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Investment Plans and Stock Returns

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ABSTRACT

When the discount rate falls, investment should rise. Thus with time-varying discount rates and instantly changing investment, investment should positively covary with current stock returns and negatively covary with future stock returns. Aggregate nonresidential U.S. investment contradicts both these implications, probably because of investment lags. Investment plans, however, satisfy both implications. These investment plans, from a U.S. government survey of firms, are highly informative measures of expected investment and explain more than three-quarters of the variation in real annual aggregate investment growth. Plans have substantial forecasting power for excess stock returns, showing that time-varying risk premia affect investment.

A BASIC IDEA IN ECONOMICS and finance is that when the discount rate falls, investment should rise. If discount rates move over time and investment instantly adjusts, then the idea has two implications. First, investment and stock returns should positively covary over time. This positive contemporaneous covariation occurs because when discount rates fall, firms increase investment (since the hurdle rate on investment falls) and stock prices rise (since the discounted sum of future cash flows rises). Second, investment and future stock returns should negatively covary over time. This negative covariation occurs because when discount rates are low, investment today is high and future expected returns are low.

Post-war annual aggregate U.S. data on stock returns and nonresidential investment growth contradict these implications. Investment and stock returns have a significant *negative* contemporaneous covariation, and investment and future stock returns have a covariation that is not statistically different from zero. The significant negative contemporaneous covariation is particularly puzzling since it seems to suggest that firms perversely cut investment when stock prices go up.

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One explanation for these facts is investment lags, that is, lags between the decision to invest and the actual investment expenditure. Lags prevent firms from immediately adjusting investment when the discount rate changes, and can temporally shift the covariance of investment and returns. I use investment plans to test a hypothesis suggested by Cochrane (1991): “If there are lags in the investment process, then investment will not rise for a few periods, but orders or investment plans rise immediately.” (p. 213)

Lags in the investment process (such as delivery lags, planning lags, and construction lags) can cause actual investment to be negatively correlated with current returns. In understanding this temporal shift, it is useful to consider the following example, which contrasts the case of instant adjustment and lagged adjustment (see Cochrane (1991) for a formal model with instant adjustment). In year t, the discount rate falls. Thus, between year $t - 1$ and year t, stock prices rise. Due to this fall in the discount rate, year t expectations about stock returns between year t and year $t + 1$ are lower than previously, and on average one will observe lower stock returns in year $t + 1$ compared to year t.

First consider the behavior of investment growth in the case of instant adjustment. Investment rises in year t in response to the lower discount rate, so that investment growth and stock returns are both high in year t. The high investment growth in year t is negatively correlated with subsequent returns (since expected returns are lower in year $t + 1$).

Now consider the case of delayed adjustment due to investment lags. Suppose investment must be chosen one year in advance, so that investment expenditures cannot instantly adjust in response to changing discount rates. In this case, investment rises in year $t + 1$ in response to a year t fall in the discount rate. This delayed adjustment process generates two empirical implications for the time-series properties of investment and stock returns. First, when stock prices rise, investment subsequently rises. Thus *lagged* stock returns should be positively correlated with investment growth. Second, investment growth and stock returns should have a *negative* contemporaneous covariance. This occurs because the low expected returns in year $t + 1$ coincide with the high investment growth in year $t + 1$.

Thus investment lags and time-varying risk premia can explain the negative contemporaneous correlation of investment and stock returns. To directly test the hypothesis that lags are responsible, I examine planned investment. The investment plans come from a survey of capital expenditure plans conducted by the U.S. Commerce Department between 1947 and 1993. The Commerce Department asked firms their planned expenditure on plant and equipment over the coming year. It then aggregated the survey responses to produce estimates of industry and aggregate investment plans. These investment plans are not unbiased forecasts of future investment. However, plans are quite informative: More than three-quarters of the annual variation in aggregate investment growth is explained by investment plans made at the beginning of the year. Thus plans allow one to create a powerful measure of expected investment (conditional on observed plans and other lagged variables). Using this measure of expected investment, I decompose actual investment into expected and unexpected components. These two components behave quite differently over time, both at the aggregate and industry level.

To preview the results, planned investment (unlike actual investment) behaves as predicted by time-varying discount rates. First, planned future investment and current stock returns positively covary over time. In contrast, unexpected current investment and current stock returns are basically uncorrelated. These facts are consistent with investment lags that break the immediate temporal link between stock prices and investment. When discount rates fall, firms increase *planned* investment (for next year), but stock prices rise immediately.

Second, unlike actual investment, planned future investment and future stock returns negatively covary over time in a statistically significant way. High planned investment forecasts low stock returns. Plans have substantial forecasting power for stock returns, and contain information not captured in other variables. These variations in expected stock returns reflect changes in risk premia, not changes in riskless interest rates. Many papers in the investment literature assume that the appropriate discount rate for firm cash flows is constant or is equal to the interest rate plus a constant, but this practice does not reflect variation in risk premia. Like Cochrane (1991), I depart from most of the investment literature by focusing on time-varying expected stock returns.

Traditional q theory relates investment to beginning-of-period q, the ratio of market value to replacement value (see Chirinko (1993) for a review of this literature). More recently, several papers relate investment to lagged stock returns instead of q, because stock returns perform better in empirical investment equations. Lagged returns (or q) are positively related to investment (see Barro (1990) and Blanchard, Rhee, and Summers (1993) for aggregate data and Morck, Shleifer, and Vishny (1990) for individual companies).

The positive coefficient on lagged returns does not prove that investment responds to changes in discount rates. The reason is that returns reflect changes in future cash flows as well as changes in future discount rates (see, e.g., Campbell (1991) on why this is true by definition). Thus the relation between lagged returns and investment could be driven only by changes in expected future cash flows, such as changes in the productivity of capital. Indeed, q theory is often presented for the case of constant discount rates. The results using plans data, however, show that discount rates are not constant. Thus the significant negative covariation of planned investment and future stock returns adds an additional piece of information.

The fact that investment responds in the right way to discount rates does not, by itself, say much about the rationality of stock prices. Investment could respond to stock prices whether or not the stock market is rational

(Fischer and Merton (1984), Stein (1996)). I do not attempt to test a specific model of equilibrium returns, so I am unable to make any strong statement about mispricing or rationality. All the evidence is consistent with rational asset pricing. Section IV.A presents evidence that is inconsistent with a particular mispricing story.

Plans also shed light on the connection between profits and investment. As documented by Barro (1990) and Blanchard et al. (1993), current (as well as lagged) profits are strongly positively related to current investment. The results using plans show that this fact is driven by the relationship between unexpected profits and unexpected investment. One explanation is that both profits and investment respond to some third variable such as changes in productivity. A second explanation is that firms are financially constrained, and unexpected cash flow is used to finance investments (see Fazzari, Hubbard, and Petersen (1988) and Hubbard (1998)). To discriminate between these different explanations, I examine investment, stock returns, and profits at the industry level. Industry-specific unexpected investment is not significantly affected by industry-specific profits, suggesting that financial constraints do not explain the aggregate results.

This paper is organized as follows. Section I describes the plans data, defines the variables used, and shows summary statistics. Section II shows the ability of plans to forecast investment, and discusses various biases. Section III shows results for aggregate investment, aggregate stock returns, and aggregate profits. Section IV shows the ability of plans to forecast stock returns. Section V shows industry results, and Section VI presents conclusions.

I. Description of the Plans Data

A. The Survey

The plant and equipment expenditure survey began in 1947, and over time was administered by various different offices within the Commerce Department. In September 1994 the survey was discontinued.

The Commerce Department sent quarterly surveys to a sample of corporate and noncorporate firms. Compliance was voluntary. The Commerce Department compiled the survey results into industry and aggregate results. In addition to collecting quarterly investment plans, the survey collected annual plans in a questionnaire that was typically mailed out January and due back in the first week of February. The precise date that the survey results arrived at the Commerce Department varied; I treat the survey as representing information as of the last day of February.[1]

[1] According to various issues of the *Survey of Current Business*, the survey was taken "mid-February" in the late 1940s,"mid-February to mid-March" in the early 1950s, "late January and early March" in the late 1950s, "February" in the early 1960s, "late January and February" from 1967 to 1985, and "January and March" in the late 1980s.

