Managerial Overextrapolation: Who and When

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Internet Appendix

A. Additional Robustness Analyses

This section presents the additional robustness analysis results aiming at further strengthening our primary findings. Results are presented in Table A1.

First, following Baker and Wurgler (2006), we add investor sentiment ($SENT$) as an additional control variable. McNichols (1989) finds that managers tend to issue more pessimistic guidance when prior stock returns are higher. We thus also control for stock price momentum over the previous 12 months (MOM). As shown in Column 1, the coefficient on $SENT$ is insignificant, and the coefficient on MOM is significantly positive, but neither affects the sign or the level of statistical significance of ROA.

Second, we construct an overconfidence measure based on the timing of option exercises following Malmendier and Tate (2008). $OVERCONFIDENT$ equals one if at least one member in the top management teams fails to exercise options with five years remaining duration despite a 67% increase in stock price (or more) since the grant date. The coefficient on ROA remains significantly negative after including this overconfidence measure.

Third, ROA growth is calculated as the change in ROA from t-3 to t-1 relative to ROA in t-3. This definition of ROA growth is not meaningful when ROA in t-3 is negative. Alternatively, we define ROA growth ($ROAGROW2$) as the change in ROA from t-3 to t-1 relative to total assets in t-3. In Column 3 and Column 4, the coefficient of the interaction term between $ROAGROW2$ and ROA is not statistically significant regardless of controlling for earnings trend as proxied by $STRINGROA_t$ or not. This suggests that the effect of salience on managerial overextrpolation is contingent on the definition of earnings growth.

Finally, we examine the effect of earnings trend on overextrapolation after controlling for earnings persistence in Column 5 of Table A1. We find that the magnitude of overextrapolation bias continues to vary on earnings trend when holding earnings persistence constant.

B. Asset Pricing

Does the extrapolation bias matter for asset prices? We address this question as follows. Note that the forecast error is defined as the difference between actual earnings at time t+1 and expected earnings at time t+1 scaled by assets at time t. We can subtract actual earnings at time t from each of the two terms in the numerator to render the numerator expressible as the difference between the actual change of earnings and the expected change of earnings. Subsequently, with assets as the scaling variable, the resulting ratio of expected change of earnings and assets can be viewed as an expected growth rate (EG). An overextrapolation framework hypothesizes that EG is relatively high because the current profit of these firms is high, and high EG firms are more likely to disappoint because actual earnings growth will be lower than expected. Therefore, EG combined with current profit shed light on the degree of overextrapolation, which varies across firms and affects stock returns.

After the firm releases its earnings forecast, we compute the EG as the difference between expected EPS for the following year t+1 and actual EPS for the current year t, scaled by total assets per share at year t. Note that the EG rate itself does not capture the degree of overextrapolation. We match a firm's EG to its stock returns over the next 12 months. We then form quintile portfolios based on the EG and compute value-weighted excess returns for each portfolio each month.

Table B1 shows a pattern of decreasing excess returns from the lowest EG portfolio (0.82% per month) to the highest EG portfolio (0.25% per month). We also apply the excess returns to standard linear factor models to examine whether they generate abnormal risk-adjusted returns. For the Fama and French (2015) five-factor models, the long-short portfolio that longs the highest EG portfolio and shorts the lowest EG portfolio has a significantly negative alpha of -0.42% per month with a t-statistic of -2.43. The results using Hou et al. (2015) are similar. The risk-adjusted abnormal return on the long-short portfolio is -0.62% per month with a t-statistic of -3.45. We leave the effect of the current profit to the regressions below.

In Table B2, we run the Fama and MacBeth (1973) regression of monthly returns on EG and other control variables. With no other control variables, the coefficient on EG is -0.12 (t-statistic = -2.59). Column 2 presents the next specification, in which we include market capitalization (MV), book-to-market ratio (BM), asset growth rate (AG), and operating profit (OP). We use the operating profit to capture the effect of the current ROA, and we expect EG to contain predictive information beyond that found in the current ROA when overextrapolation varies across firms. At -0.13, the magnitude of the coefficient for EG is still highly significant. The results from using the current ROA, not operating profit, are similar and untabulated. We further include momentum (MOM) and idiosyncratic volatility (IVOL) as control variables in the last specification. The expected earnings growth rate remains significantly negative.

