are less than in the case of short-run expectations.

Tables 2-17 and M2-20 present inequality coefficients and bias, variance, and covariance proportions for alternately defined long-run expectations and realizations. In both tables, inequality coefficients

[9] Table M2-16 appears only in microfiche.

Table 2-17. U
Four Years as
Variance (U^S)
and Year, Ove

(1) Individual f
By Industry
Primary metals
Metalworking
Chemical processing
All other manufact
Mining
Utilities
Petroleum
Railroads
Insurance and bank
Stores
Transportation and cation other than
By year
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
All years and indus
Group means
Industry years
Industries
Years

$U = [\Sigma(a-p)^2/\Sigma a^2$

and

$a-p = s_t^{g3}$ and $p =$

Note: Table M2-16

are lower in observations a firms. Pooling basis of year cient, suggest

Table 2-17. Long-Run Sales Realizations from Anticipations over Three or Four Years as Reported: Inequality Coefficients (U) and Bias (U^m), Variance (U^s), and Covariance (U^c) Proportions, Individual Firms by Industry and Year, Overall and Groups

(1) Individual firms	(2) U	(3) U^m	(4) U^s	(5) U^c
By Industry				
Primary metals	1.062	.086	.063	.851
Metalworking	.880	.001	.087	.912
Chemical processing	.748	.006	.143	.851
All other manufacturing	.849	.000	.210	.789
Mining	.983	.019	.070	.911
Utilities	.560	.004	.128	.868
Petroleum	.759	.284	.319	.397
Railroads	.860	.118	.381	.501
Insurance and banks	.673	.069	.213	.718
Stores	.640	.035	.446	.518
Transportation and communication other than railroads	.694	.346	.168	.486
By year				
1956	.833	.074	.123	.803
1957	.858	.018	.211	.711
1958	1.011	.031	.095	.874
1959	.945	.097	.032	.872
1960	1.239	.189	.020	.791
1961	.981	.056	.000	.944
1962	.988	.055	.059	.886
1963	.809	.003	.184	.812
1964	.680	.103	.221	.677
1965	.700	.134	.259	.607
1966	.713	.249	.251	.500
1967	.715	.086	.327	.587
1968	.701	.058	.130	.812
All years and industries	.838	.002	.125	.874
Group means				
Industry years	.493	.009	.192	.798
Industries	.530	.006	.017	.977
Years	.962	.001	.014	.984

$U = [\Sigma(a-p)^2/\Sigma a^2]^{1/2}$, where $a-p = s_t^{g4}$ and $p = s_t^{t-4}$, for t = 1956 to 1959

and

$a-p = s_t^{g3}$ and $p = s_{t-3,t}^{t-4}$, for t = 1960 to 1968.

Note: Table M2-16 appears only in microfiche.

are lower in utilities and in later years and are also lower when observations are industry year means rather than those of individual firms. Pooling of all firms and industries, with calculation on the basis of year means, yields a considerably higher inequality coefficient, suggesting inability to anticipate the timing of fluctuations.

And as with the short-run sales realizations, the greatest proportion of the error by far is identified with covariance, that is, residuals about the regression line of actual on expected sales changes.

This last is confirmed in Table 2-18, where coefficients of determination are virtually zero in the time series relations, not much above zero in the cross sections of firms within industries, and still low (well below 0.2) in the industry cross sections. As far as the time series go, it would appear that firms' reported expectations of their own long-run sales changes are useless as forecasts of the changes which actually occur. The regressions indicate that over the entire period, the mean of each firm's actual long-run sales changes would have been as good a predictor of its actual long-run sales change to any particular year as its prior reported sales change expectation.[10]

In the case of cross sections, there is again distinctly more positive covariance between anticipated and actual sales changes, particularly in the industry mean regressions. This suggests that some firms, and particularly some industries, are growing more rapidly than others over the long run and that long-run anticipations of firms and the average anticipations of firms in industries differ correspondingly. Cross sections by individual years (available in Table M2-21) suggest that much of the cross-sectional relation was concentrated in the years 1964 through 1968. In earlier years, the cross-sectional regressions are particularly poor, as measured by regression coefficients and coefficients of determination.