In the February survey, firms were asked to state planned investment for the entire year. More precisely, the survey asked respondents to estimate their investment over three periods: QI, QII, and the second half (QIII and QIV) of the year. I ignore the quarterly projections and examine only annual plans and (in Sec. V) plans for the second half of the year.

The actual wording of the survey is that firms are asked to report "all capital expenditures you expect to make in each of the forthcoming time period shown, whether or not commitments or orders have already been placed" (Green and Hertzberg (1980), p. 41). As detailed later, the survey responses do not have the mathematical properties of unbiased forecasts of investment expenditures. Rather than being unbiased forecasts, Keezer et al. (1960) describe similar survey results as representing "varying degrees of finality. Some represent actual construction schedules based on outstanding orders; others, expenditures formally approved by a board of directors" (p. 370).

B. Data Definitions

I study real investment growth in year t, defined as nominal investment growth minus inflation for capital goods. Nominal investment growth is $i_t = (I_t/I_{t-1}) - 1$, where I_t is annual expenditures on plant and equipment. Planned investment growth is $\hat{i}_t = (\hat{I}_t/I_{t-1}) - 1$, where $\hat{I}_t$ is the reported level of planned investment.

The Commerce Department survey asks its participants to report their nominal spending on plant and equipment. Real actual investment growth is $g_t = (I_t/I_{t-1}) - (D_t/D_{t-1})$ and real planned growth is $\hat{g}_t = (\hat{I}_t/I_{t-1}) - (D_t/D_{t-1})$, where D_t is the nonresidential fixed investment deflator from the national income accounts.[2]

The difference between actual growth and planned growth is $g_t - \hat{g}_t$, the revision in year t investment between February and December of year t. The inflation adjustment does not affect $g_t - \hat{g}_t$.

Aggregate real stock returns, r_t, are total returns on the S&P Composite Index minus Consumer Price Index (CPI) inflation. Following Barro (1990), I also use the change in the profits ratio, $\Delta\pi_t$, defined as the difference between the ratio of profits to gross domestic product for private industry in year t and year $t - 1$.[3]

Table I shows summary statistics. First, note that $\sigma(g_t) > \sigma(\hat{g}_t)$. This variance inequality is a basic property that any good forecast should have. Second, note that g_t and r_t are negatively correlated. This puzzling empirical

[2] The survey's investment series differs from the nonresidential fixed investment series of the national income accounts due to differences in coverage and data sources. The correlation of annual real investment growth from the survey and from the national income accounts between 1948 and 1993 is 0.87 for real growth and 0.89 for nominal growth (see also Kopcke (1993) for a discussion of this issue).

[3] Unlike Barro, I use pretax profits instead of after-tax profits because pretax profits are available both for aggregate and for individual industries.

Table I

Summary Statistics

Descriptive statistics for real investment growth (actual and planned), real stock returns, and profits. $g_t = (I_t/I_{t-1}) - (D_t/D_{t-1})$ is actual real investment growth and $\hat{g}_t = (\hat{I}_t/I_{t-1}) - (D_t/D_{t-1})$ is planned real investment growth, where I_t is actual annual expenditures on plant and equipment from the Commerce Department survey, D_t is the nonresidential fixed investment deflator from the national income accounts, and $\hat{I}_t$ is planned investment in year t as of the Commerce Department survey in February of year t. The revision, $g_t - \hat{g}_t$, is the difference between actual and planned investment growth. $\Delta\pi_t$ is the change in the ratio of pretax profits to GDP of private industry. r_t is real stock returns, the total return on the S&P Composite Index between the end of December in year $t-1$ and the end of December in year t, minus the growth in the CPI between the end of December in year $t-1$ and the end of December in year t. The sample period is 1948 to 1993.

	Real Investment Growth			Real Stock Returns	Change in Profits Ratio
	Actual	Planned	Revision		
	g_t	$\hat{g}_t$	$g_t - \hat{g}_t$	r_t	$\Delta\pi_t$
Univariate summary statistics					
Mean	0.043	0.029	0.014	0.094	−0.002
Standard deviation	0.076	0.063	0.037	0.177	0.012
Min	−0.175	−0.132	−0.076	−0.387	−0.024
Max	0.168	0.171	0.139	0.531	0.039
Autocorrelation	0.10	0.06	0.22	−0.09	−0.18
Correlation matrix					
$\hat{g}_t$	0.87				
$g_t - \hat{g}_t$	0.55	0.07			
r_t	−0.46	−0.49	−0.10		
$\Delta\pi_t$	0.31	−0.01	0.64	−0.06	

regularity does not involve plans data. Note also that the correlation of $g_t - \hat{g}_t$ and r_t is much lower. Third, note that $g_t - \hat{g}_t$ and $\Delta\pi_t$ are highly correlated. Figure 1 shows the time series of g_t and $\hat{g}_t$, and Figure 2 shows revisions in investment, $g_t - \hat{g}_t$.

II. Regressions of Actual on Planned Investment

A. Explanatory Power

Column 1 of Table II shows univariate regressions of actual investment growth on planned investment growth. If plans measure the expectation of investment growth, then (A) the intercept should be zero, (B) the coefficient should be one, and (C) no other regressor should be significant. Column 1 shows that plans do a superb job at satisfying conditions (A) and (B). The explanatory power is quite large. By itself, Column 1 presents an interesting

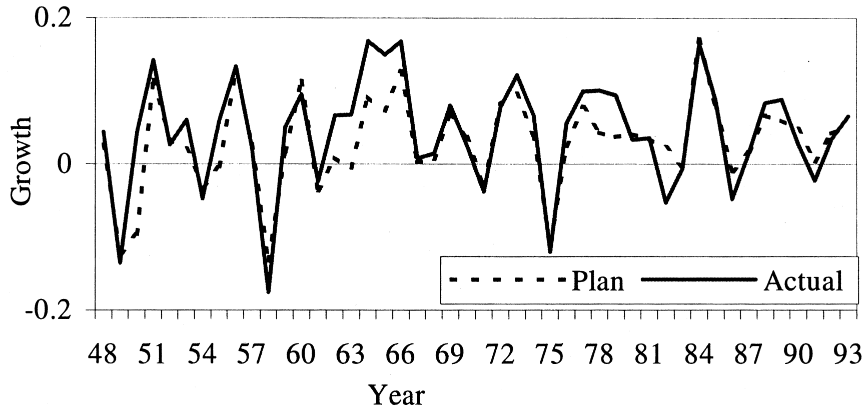

Figure 1. Real investment growth, 1948–1993. The solid line is $g_t = (I_t/I_{t-1}) - (D_t/D_{t-1})$, actual real investment growth. The dotted line is $\hat{g}_t = (\hat{I}_t/I_{t-1}) - (D_t/D_{t-1})$, planned real investment growth. I_t is actual annual expenditures on plant and equipment from the Commerce Department survey, D_t is the nonresidential fixed investment deflator from the national income accounts, and $\hat{I}_t$ is planned investment in year t as of the Commerce Department survey in February of year t. The revision, $g_t - \hat{g}_t$, is the difference between actual and planned investment growth.

decomposition of real investment growth: More than three-quarters of the variation in investment growth in a given year can be predicted at the beginning of the year.

In interpreting the R^2, there are several factors to consider. First, it could be that much of the investment in a given year is irreversibly determined at the beginning of the year. This fixity makes investment easy to forecast, no matter how uncertain actual events are in the year ahead. Second, it could be that investment within a given year is very flexible, but that the driving forces are easy to forecast. Last, the observed R^2 is a lower bound on the actual predictability of investment growth, since there is undoubtedly measurement error in plans. So although the high R^2 is not conclusive, it is at least consistent with substantial investment lags.