In summary, we show that managers' higher expected earnings growth rates are associated with moderately lower returns in the future. This finding is consistent with the extrapolation bias presented in earlier sections.

C. Effect of Housing

Recent literature also shows that subjects bring their experience from one domain to another domain (Ali and Hirshleifer, 2017). Davidson, Dey, and Smith (2015) find that managers with personal legal infractions are more likely to engage in fraudulent reporting and that firms with managers who are profligate in their personal spending habits have a looser corporate control environment and a higher probability of fraud. More broadly speaking, past personal experience could impact an individual's formation of expectations. D'Acunto, Malmendier, and Weber (2021) use a novel microdata set to explain that women have consistently higher inflation expectations than men do because women have more shopping experience. Zhao (2020) finds that both analysts who have covered firms with more autocorrelated earnings and investors who have experienced more autocorrelated markets tend to be more extrapolative.

Motivated by these studies, we hypothesize that the magnitude of managerial overextrapolation is contingent on managers' personal experience in other financial markets. Gao, Sockin, and Xiong (2020) document that homebuyers extrapolate past housing price growth. They find that the probability of purchasing a second home is greater when past housing prices increase more aggressively. Since most households are exposed to housing markets, we hypothesize that managers are likely to be influenced by their experience in housing markets when forming EPS forecasts. Specifically, we predict that managers exposed to housing markets with more rapidly growing prices have more severe overextrapolation biases in their earnings guidance.

We use the growth rate of the median housing price in the zip code where a firm's headquarters is located to proxy for the manager's exposure to booming housing markets. The growth rate is calculated over the 36 months prior to the month in which a management EPS forecast is released. We define an indicator variable, $\Delta HOUSE$, that equals one if housing price growth in a zip code area is above the annual median and zero otherwise. We then include $\Delta HOUSE$ and its interaction with ROA in the baseline model. Table C1 presents the results. Column 1 shows that the coefficient of the interaction term is –4.47 with a t– statistic of –3.33, indicating that their earnings expectations become more extrapolative when managers experience higher local housing price appreciation.

Because housing prices are correlated with general economic conditions and managerial EPS forecasts could incorporate expectations of industry growth, we replace housing price growth with industry GDP growth in Column 2 to examine whether the result reflects rational managerial expectations formed based on industry-wide economic conditions. Industry GDP growth, $\Delta INDGDP$, is an indicator variable for high industry GDP growth defined similarly as housing price growth. Column 2 shows that the interaction term between industry GDP growth and ROA is not statistically significant at the 10% level, which indicates the magnitude of managerial overextrapolation does not vary by the level of industry GDP growth. Column 3 horse races industry GDP growth with housing price growth and shows that the coefficient of the interaction term between $\Delta HOUSE$ and ROA remains significantly negative at the 1% level. Overall, our results show that managers' exposure to other financial markets, housing markets, for example, has a distinct effect on their overextrapolation behavior, and the effect is beyond what can be explained by economic conditions in their industry.

Table A1: Additional Results

This table reports the additional results to strengthen our primary inferences. In Column 1, sentiment ($SENT$) and stock price momentum (MOM) are included as additional control variables. $SENT$ is the market sentiment in the month that a management earnings forecast is issued. MOM is stock price momentum in the 12 months prior to issuance of a management earnings forecast. In Column 2, the overconfidence measure ($OverConfidence$) constructed based on the timing of option exercises following Malmendier and Tate (2008) is included as an additional control variables. In Column 3, *GROWROA2* is defined as the standardized value of the change in ROA from t-3 to t-1 deflated by the total assets in t-3. The other variables are defined in Table 1. Controls including MV and MTB as well as firm and year fixed effects are included in all regressions. The t-statistics, displayed in parentheses below coefficient estimates, are calculated based on standard errors adjusted for heteroskedasticity and clustered by firm. ***(**)(*) indicates significance at the 1% (5%) (10%) level using two-tailed tests.