Table 2-19[11] offers results of regressions once more relating to changes in the constant dollar volume of sales rather than sales ratios. Time series results are now distinctly better in the case of industry regressions, and all cross section results are better, suggesting once more that larger firms with large actual and anticipated changes in the physical volume of sales are considerably more accurate in their anticipations. These results are corroborated in individual year cross section regressions (available in Table M2-22).

SUMMARY AND CONCLUSIONS

Our analysis has indicated, at the very least, the need for extreme caution in using past sales changes as proxies for expectations of future changes. First, a significant regressive component has been noted in expectations of the year-to-year sales changes. Where firms have most recently experienced sales increases, they tend to expect sales declines and vice versa.

[10] Firms, of course, can only know regressions or the means of their sales changes ex post, but the results suggest that the mean of sales changes up to any year would have been as good a predictor of future sales changes as an extrapolation of a regression involving prior actual and expected sales changes.

[11] Table M2-20, M2-21, and M2-22 appear only in microfiche.

Table 2-18. L
Function of E
and Cross Sec

(A) $\frac{S_t - S_{t-4}}{S_{t-4}} = b_0$

$\frac{S_t - S_{t-3}}{S_{t-3}} = b_0$

(B) $\frac{S_t - S_{t-4}}{S_{t-4}} = b_0$

and $s'^{t-4}_t = (1$

(1)

Variable or Statistic
Constant
(A) s^{t-4}_t or $s^{t-4}_{t-3,t}$
(B) s'^{t-4}_t
$n(-76)$
r.d.f.
$\hat{R}^2$
F
F for differences be
Numerator degrees
Denominator degre
$F_{.01}$

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Table 2-18. Long-Run Sales Realizations: Actual Sales Change Ratios as a Function of Expected Sales Change Ratios, Firm and Industry Time Series and Cross Sections, 1956-1968

(A) $\frac{S_t - S_{t-4}}{S_{t-4}} = b_0 + b_1 s_t^{t-4} + u_t$, for t = 1956 to 1959

$\frac{S_t - S_{t-3}}{S_{t-3}} = b_0 + b_1 s_{t-3,t}^{t-4} + u_t$, for t = 1960 to 1968

(B) $\frac{S_t - S_{t-4}}{S_{t-4}} = b_0 + b_1 s'^{t-4}_t + u_t$, where $s'^{t-4}_t = s_t^{t-4}$ for t = 1956 to 1959

and $s'^{t-4}_t = (1 + s_{t-3}^{t-4})(1 + s_{t-3,t}^{t-4}) - 1$, for t = 1960 to 1968

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
	Regression Coefficients and Standard Errors							
	Time Series				*Cross Section*			
	Firm		*Industry*		*Firm within Industries*		*Industry*	
Variable or Statistic	*(A)*	*(B)*	*(A)*	*(B)*	*(A)*	*(B)*	*(A)*	*(B)*
Constant	.209 (.010)	.227 (.011)	.333 (.088)	.201 (.124)	.164 (.009)	.186 (.010)	.083 (.050)	.079 (.061)
(A) s_t^{t-4} or $s_{t-3,t}^{t-4}$	.025 (.043)	.144 (.037)	−.593 (.228)	.240 (.226)	.244 (.035)	.297 (.031)	.643 (.180)	.715 (.166)
(B) s'^{t-4}_t								
$n(-76)$	2051	2051	101	101	2158	2158	101	101
r.d.f.	1677	1677	89	89	2057	2057	87	87
$\bar{R}^2$	−.0004	.008	.060	.001	.023	.043	.118	.167
F	0.34	15.2	6.8	1.1	49.9	92.9	12.8	18.6
F for differences between industries and firm regressions							11.77	16.93
Numerator degrees of freedom							1	1
Denominator degrees of freedom							2144	2144
$F_{.01}$							6.63	6.63

These short-run or one year sales change expectations are positively related, however, to expectations of long-run or three and four year sales changes. Short-run sales change expectations seem to reflect a combination of movement along an expected long-run

Table 2-19. Long-Run Sales Realizations: Actual Sales Change as a Function of Expected Sales Change, Firm and Industry Time Series and Cross Sections, 1956-1968