The informativeness of these forecasts is remarkable, given the generally poor performance of other survey forecasts. One explanation for this difference in accuracy is that, unlike other surveys (e.g., surveys of inflation expectations), this survey only asks participants to forecast their own behavior, not the behavior of other agents. And most large firms produce such projections for their own internal use (these projections are sometimes made public, see, e.g., McConnell and Muscarella (1985)). One piece of evidence in favor of this explanation is that these same firms do not exhibit similar ability at forecasting other variables. During part of the sample period, the Commerce Department survey also asked the firms to forecast price inflation. The resulting inflation forecasts have poor properties (de Leeuw and McKelvey (1984)).

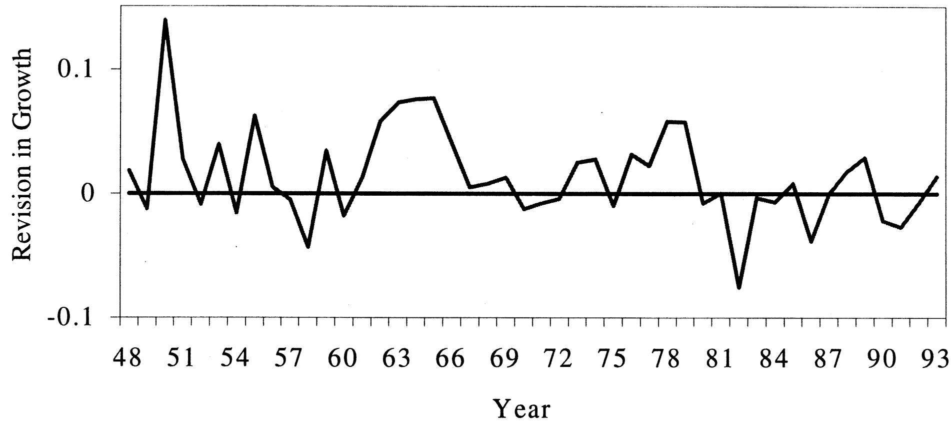

Figure 2. Revisions to investment growth, 1948–1993. The graph shows revisions to investment growth, $g_t - \hat{g}_t$, which is the difference between actual investment growth and planned investment growth. $g_t - \hat{g}_t = (I_t/I_{t-1}) - (\hat{I}_t/I_{t-1})$, where I_t is actual annual expenditures on plant and equipment from the Commerce Department survey, and $\hat{I}_t$ is planned investment in year t as of the Commerce Department survey in February of year t.

B. Biases in the Plans Data

The reported plans display systematic forecast errors (de Leeuw and McKelvey (1981)). First, plans tend to underestimate actual investment expenditures in the distant future. In the February survey, plans for the second half of the year (from July to December) systematically understate actual investment. Second, the plans exhibit a systematic seasonal pattern in forecast errors for quarterly data. This seasonal bias causes February's plans for the first half of the year to systematically overstate actual investment.

The magnitude of these two biases is fairly large, but they roughly cancel out for the annual forecast, resulting in the combined effect that annual plans have a small positive forecast error. On average, planned growth understates actual investment growth by about 1.4 percent during the sample period from 1947 to 1993 (as seen in Table I). However, the bias diminishes over time, falling from about 4 percent at the beginning of the sample to about zero at the end. The reduction in bias does not occur because the plans as a whole become more accurate, it occurs because the plans become less accurate in a way that cancels out. The bias in first-half plans grows worse over time, whereas the opposite bias in second-half plans stays constant. The reasons for this trend in bias presumably involve changes in seasonal patterns of investment, in accounting or planning practices, in investment technology, in composition of investment type and firm size, or in attitudes towards the survey.

Column 2 in Table II reflects the imperfect forecasting properties of investment plans. Due in part to the biases discussed above, revisions to investment are positively autocorrelated. Forecast errors made this year are

Table II

Explaining Aggregate Investment Growth

OLS regressions explaining actual investment growth, planned investment growth, and revisions to plans. g_t is real investment growth, and $\hat{g}_t$ is planned real investment growth from the Commerce Department survey in February of year t. $\Delta\pi_t$ is the change in the ratio of pretax profits to GDP of private industry. r_t is real returns on the S&P Composite between December of year $t-1$ and December of year t. D-W is the Durbin-Watson statistic. The sample period is 1949 to 1993, $N = 45$ annual observations. Robust standard errors in parentheses.

	Actual Investment: g_t						Plans: $\hat{g}_t$	Revisions: $g_t - \hat{g}_t$
	1	2	3	4	5	6	7	8
Constant	0.01	0.02	0.02	0.03	0.01	0.01	0.02	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
g_{t-1}		0.24	0.20	0.34	0.37	0.66	−0.01	0.66
		(0.14)	(0.12)	(0.12)	(0.18)	(0.11)	(0.20)	(0.11)
r_t				−0.12		−0.02	−0.12	−0.01
				(0.04)		(0.02)	(0.03)	(0.02)
r_{t-1}			0.22	0.17	0.03	0.01	0.16	0.00
			(0.06)	(0.05)	(0.05)	(0.03)	(0.04)	(0.02)
$\Delta\pi_t$				2.67		2.73	0.03	2.72
				(0.79)		(0.34)	(0.93)	(0.37)
$\Delta\pi_{t-1}$			3.10	2.99	−0.59	−0.51	3.02	−0.70
			(0.72)	(0.49)	(0.83)	(0.45)	(0.61)	(0.38)
$\hat{g}_t$	1.04	1.01			1.01	0.94		
	(0.12)	(0.11)			(0.13)	(0.09)		
$\hat{g}_{t-1}$		−0.44			−0.53	−0.63	0.25	−0.65
		(0.19)			(0.26)	(0.14)	(0.21)	(0.13)
R^2	0.76	0.80	0.47	0.68	0.81	0.92	0.63	0.67
D-W	1.54	2.14	1.82	1.58	2.01	2.17	1.39	2.13

likely to be inefficiently repeated next year. In Table II, this autocorrelation appears as a positive coefficient on lagged investment growth and negative coefficient on lagged planned growth. Because the coefficient on lagged planned growth is significant, column 2 rejects the hypothesis that plans are optimal forecasts of investment. Quantitatively, however, the added information is small since the R^2 only increases from 0.76 to 0.80 for real investment growth. The fact that survey participants make systematic errors is not a particular concern for this paper, because I am not interested in the studying the forecasting ability of firms, but rather want to use their survey responses as useful information in forming my own forecasts of investment.

C. Effects of Deflating and Data Revisions

Because the survey participants are asked to state their nominal planned investment, I also repeat column 1 of Table II using nominal investment and planned investment. The results, not shown, are quite similar, with an R^2 of 0.80, an intercept term of 0.01 (standard error 0.01) and a coefficient of 1.01 (standard error 0.10).

The plant and equipment expenditure data are routinely revised. Benchmark revisions to incorporate information from census data causes estimates of both actual investment spending and reported planned spending to be revised. In revising the plans, the Commerce Department typically revised the actual spending, then revised the planned spending in order to keep the ratio of actual to plan constant.

To ensure that these revisions do not distort the results, I rerun column 1 of Table II using hand-collected data from the *Survey of Current Business*, as it was originally published in real time. I again use nominal data because the deflator is also subject to revisions. The results are very similar. Specifically, using the 38 annual observations on nominal investment growth available from the *Survey of Current Business*, the R^2 is 0.82, the intercept term is 0.003 (standard error 0.013) and the coefficient is 0.99 (standard error 0.12).[4]

III. Aggregate Investment, Profit, and Stock Returns

A. Explaining Aggregate Investment without Plans

Columns 3 and 4 of Table II show regressions of aggregate real investment growth on real stock returns and changes in real profits. These regressions are nearly identical to those in Barro (1990) and are also very similar to Blanchard et al. (1993). I regress g_t, the real growth in plant and equipment investment, on lagged investment, current and lagged corporate profits, and current and lagged real stock returns.

Columns 3 and 4 reproduce the results of Barro (1990). Column 3 shows that lagged investment, profits, and stock returns all are positively related to current investment. The significant positive coefficient of lagged stock returns is the standard result, similar to the familiar regression of investment on q.