(A) $S_t - S_{t-4} = b_0 + b_1 (S_t^{t-4} - S_{t-4}) + u_t$ for t = 1956 to 1959

where $S_t^{t-4} - S_{t-4} = s_t^{t-4} S_{t-4}$

$S_t - S_{t-3} = b_0 + b_1 (S_t^{t-4} - S_{t-3}^{t-4}) + u_t$ for t = 1960 to 1968

where $S_t^{t-4} - S_{t-3}^{t-4} = s_{t-3,t}^{t-4} (1 + s_{t-3}^{t-4}) S_{t-4}$

(B) $S_t - S_{t-4} = b_0 + b_1 (S'^{t-4}_t - S_{t-4}) + u_t$

where $S'^{t-4}_t = (1 + s_t^{t-4}) S_{t-4}$ for t = 1956 to 1959

and $S'^{t-4}_t = (1 + s_{t-3}^{t-4}) (1 + s_{t-3,t}^{t-4}) S_{t-4}$ for t = 1960 to 1968

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Regression Coefficients and Standard Errors							
	Time Series				*Cross Section*			
Variable or Statistic	*Firm*		*Industry*		*Firm within Industries*		*Industry*	
	(A)	*(B)*	*(A)*	*(B)*	*(A)*	*(B)*	*(A)*	*(B)*
Constant	62.0 (3.3)	67.2 (3.6)	−4.5 (36.2)	−13.4 (42.7)	20.2 (3.0)	23.1 (3.3)	−42.3 (23.4)	−49.8 (26.2)
(A) $(S_t^{t-4} - S_{t-4})$ or $(S_t^{t-4} - S_{t-3}^{t-4})$	.089 (.045)	.168 (.040)	1.198 (.218)	1.282 (.191)	.781 (.023)	.770 (.021)	1.839 (.172)	1.793 (.156)
(B) $(S'^{t-4}_t - S_{t-4})$								
$n(-76)$	2051	2051	101	101	2158	2158	101	101
r.d.f.	1677	1677	89	89	2057	2057	87	87
$\hat{R}^2$	.002	.010	.245	.328	.365	.395	.562	.597
F	3.88*	17.93	30.2	45.0	1182	1343	114	131
F for differences between industry and firm regressions							114.19	136.6
Numerator degrees of freedom							1	1
Denominator degrees of freedom							2144	2144
$F_{.01}$							6.63	6.63

*$F_{.05} = 3.85$

trend, evidenced by the long-run expectations, and a reversion to trend signified by the negative coefficients relating to recent experience. The evidence of positive association with trend comes through further in industry year mean regressions. Here, apparently, "transitory" elements contributing to negative or regressive relations tend to be averaged out and swamped by the more permanent components contributing to the positive trend relation.

Long-run sales expectations show little of the regressive relation and more of a positive association with past experience. Coefficients of past sales changes are generally positive and are larger in industry cross sections where transitory elements are most substantially eliminated.

Short-run sales realizations, the difference between actual and expected sales changes, show an overall mean of virtually zero. This, however, hides major offsetting errors in the annual observations of individual firms. The overall Theil inequality coefficient is on the order of 0.9, indicating that expectations of short-run changes in the physical volume of sales prove fairly poor forecasts of ex post changes in actual sales as we have been able to deflate them. The errors in sales expectations turn out to be overwhelmingly related to low covariance, as indicated by both the Theil measure of covariance proportions and ordinary least squares regressions. Inequality coefficients are markedly lower, 0.580 against 0.903, and coefficients of determination higher, 0.294 as against 0.141, in time series, when we are dealing with industry year means that wash out the interfirm variance within industries.

Long-run sales realizations, as measured by inequality coefficients, indicate considerably more accuracy of anticipations than do the short-run realizations. This turns out to relate to interfirm rather than intertemporal variance. Thus, cross sections of firms and, a fortiori, industry means show substantial positive association between actual and expected sales changes. Inequality coefficients involving year means are almost unity, however, and time series regressions of long-run actual on expected sales changes show coefficients of determination generally indistinguishable from zero, indicating that the firm's average experience (over the entire period) is as good a predictor of long-run sales changes as are reported expectations.