Column 4 shows that current stock returns are negatively related to investment, whereas current profits are positively and significantly related. This negative relation of returns and investment growth contradicts the predicted positive relation that comes from models with instant adjustment of investment. Barro (1990) also finds a negative and significant relationship between contemporaneous stock returns and nonresidential investment growth in postwar aggregate annual data.[5]

[4] This regression uses "bias-adjusted" planned investment. The Commerce Department calculates bias adjustments to account for past forecast errors (and also seasonally adjusts some data). With the exception of this regression, this paper uses only the raw and seasonally unadjusted data, since some of the bias adjustment used information that could not have been available in real time.

[5] Barro (1990, Table 1, line 15). According to Poterba (1990), current stock returns also have a negative sign in the aggregate regressions of Morck et al. (1990). In a similar vein, Chen (1991) finds that industrial production is negatively correlated with contemporaneous stock returns. Campbell and Mei (1993) explain Chen's negative contemporaneous correlation of returns and industrial production as reflecting changes in expected future returns.

In contrast, Cochrane (1991) finds that aggregate investment growth and stock returns are positively contemporaneously correlated. Cochrane (1991) gets different results for two reasons. First, he uses different timing conventions for investment and stock returns.[6] Second, rather than the more traditional nonresidential investment, Cochrane uses an investment measure that includes both residential and nonresidential investment. Excluding residential investment is arguably more appropriate for relating investment and stock returns, because most of the residential capital stock is not traded on equity markets.[7]

B. Adding Investment Plans

Column 5 of Table II adds plans to the specification in column 3. It shows that plans drive out lagged profits and returns. Lagged profits and returns are individually and jointly insignificant and add very little explanatory power (the R^2 rises from 0.80 in column 2 to only 0.81 in column 5). Evidently, planned investment in February reflects the information in lagged profits and returns.

Column 6 adds plans to the specification in column 4. The coefficient on current stock returns falls to about zero. The zero coefficient on current returns in column 6 shows that the reason that investment and stock returns are negatively correlated is that *expected* future investment and *expected* future stock returns are negatively correlated. Because $\hat{g}_t$ measures expected investment, the expected return component of current returns is driven out of the regression. The interpretation is that planned investment responds to changes in discount rates.

Comparing the coefficient on current returns in columns 4 and 6 shows why observing plans is necessary to understand returns and investment. By including lagged variables in column 4, one is controlling for variables that are correlated with expected investment. Column 6 shows that these lagged variables are not adequate controls for expected investment, and that without plans, it is difficult to interpret regressions of current investment on current returns.

In contrast, the virtually unchanged coefficient on current profits in columns 4 and 6 shows that current profits contain a substantial surprise, and that within a given year, companies are able to increase investment when profits increase.[8] Thus profits and investment are positively correlated because *unexpected* investment and *unexpected* profits are correlated.

[6] Cochrane adjusts for the different temporal aggregation of investment (which is an average flow) compared to stock returns (which are measured from point to point), an issue I ignore here.

[7] Including residential investment increases the covariation of stock returns and investment growth, because residential investment leads nonresidential investment. See also Cochrane (1996) for a further discussion of nonresidential versus residential investment.

[8] de Leeuw and McKelvey (1981) run similar regressions using plans and also find that the unexpected component of profits is positively correlated with investment.

These relationships are the central result of the paper. Columns 7 and 8 express these relationships in a different way, showing regressions in which plans or revisions are the dependent variable. Column 7 puts future variables (reflecting the entire year) in the regression explaining investment plans (which are determined in February). The idea is that this year's investment plans should reflect expectations about next year's profits and stock returns.[9]

Column 7's results are similar to column 4's, except for the coefficient on current profits (which is now about zero). The coefficient of 0.16 on lagged returns shows that planned growth and stock returns positively covary over time. When stock returns are high in year $t-1$, planned growth for year t (which is determined at the end of year $t-1$) is also high.

Column 7 also shows that the change in the profits ratio in year t appears to contain news not available in February of year t. Similarly, column 8 shows that revisions to investment are strongly correlated with contemporaneous profits, but are totally unrelated to stock returns.

C. Expected and Unexpected Components

Table III shows the results from Table II in a more direct way, by constructing expected investment, expected profits, and expected stock returns. For the three variables, Table III runs forecasting regression with the current variable on the left-hand side and plans and lagged variables on the right-hand side. For investment, for example, the regression defines $E_{t-1}[g_t]$ as the fitted value of the regression, and $g_t - E_{t-1}[g_t]$ as the residual, where E_{t-1} is the expectation conditional on observing the variables in February of year t.

Column 1 simply repeats column 5 in Table II. Column 2 shows the forecasting regression for profits. High lagged investment growth forecasts low profits (perhaps reflecting cyclical movements in these variables), but planned investment appears to be unrelated to future profits (consistent with the zero coefficient on current profits in column 7 of Table II). Given the importance of current profits in determining current investment (as shown in column 4 of Table II), it is remarkable how planned investment totally fails to anticipate future profits.

Column 3 shows forecasting regressions for stock returns. The result is striking. For every one percent increase in planned investment growth, real returns are more than one percent lower. Because $\hat{g}_t$ only reflects information known as of the end of the year, the regression implies that $\hat{g}_t$ and expected returns are negatively correlated. Column 3 makes it clear why actual investment and returns are negatively correlated. It is because planned investment and expected returns are negatively correlated.

[9] Fama (1990) and Schwert (1990), for example, use future industrial production to explain current stock returns.

Table III

Expected and Unexpected Aggregate Investment, Profits, and Stock Returns

Columns 1 to 3 show OLS forecasting regressions for investment, profits, and stock returns. g_t is real investment growth, $\hat{g}_t$ is planned real investment growth, $\Delta\pi_t$ is the change in the profits ratio, r_t is real stock returns. Columns 4 and 5 use the forecasting regressions in columns 1 to 3 to create expected and unexpected variables: $E_{t-1}[g_t]$ is the fitted value from column 1, $E_{t-1}[\Delta\pi_t]$ is the fitted value from column 2, and $E_{t-1}[r_t]$ is the fitted value from column 3. The standard errors in column 4 are two-stage least squares standard errors from a regression of g_t on $\Delta\pi_t$ and r_t, with the right-hand-side variables in columns 1 to 3 as instruments. The standard errors in column 4 come from column 6 of Table II. The sample period is 1949 to 1993, $N = 45$ annual observations. Robust standard errors in parentheses.

	g_t	$\Delta\pi_t$	r_t	$E_{t-1}[g_t]$	$g_t - E_{t-1}[g_t]$
	1	2	3	4	5
Constant	0.01	0.00	0.14	0.10	
	(0.01)	(0.00)	(0.04)	(0.02)	
g_{t-1}	0.37	−0.10	0.35		
	(0.18)	(0.05)	(0.74)		
r_{t-1}	0.03	0.01	0.12		
	(0.05)	(0.01)	(0.18)		
$\Delta\pi_{t-1}$	−0.59	−0.01	2.75		
	(0.83)	(0.27)	(2.77)		
$\hat{g}_t$	1.01	0.01	−1.81		
	(0.13)	(0.04)	(0.49)		
$\hat{g}_{t-1}$	−0.53	0.03	−0.49		
	(0.26)	(0.07)	(1.01)		
$E_{t-1}[\Delta\pi_t]$				1.12	
				(1.90)	
$E_{t-1}[r_t]$				−0.60	
				(0.13)	
$\Delta\pi_t - E_{t-1}[\Delta\pi_t]$					2.73
					(0.34)
$r_t - E_{t-1}[r_t]$					−0.02
					(0.02)
R^2	0.81	0.36	0.29	0.69	0.60

Comparing the coefficients on $\hat{g}_t$ and g_{t-1} in column 3 shows the difference between planned investment and actual investment in forecasting returns. Unlike actual investment, planned investment negatively covaries with future returns.

Columns 4 and 5 use the variables defined by columns 1 to 3.[10] Column 4 regresses expected investment on expected profits and expected stock returns. This regression is analogous to column 7 of Table II, except now the

[10] The robust standard errors in these regressions reflect the imprecision of the first-stage estimates. The standard errors in column 4 are two-stage least squares standard errors from a regression of g_t on $\Delta\pi_t$ and r_t, with the right-hand-side variables in columns 1 to 3 as instruments. The standard errors in column 4 come from column 6 of Table II.

Table IV

Subperiod Results for Expected and Unexpected Aggregate Investment, Profits, and Stock Returns

Regressions of expected investment growth on expected returns and expected profits, and unexpected investment growth on unexpected returns and unexpected profits. g_t is real investment growth, $\hat{g}_t$ is planned real investment growth, $\Delta\pi_t$ is the change in the profits ratio, r_t is real stock returns. $E_{t-1}[g_t]$, $E_{t-1}[\Delta\pi_t]$, and $E_{t-1}[r_t]$ are the fitted values from regressions (not shown) on g_{t-1}, r_{t-1}, $\Delta\pi_{t-1}$, $\hat{g}_t$, and $\hat{g}_{t-1}$. The robust standard errors reflect the imprecision of the first-stage estimates and are calculated as in Table III. Robust standard errors in parentheses.

	1952–1993		1949–1971		1972–1993	
	$E_{t-1}[g_t]$	$g_t - E_{t-1}[g_t]$	$E_{t-1}[g_t]$	$g_t - E_{t-1}[g_t]$	$E_{t-1}[g_t]$	$g_t - E_{t-1}[g_t]$
Constant	0.10		0.10		0.10	
	(0.02)		(0.02)		(0.05)	
$E_{t-1}[\Delta\pi_t]$	2.61		1.70		3.71	
	(2.04)		(1.17)		(3.85)	
$E_{t-1}[r_t]$	−0.59		−0.45		−0.80	
	(0.12)		(0.13)		(0.35)	
$\Delta\pi_t - E_{t-1}[\Delta\pi_t]$		2.82		2.50		3.08
		(0.51)		(0.32)		(1.86)
$r_t - E_{t-1}[r_t]$		−0.01		−0.07		0.02
		(0.02)		(0.03)		(0.04)
R^2	0.79	0.47	0.49	0.71	0.98	0.31

dependent variable is the expectation of investment conditional on all lagged variables, not just on plans. As one would expect from column 3, expected returns are significantly negatively related to expected investment. Expected profits are positively related to expected investment, but the standard error is huge and one cannot reject the null hypothesis that the coefficient is zero.

Column 5 tests the relation between unexpected components of investment, profits, and returns. Column 5 shows no new information, as the coefficients are, of course, numerically identical to column 6 of Table II.

In summary, the basic results for aggregate investment are that expected investment is negatively related to expected returns, and unexpected investment is positively related to unexpected profits. Unlike actual investment, planned investment positively covaries with current returns and negatively covaries with future returns.

D. Robustness Checks

Table IV shows the relationship between expected and unexpected variables in different periods. First, examining regression leverage for individual years shows that 1949, 1950, and 1951 are all influential data points for column 6 of Table II. The first part of Table IV shows the results omitting

Table V

Stock Returns, Investment Plans, and the Equity Share

OLS regressions predicting stock returns using planned investment, actual investment, actual lagged investment, and the equity share. The dependent variable is r_t, real stock returns. g_t is real investment growth and $\hat{g}_t$ is planned real investment growth. I_t/K_{t-1} is the investment to capital ratio, year t nonresidential fixed investment divided by the net stock of nonresidential fixed private capital at the end of year $t-1$. $\hat{I}_t/K_{t-1}$ is the planned investment to capital ratio, defined as I_t/K_{t-1} multiplied by the ratio of planned investment to actual investment. S_{t-1} is the year $t-1$ ratio of total equity issues to the sum of total debt plus total equity issues, from Federal Reserve Bulletin via Baker and Wurgler (2000). The sample period is 1949 to 1993, $N = 45$ annual observations. Robust standard errors in parentheses.

	1	2	3	4	5	6	7	8	9
Constant	0.14	0.11	0.14	0.89	0.44	0.93	0.24	0.51	0.89
	(0.02)	(0.02)	(0.02)	(0.23)	(0.26)	(0.23)	(0.07)	(0.26)	(0.23)
$\hat{g}_t$	−1.36								
	(0.29)								
g_{t-1}		−0.33							
		(0.29)							
g_t			−1.07						
			(0.25)						
$\hat{I}_t/K_{t-1}$				−8.36					−7.45
				(2.49)					(2.50)
I_{t-1}/K_{t-1}					−3.55			−2.91	
					(2.74)			(2.53)	
I_t/K_{t-1}						−8.75			
						(2.43)			
S_{t-1}							−0.69	−0.64	−0.44
							(0.34)	(0.33)	(0.33)
R^2	0.24	0.02	0.21	0.21	0.04	0.24	0.09	0.11	0.24

these three years. The rest of Table IV splits the sample into two halves, 1949 to 1971 and 1972 to 1993. The results are stable over these different periods, with the coefficients on expected investment and unexpected profits always similar to Table III, and significant in five out of six cases.

IV. Forecasting Stock Returns Using Planned Investment

This section takes a closer look at the forecasting ability of actual and planned investment. Table V shows forecasting regressions for real stock returns. Column 1 shows the strong negative relation between planned investment growth and stock returns in a univariate regression. As seen in Table III, expected future investment is negatively related to expected future stock returns.

Column 2 shows that actual investment does not reliably forecast stock returns. Baker and Wurgler (2000) consider alternate models (based on Stein (1996)) that include irrational investors, and describe the prediction that investment should negatively forecast stock returns as "an unambiguous prediction of all efficient markets cases." They examine annual data between 1928 and 1995 and, like column 2, fail to reject the null hypothesis that investment has no forecasting ability for stock returns.[11]

Column 3 shows that actual investment growth is negatively correlated with contemporaneous stock returns (as seen in Table II). Columns 1 and 3 both reflect the same tendency that investment, fixed at least partially in advance, falls when discount rates rise. However, the plans data provide positive evidence that the negative contemporaneous covariation between investment and stock returns is caused by expected, not unexpected, investment.

Columns 4 to 6 show the results using investment-to-capital ratios instead of investment growth (as in Cochrane (1991) and Baker and Wurgler (2000)). For these regressions, the independent variable is nonresidential fixed investment divided by the net stock of nonresidential fixed private capital, provided by the Bureau of Economic Analysis (BEA). The planned investment-to-capital ratio is the ratio of planned investment to actual investment (where both variables are from the plant and equipment expenditure survey) multiplied by the actual investment-to-capital ratio. The results are similar to columns 1 to 3. Both actual current investment and planned investment ratios are significantly negatively correlated with stock returns; lagged investment ratios do not significantly forecast stock returns.

A. Mispricing and Equity Issuance

The discussion so far has focused on these facts in the context of a model in which firms invest optimally and asset prices correctly reflect information about cash flows and discount rates. An alternate model is one in which the aggregate level of stock prices is mispriced, and firms respond to this mispricing by issuing equity and investing in physical capital.

Loughran and Ritter (1995) show that equity issuance predicts low future returns for individual stocks, and interpret this fact as consistent with a world in which firms issue equity when firm stock price is overvalued. Loughran and Ritter (1997) show that these issuing firms have high capital expenditures. Baker and Wurgler (2000) show that aggregate equity issuance forecasts low aggregate stock returns. Baker and Wurgler (2000) argue that since investment does not forecast stock returns (as in columns 2 and 5 of Table V), the evidence is inconsistent with rationality.

Columns 7 and 8 of Table V reproduce regressions from Baker and Wurgler (2000). These regressions examine the forecasting ability of the equity share. The equity share, S, is the ratio of gross equity issues to the sum of gross equity issues and gross debt issues. Column 7 shows that as the percentage

[11] In contrast, Cochrane (1991) finds that investment does have significant forecasting power for stock returns. As noted previously, he uses different timing and a different definition of investment.

of equity in total new financing rises, stock returns in the subsequent year fall. The coefficient on the equity share is statistically significant.[12] Column 8 shows that if one controls for lagged investment, the coefficient on the lagged equity share is unchanged, and lagged investment is insignificant. Baker and Wurgler (2000) interpret these results as consistent only with a world in which managers issue equity when it is overpriced.