Utilities, involving firms with relatively stable patterns of growth and less year-to-year fluctuation, seem distinctly more accurate in their long-run sales expectations, as do larger firms in general. There is also some evidence of more positive associations in the cross

nge as a Function
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(8)	(9)
Errors	
s Section	
Industry	
(A)	(B)
−42.3	−49.8
(23.4)	(26.2)
1.839	1.793
(.172)	(.156)
101	101
87	87
.562	.597
114	131
114.19	136.6
1	1
2144	2144
6.63	6.63

sections of later years, when sales may have been tied more closely to capacity. We may infer, though, that while firms whose sales were increasing more rapidly than those of others generally expected such increases, and firms in more rapidly growing industries clearly expected to grow more rapidly than those in less rapidly growing industries, firms were conspicuously inaccurate in predicting the timing of long-run changes in sales. Specifically, neither information from individual firms nor from the means of firm observations for industries seemed of much use in forecasting whether sales changes over the next three or four years would be greater or less than sales changes over any other three or four year period.

All of this should probably come as no great surprise, since contrary findings would suggest that business firms are able to predict cyclical fluctuations, an accomplishment that has generally escaped economists and other observers and analysts. But confirmation of this may offer further explanation of our difficulty in predicting investment, which, for profit-maximizing firms, must depend critically on precisely those unpredictable future changes in demand.

APPENDIX

Symbols and Descriptions of Variables

Symbol		*Description*
$\Delta s_t^* = \dfrac{3(S_t - S_{t-1})}{S_t + S_{t-1} + S_{t-2}}$		Relative sales change ratio, price-deflated, previous three year denominator
$s^t_{t+1} = \dfrac{S^t_{t+1} - S_t}{S_t}$	and	Short-run sales expectations = expected percent change in physical volume of sales from McGraw-Hill survey, converted to pure decimal
$s_t^{t-1} = \dfrac{S_t^{t-1} - S_{t-1}}{S_{t-1}}$		
$s^t_{t+4} = \dfrac{S^t_{t+4} - S_t}{S_t}$	and	Long-run expected sales change over four years, from McGraw-Hill surveys of 1952 to 1955 = expected percent change in the physical volume of sales over four years, converted to pure decimal
$s_t^{t-4} = \dfrac{S_t^{t-4} - S_{t-4}}{S_{t-4}}$		

Symbol	*Description*
$s^t_{t+1,4} = \dfrac{S^t_{t+4} - S^t_{t+1}}{S^t_{t+1}}$ and	Long-run expected sales change over three years, from McGraw-Hill surveys of 1956 to 1968 = expected percent change in the physical volume of sales over three years, beginning one year ahead, converted to pure decimal
$s^{t-4}_{t-3,t} = \dfrac{S^{t-4}_t - S^{t-4}_{t-3}}{S^{t-4}_{t-3}}$	
$\bar{s}^t = (1 + s^t_{t+1,4})^{1/3} - 1$	Average long-run sales change expectations at annual rates, 1956-1968
$s^s_t = \dfrac{S_t - S_{t-1}}{S_{t-1}} - s^{t-1}_t$	Short-run realizations, ratios
$S_t - S^{t-1}_t = S_t - (1 + s^{t-1}_t)S_{t-1}$	Implicit short-run realizations in millions of 1954 dollars
$s^{g4}_t = \dfrac{S_t - S_{t-4}}{S_{t-4}} - s^{t-4}_t$	Long-run sales realizations over four years, ratios t = 1956 to 1959
$s^{g4'}_t = \dfrac{S_t}{S_{t-4}} - (1 + s^{t-4}_{t-3})(1 + s^{t-4}_{t-3,t})$	Long-run sales realizations over four years, synthesized, ratios, t = 1960 to 1968
$s^{g3}_t = \dfrac{S_t - S_{t-3}}{S_{t-3}} - s^{t-4}_{t-3,t}$	Long-run sales realizations over three years, t = 1960 to 1968

Acceptable Intervals for Basic Variables

Variable	*Acceptable Interval*
Δs^*_t	[0.7, −0.6]
s^t_{t+1}	[0.7, −0.6]

Variable	*Acceptable Interval*		
	and [0.7, −1.0]	for Tables 2-8 through M2-14
$s^t_{t+4}, s^t_{t+1,4}$	[2.0, −0.6]	
	and [2.0, −0.4]	for Tables 2-15 through M2-22
$(S_t - S_{t-1})/S_{t-1}$	[5.0, −1.0]	
$(1 + s^{t-4}_{t-3})\,(1 + s^{t-4}_{t-3,t}) - 1$	[2.0, −0.4]	
$(S_t - S_{t-4})/S_{t-4}$	[2.0, −0.4]	
$(S_t - S_{t-3})/S_{t-3}$	[2.0, −0.4]	

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