Column 9 shows the results using planned investment along with the equity share. The coefficient on the equity share falls and becomes insignificant, while the coefficient on planned investment is little changed from column 4. Columns 8 and 9 use the investment-to-capital ratio to facilitate comparison to Baker and Wurgler (2000); replacing investment-to-capital ratios with investment growth produces similar results.[13]

In summary, Table V is consistent with investment chosen by optimizing firms in response to rational changes in stock prices. Going from column 8 to 9, the coefficient on the equity share does not drop dramatically, so investment plans do not completely explain the covariation between stock returns and the equity share. However, the evidence certainly does not indicate that investment plans forecast returns because plans are correlated with mispricing and equity issuance.

B. Incremental Forecasting Power of Investment Plans

Table VI shows the effects on stock return forecasts of adding further forecasting variables and using different timing. The dependent variable in the first two columns is returns from the traditional period of December of year $t - 1$ to December of year t. Column 1 shows forecasting regressions without plans but with a variety of lagged variables that have been shown to forecast returns. It includes returns, dividend yields, dividend payout ratios, term premiums, default premiums, and real interest rates.

Both the dividend yield and the payout ratio correspond to the S&P Composite (the source of the real return series). The dividend yield is four-quarter dividends divided by price as of December of year $t - 1$. The dividend yield is thought to forecast stock returns because it measures time-varying risk premia on stocks, which are reflected in scaled stock prices. The payout ratio is four-quarter dividends divided by quarterly earnings, as of December of year $t - 1$. The payout ratio is a measure of macroeconomic conditions (Lamont (1998)). The term and default premia variables are based on interest-rate spreads and are similar to those used by Fama and French (1989). The term spread is the difference between the long-term Treasury bond yield and the 1-month Treasury bill rate. The default spread is the difference between

[12] I thank Malcolm Baker for providing this data. The sample period in Table V is significantly shorter than Baker and Wurgler (2000). They start in 1928 and report a t-statistic of 3.86 compared to the t-statistic of 2.00 in column 7.

[13] However, the variables in columns 7 to 9 have slightly different units than those in Baker and Wurgler (2000).

Table VI

Incremental Stock Return Forecasting Ability of Investment Plans

OLS regressions predicting stock returns using plans and other lagged variables. $\hat{g}_t$ is planned real investment growth in year t as of February of year t. Columns 1 and 2: The dependent variable r_t is real S&P Composite stock returns between the end of December of year $t-1$ and the end of December of year t; Dividend yield$_{t-1}$ is the S&P Composite dividend yield as of December of year $t-1$; Dividend payout$_{t-1}$ is the S&P Composite dividend payout ratio (ratio of four-quarter dividends to quarterly earnings) as of the end of December of year $t-1$; Term premium$_{t-1}$ is the yield on AAA Corporates minus the 3-month Treasury bill yield as of December of year $t-1$; Default premium$_{t-1}$ is the yield on BAA Corporates minus the yield on AAA Corporates as of December of year $t-1$, Real interest rate$_{t-1}$ is the return earned by T-bills over the last 12 months minus the CPI inflation rate over the last 12 months as of December of year $t-1$. Column 3: The dependent variable r_t is S&P Composite stock returns minus T-bill returns between the end of December of year $t-1$ and the end of December of year t. Column 4: The dependent variable r_t is real stock returns between the end of February of year t and the end of February of year $t+1$; the lagged return, dividend yield, term premium, default premium, and real interest rate are all as of the end of February of year t; the dividend payout ratio remains as of December of year $t-1$. The sample period is 1949 to 1993, $N = 45$ annual observations. Robust standard errors in parentheses.

	1 Dec-to-Dec Real Returns	2 Dec-to-Dec Real Returns	3 Dec-to-Dec Excess Returns	4 Feb-to-Feb Real Returns
Constant	−0.39	−0.20	−0.18	−0.19
	(0.18)	(0.17)	(0.16)	(0.13)
$\hat{g}_t$		−1.13	−1.13	−0.85
		(0.34)	(0.34)	(0.33)
r_{t-1}	−0.10	0.00	−0.00	−0.04
	(0.18)	(0.15)	(0.14)	(0.13)
Dividend yield$_{t-1}$	8.37	6.19	5.84	6.87
	(2.41)	(2.39)	(1.96)	(1.92)
Dividend payout$_{t-1}$	0.06	0.03	0.03	0.02
	(0.05)	(0.05)	(0.04)	(0.04)
Term premium$_{t-1}$	0.02	0.02	0.03	0.02
	(0.02)	(0.02)	(0.02)	(0.02)
Default premium$_{t-1}$	−0.01	−0.04	−0.05	−0.08
	(0.06)	(0.05)	(0.05)	(0.06)
Real interest rate$_{t-1}$	1.12	1.26		1.97
	(0.98)	(0.95)		(0.76)
R^2	0.28	0.40	0.42	0.47

the BAA and AAA Corporate bond yields. The real interest rate is the return earned by T-bills over the last 12 months minus the CPI inflation rate over the last 12 months.

Column 1 shows that these six forecasting variables, in combination, have about as much explanatory power as plans alone (the R^2 is 0.28 vs. 0.24 for plans alone in Table V, column 1). The dividend yield is an important forecasting variable; the other five variables are jointly and individually insignificant. Column 2 shows regressions with both plans and the other forecasting variables. These variables have the potential to drive plans out of the forecasting regression, if they measure time-varying expected returns better than planned investment growth does. The coefficient on $\hat{g}_t$ is not dramatically affected by these other variables. Evidently, planned investment contains information about future returns that is not captured by standard variables. To the extent that these other variables capture macroeconomic conditions, column 2 shows that the relationship between discount rates and investment is not being driven only by macroeconomic conditions.

Column 3 shows regressions where excess returns on stocks over T-bills are the dependent variable. This column essentially puts the riskless rate on the left-hand side instead of the right (and replaces lagged real returns with lagged excess returns on the right-hand side as well). One might expect plans to forecast risk premia differently than they forecast real returns, if the riskless rate and plans move together. Column 3 shows that this is not the case, as the coefficient on plans is about the same (the correlation of planned real investment growth and real interest rates is only 0.05). This result highlights the importance of allowing for time-varying risk premia on stocks.

Last, column 4 shows a regression where the dependent variable is real returns from February of year t to February of year $t + 1$. This regression more properly reflects the timing of the plans data, which are collected during January and February. The dividend yield, term premium, default premium, and real interest rate are also as of February of year t (because the dividend payout is quarterly, the latest available value in February is still December of year $t - 1$). The coefficient on plans falls but is still large and significant.

Although investment plans were impressive at forecasting stock returns between 1948 and 1993, out-of-sample performance will be forever unknown because the investment survey was discontinued. Other impressive variables between 1948 and 1993, such as the dividend price ratio, have not done well out of sample.

V. Industry Investment

This section examines results for individual industries (see also Schankerman (1991) and Porter (1998)). Examination of industry investment and industry returns has the potential to provide more statistical power and to distinguish between competing hypotheses. I study two types of investment plans. The first is the investment plan used so far, annual investment plans made in February for the entire year. The other is "second-half" plans, which is planned investment in the period July–December.

A. Annual Industry Investment

I collect data on planned and actual investment, profits, and stock returns for 15 separate industries: Stone Clay and Glass, Primary Metals, Fabricated Metals, Electrical Machinery, Machinery Except Electrical, Motor Vehicles, Food Including Beverage, Textiles, Paper, Chemicals, Petroleum, Rubber, Railroad Transportation, Air Transportation, and Mining. Plans data are available from 1949 to 1993 for Railroad Transportation, Air Transportation, and Mining and from 1953 to 1993 for the other industries. I use these industries because they have available data on investment plans, annual industry profits, and annual industry gross domestic product. Industry stock returns come from value-weighted industry portfolios constructed using individual firms' stock returns and Standard Industrial Classification codes from the Center for Research in Security Prices (CRSP).

Table VII repeats the analysis of Table III, using pooled data for 15 individual industries. In addition to the variables shown, each regression includes industry dummies and year dummies.[14] The standard errors are adjusted for correlation of the residuals within years, and for heteroskedasticity.[15] By including year dummies, Table VII eliminates aggregate variation in the dependent and independent variables, so that the coefficients on profits, plans, and returns reflect idiosyncratic industry variation that is uncorrelated with aggregate variables such as aggregate profits, aggregate returns, inflation, and all the forecasting variables shown in Table VI. For example, the effects of the aggregate dividend yield are absorbed by the year dummies, as are unpredictable common movements in stock returns. The year dummies mean that the coefficients in Table VII do not need to aggregate to the coefficients in Table III.

Column 1 of Table VII shows that industry-specific plans forecast industry-specific actual investment with a coefficient of about one. Comparing Tables VII and III, industry plans look less accurate than aggregate plans since they do not incorporate the information in lagged industry returns (as reflected by the significant and positive coefficient on lagged returns). Column 2 shows the forecasting regression for profits. Planned industry investment, surprisingly, negatively forecasts profits. Lagged industry returns (as one would expect) positively forecast profits.

Column 3 shows forecasting regressions for returns. The nearly significant positive coefficient on returns is similar to the industry momentum of Moskowitz and Grinblatt (1999). As before, plans have a significant negative coefficient. Industry-specific plans negatively forecast industry-specific returns. However, the strength of the relationship is much smaller at the industry level (-0.13 in Table VII compared to -1.81 in Table III).

Column 4 shows that despite the significant coefficient on plans in Column 3, one cannot reject the null hypothesis that expected investment is unrelated to expected returns.[16] This result says that, taking into account all

[14] Using fixed effects estimation in the presence of a lagged dependent variable produces biased results (see Hsiao (1986)). I ignore this bias; in this context it is small because the number of periods is fairly large and the dependent variable is not highly autocorrelated.

[15] The robust standard errors allow for clustered sampling (dependence of observations within each year). See Rogers (1993).

[16] The R^2 in columns 4 and 5 are from a regression where both the dependent and independent variables are orthogonalized to the year and industry dummies.

Table VII

Expected and Unexpected Annual Industry Investment, Profits, and Stock Returns

Columns 1 to 3 show OLS forecasting regressions for investment, profits, and stock returns. g_t is investment growth, $\hat{g}_t$ is planned investment growth, $\Delta\pi_t$ is the change in the profits ratio, r_t is industry stock returns (total returns on a value weighted portfolio of all CRSP firms in the industry). Columns 4 and 5 use the forecasting regressions in columns 1 to 3 to create expected and unexpected variables: $E_{t-1}[g_t]$, $E_{t-1}[\Delta\pi_t]$, and $E_{t-1}[r_t]$ are the fitted values from columns 1 to 3. Panel data using 15 individual industries. All regressions include 15 industry dummy variables and 45 year dummies, not shown. The standard errors are corrected to allow for both heteroskedasticity and correlation within years. The standard errors in columns 4 and 5 reflect the imprecision of the first-stage estimates and are calculated as in Table III. The R^2 in columns 4 and 5 reflect regressions where both the dependent and independent variables are orthogonalized to the year and industry dummies. $N = 627$; the sample periods are 1949 to 1993 for Railroad Transportation, Air Transportation, and Mining and 1953 to 1993 for the other industries. Robust standard errors in parentheses.

	g_t	$\Delta\pi_t$	r_t	$E_{t-1}[g_t]$	$g_t - E_{t-1}[g_t]$
	1	2	3	4	5
g_{t-1}	0.13	−0.09	−0.06		
	(0.04)	(0.03)	(0.12)		
r_{t-1}	0.11	0.07	0.11		
	(0.03)	(0.02)	(0.06)		
$\Delta\pi_{t-1}$	0.01	−0.03	0.16		
	(0.07)	(0.09)	(0.13)		
$\hat{g}_t$	0.92	−0.04	−0.13		
	(0.04)	(0.02)	(0.06)		
$\hat{g}_{t-1}$	−0.15	0.05	−0.02		
	(0.05)	(0.03)	(0.08)		
$E_{t-1}[\Delta\pi_t]$				2.75	
				(3.43)	
$E_{t-1}[r_t]$				−2.90	
				(1.65)	
$\Delta\pi_t - E_{t-1}[\Delta\pi_t]$					0.03
					(0.06)
$r_t - E_{t-1}[r_t]$					0.03
					(0.02)
R^2	0.84	0.23	0.67	0.15	0.00

the sources of predictability of investment growth and of returns, there is not strong evidence that industry-specific investment responds to changes in industry-specific discount rates.

Column 5 shows the relation between unexpected investment and unexpected returns and profits. The results for industry-specific investment are quite different from aggregate investment, as the coefficient on profits is tiny and far from significant. This result contradicts the financial constraint explanation, because industry-specific unexpected profits have no effect on industry-specific investment. The aggregate and industry results taken together are consistent with common productivity shocks that raise both the desirability of investing and profits. Of course, because these results only pertain to the industry level of aggregation, they do not contradict the voluminous evidence on cash flow and investment at the firm level (see Hubbard (1998)). But they certainly suggest that at the aggregate level, the covariation of investment and profits is not due to financial constraints.

B. Second-half Revisions to Industry Investment Plans

Second-half plans is planned investment in the period July to December. The Commerce Department collected these second-half plans both in February and six months later in August. Thus, instead of comparing plans to actual, one can compare second-half plans made in February to second-half plans made in August, thus eliminating the effect of events occurring after August.

Revisions in second-half plans between February and August provide a closer look at the precise timing of events that underlie the annual results in Table VII. Table VII shows that at the annual level, unexpected industry-specific returns are not significantly correlated with unexpected industry-specific investment. But this fact represents the combination of different effects at different horizons.

For example, consider good news released on December 31 about higher future productivity or lower discount rates. This good news raises stock prices unexpectedly for the entire year, but because investment has already occurred for the entire year, this component of unexpected returns has zero correlation with unexpected investment for the year. In contrast, good news that gets released in February should be correlated with investment for the rest of the year, as long as investment lags are sufficiently short.

Second-half investment growth is second-half investment in year t divided by second-half investment in year $t-1$. Second-half planned growth is second-half planned investment in year t divided by second-half investment in year $t-1$. Not surprisingly, August plans are more accurate than February plans, with the R^2 in a pooled regression of nominal second-half investment growth on planned nominal second-half investment growth increasing from 0.51 to 0.82 (with no dummies in the regression).

Table VIII shows regressions constructing expected and unexpected investment in the same format as before. Again, the regressions include year dummies, so the coefficients show the effect of deviations from aggregate. Instead of using actual investment, Table VIII uses second-half plans in August as the object to be explained. Table VIII regresses variables known in August of year t on variables known in February of year t. Column 1 regresses second-half plans in August, $\hat{g}^{2nd}_{t,AUG}$, on second-half plans for the same period as of February, $\hat{g}^{2nd}_{t,FEB}$. Other right-hand-side variables include first-half plans in February of year t, lagged second-half plans (plans made in August of year $t-1$ concerning investment in the second half of year $t-1$), lagged second-half investment growth (from year $t-1$), lagged stock returns in the 12 months ending in February of year t, and profits in year $t-1$.

Table VIII

Expected and Unexpected Second Half Industry Investment, Profits, and Stock Returns

Columns 1 to 3 show OLS forecasting regressions for investment plans, profits, and stock returns. Second-half investment growth is $g_t^{2nd} = I_t^{2nd}/I_{t-1}^{2nd}$, where I_t^{2nd} is investment in the second half of year t (July–December). $\hat{g}_{t,AUG}^{2nd} = P_{t,AUG}^{2nd}/I_{t-1}^{2nd}$ is planned second-half investment growth as of August of year t. $\hat{g}_{t,FEB}^{1st} = P_{t,FEB}^{1st}/I_{t-1}^{1st}$ and $\hat{g}_{t,FEB}^{2nd} = P_{t,FEB}^{2nd}/I_{t-1}^{2nd}$ are planned first- and second-half investment growth as of February of year t. $r_{FEB\,t,AUG\,t}$ is industry stock returns between February of year t and August of year t and $r_{FEB\,t-1,FEB\,t}$ is industry stock returns between February of year $t-1$ and February of year t. $\Delta\pi_t$ is the change in the profits ratio for the entire year. Columns 4 and 5 use the forecasting regressions in columns 1 to 3 to create expected and unexpected variables: $E_{FEB\,t}[\hat{g}_{t,AUG}^{2nd}]$, $E_{FEB\,t}[\Delta\pi_t]$, and $E_{FEB\,t}[r_{FEB\,t,AUG\,t}]$ are the fitted values from columns 1 to 3. Panel data using 15 individual industries. All regressions include 15 industry dummy variables and 45 year dummies, not shown. The standard errors are corrected to allow for both heteroskedasticity and correlation within years. The standard errors in columns 4 and 5 reflect the imprecision of the first-stage estimates and are calculated as in Table III. The R^2 in columns 4 and 5 reflect regressions where both the dependent and independent variables are orthogonalized to the year and industry dummies. $N = 627$. The sample periods are 1949 to 1993 for Railroad Transportation, Air Transportation, and Mining and 1953 to 1993 for the other industries. Robust standard errors in parentheses.

	$\hat{g}_{t,AUG}^{2nd}$	$\Delta\pi_t$	$r_{FEB\,t,AUG\,t}$	$E_{FEB\,t}[\hat{g}_{t,AUG}^{2nd}]$	$\hat{g}_{t,AUG}^{2nd} - E_{FEB\,t}[\hat{g}_{t,AUG}^{2nd}]$
	1	2	3	4	5
$\hat{g}_{t,FEB}^{1st}$	0.26	0.00	−0.01		
	(0.05)	(0.01)	(0.03)		
$\hat{g}_{t,FEB}^{2nd}$	0.68	−0.01	−0.01		
	(0.05)	(0.02)	(0.03)		
$\hat{g}_{t-1,AUG}^{2nd}$	−0.02	0.02	0.00		
	(0.06)	(0.03)	(0.04)		
g_{t-1}^{2nd}	−0.16	−0.06	−0.02		
	(0.06)	(0.03)	(0.04)		
$r_{FEB\,t-1,FEB\,t}$	0.09	−0.01	0.01		
	(0.04)	(0.02)	(0.04)		
$\Delta\pi_{t-1}$	−0.01	0.00	−0.08		
	(0.08)	(0.09)	(0.06)		
$E_{FEB\,t}[\Delta\pi_t]$				3.17	
				(6.48)	
$E_{FEB\,t}[r_{FEB\,t,AUG\,t}]$				−9.14	
				(5.82)	
$\Delta\pi_t - E_{FEB\,t}[\Delta\pi_t]$					0.11
					(0.08)
$r_{FEB\,t,AUG\,t} - E_{FEB\,t}[r_{FEB\,t,AUG\,t}]$					0.23
					(0.04)
R^2	0.80	0.20	0.68	0.18	0.05

Column 3 performs a similar forecasting regression for stock returns between February and August of year t. The dependent variables in columns 1 and 3 cannot be affected by unexpected events occuring after August. The main drawback in Table VIII is that profits are only available on an annual basis for these industries, so that the dependent variable in column 2 is an annual variable for the entire year. Although the regression correctly creates expected profits as of February of year t, it does not accurately observe changes in expectations about profits, because $\Delta\pi_t - E_{\text{FEB}\,t}[\Delta\pi_t]$ is contaminated by information occurring after August of year t. Table VII shows that industry profits have no statistically discernible effect on industry investment, so this drawback may be unimportant.

Column 1 shows that February second-half plans have a coefficient significantly less than one. Further, February second-half plans do not correctly reflect information that is embodied in February first-half plans (data that is certainly in the information set of the survey respondents). It is clear that at this level of disaggregation, the investment plans look increasingly less like optimal forecasts. As in Table VII, lagged returns also help forecast August second-half plans.

Column 2 again shows that profits are negatively related to lagged investment. Column 3 shows no evidence of the forecastability of industry-specific stock returns between February and August, as the coefficients are all individually and jointly insignificant. Column 4 shows, not surprisingly given the weak forecasting power in columns 2 and 3, that one cannot reject the null hypothesis that expected second-half investment plans are unrelated to expected returns and expected profits (the coefficients are individually and jointly insignificant).

Column 5 shows the main benefit of using second-half plans: One can now reliably detect the response of unexpected investment to unexpected returns. The coefficient is significant at 0.23, and means that when an innovation of one standard deviation (8 percent) in industry-specific stock returns occurs between February and August, firms are able to increase their investment in July through December (of that same year) by 1.8 percent. This positive relation between unexpected returns and unexpected investment is drowned out at the annual level. Column 5 shows that investment lags must be less than ten months, at least for part of investment, since new information arriving between February and August affects second-half investment plans.

To summarize the industry investment results, industry-specific profits are not significantly related to industry-specific investment (neither for expected investment and profits nor for unexpected investment and profits). Industry-specific planned investment growth does forecast annual industry-specific returns, but the magnitude is much less than in aggregate data. With precise enough information about timing, one can detect a positive covariance between unexpected investment and unexpected returns.

VI. Conclusions

More than three-quarters of the variation in aggregate investment in a given year can be forecast at the beginning of the year using plans, and plans drive out other forecasting variables. Thus variation in expected investment is a large part of the variation in actual investment. This fact is consistent with lags in the investment process that cause a large part of this year's investment to be chosen last year.

Unlike actual investment, planned investment positively covaries with current returns and negatively covaries with future returns. Plans are useful because they help measure expected investment. With investment lags, expected future investment, rather than actual current investment, responds to changes in the desirability of investing.

At the annual level, unexpected investment is uncorrelated with unexpected returns. Looking within the year however, unexpected industry-specific returns in the first part of the year positively affect unexpected industry-specific investment in the second part of the year.

At the aggregate level, unexpected investment is positively related to unexpected profits. But industry-specific profits are not significantly related to industry-specific investment, showing that that profitability is correlated with investment because aggregate profitability captures unexpected shocks that are common to all industries.

Expected aggregate investment is negatively related to expected returns. This negative covariation means that planned investment responds to discount rate changes. The source of the discount-rate variation studied here is not changes in interest rates or tax rates (as in the user cost of capital approach), but rather changes in the equity risk premium. Unlike interest rates or tax rates, one cannot directly observe the level of the equity premium, so one needs to infer its effect from time-series covariation in investment and returns. One cannot simply use the dividend yield, q, or any other measure of scaled prices as a pure measure of equity premia, since these price variables reflect expected future cash flow as well as expected future returns.

I show that when the discount rate moves up, investment moves down. Investment plans have substantial forecasting power for annual stock returns, and contain information not captured by other forecasting variables. Observing investment plans is necessary to establish that expected investment and expected returns are negatively correlated. Without observing investment plans, one might wrongly conclude that unexpected investment is negatively correlated with unexpected returns.

A specific mispricing story is that irrational investors sometimes incorrectly value physical capital, and that managers respond to overvalued stock prices by issuing equity and investing the proceeds in physical capital. The evidence does not support this explanation for the negative covariation of investment plans and future stock returns. Controlling for equity issuance does not affect the predictive power of investment plans

The result that higher discount rates cause lower investment is a minimal condition that should be satisfied by any rational model and by most irrational models. In that sense, the basic results are consistent with investment chosen by optimizing firms in response to rational changes in stock prices, but do not discriminate between different models of asset prices. One model that is clearly rejected is one with constant expected returns over time.

The results have two implications for future research on understanding investment. First, it is important to allow for time-varying aggregate risk premia. Second, it is important to allow for investment lags.

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