	(1)	(2)	(3)	(4)	(5)
ROA_t	-6.97***	-5.68***	-6.95***	-6.79***	-6.68***
	(-5.60)	(-5.00)	(-5.82)	(-5.74)	(-5.52)
$SENT_t$	0.00				
	(0.07)				
MOM_t	0.37***				
	(4.76)				
$OVERCONFIDENCE_t$		0.12			
		(1.06)			
$GROWROA2_t$*ROA_t			-0.21	-0.13	
			(-0.49)	(-0.29)	
$STRINGROA_t$*ROA_t				-2.40***	-2.20***
				(-3.01)	(-2.83)
$GROWROA2_t$			0.01	0.00	
			(0.35)	(0.02)	
$STRINGROA_t$				-0.00	-0.01
				(-0.08)	(-0.17)
$AR1ROA_t$*ROA_t					0.24
					(1.15)
$AR1ROA_t$					0.04
					(1.14)
Intercept	13.44***	12.59***	12.58***	12.02***	12.07***
	(11.20)	(9.45)	(10.89)	(10.26)	(10.29)
Controls	Included	Included	Included	Included	Included
Firm and year fixed effects	Included	Included	Included	Included	Included
Observations	8,000	7,760	8,677	8,677	8,677
Wald-statistics	356.45	298.51	344.57	407.83	410.56

Table B1: Portfolio Sorts Based on Managers' Beliefs

We compute the expected growth rate of earnings (EG) as the difference of expected earnings for next year and actual earnings for the current year, scaled by the total assets at year t. An EG is applied to the following 12 months after a forecast is released. We exclude microcap stocks and stocks whose prices are less than five dollars per share. Returns are in percentages.

At the end of each month, we form quintile portfolios based on EG. We track the excess return of these quintile portfolios in the next month. The portfolio return is value-weighted and expressed in percentages; High Minus Low represents the difference between the 5th quintile and the 1st quintile. We present the excess return (Ret) in percentage terms, the alpha (FF5) from adjusting the Fama and French (2015) factors, and the alpha (Q) from adjusting the Q factors of Hou et al. (2015). The t-value stands for t-statistics for respective variables.

Return (%) of portfolios formed on extrapolated growth						
Port	Ret	t-value	FF5 Alpha	t-value	Q Alpha	t-value
1	0.82	2.89	0.19	1.45	0.29	2.49
2	0.55	2.17	0.04	0.34	0.05	0.41
3	0.54	2.10	-0.02	-0.16	0.05	0.46
4	0.58	2.18	0.04	0.41	-0.06	-0.53
5	0.25	0.80	-0.23	-2.04	-0.33	-2.56
High Minus Low	-0.57	-3.04	-0.42	-2.43	-0.62	-3.45

Table B2: Cross Sectional Regression

We compute the expected growth rate of earnings (EG) as the difference of expected earnings for next year and actual earnings for the current year, scaled by the total assets at year t. An EG is applied to the following 12 months after a forecast is released. We exclude microcap stocks and stocks whose prices are less than five dollars per share. Returns are in percentages.

We run the Fama-MacBeth regression of next month returns on EG, with and without control variables, including size, book-to-market ratio, asset growth, operating profit, momentum, and idiosyncratic volatility (MV, BM, AG, OP, MOM, IVOL). The t-statistic is Newey-West (1987) with four lags.

Predicting next month return			
EG	-0.12**	-0.13***	-0.13***
t-value	(-2.59)	(-2.9)	(-3.3)
MV		-0.08**	-0.09**
t-value		(-1.99)	(-2.45)
BM		-0.05	-0.02
t-value		(-0.84)	(-0.34)
AG		-0.14**	-0.11***
t-value		(-2.49)	(-2.6)
OP		0.01	0.04
t-value		-0.47	-1.13
MOM			-0.01
t-value			(-0.06)
IVOL			-0.09
t-value			(-1.06)
Const.	0.82*	0.84**	0.83**
t-value	-2.50	-2.58	-2.55
Adj. R2	0.01	0.01	0.04

Table C1: Overextrapolation and Experience in Other Financial Markets

This table reports the results of estimating the impact of managers' experience in other financial markets on managerial overextrapolation. $\Delta HOUSE$ is an indicator variable that equals one if the housing price growth in a ZIP code area over the past three years is above the annual median, and zero otherwise. $\Delta INDGDP$ is an indicator variable that equals one if GPD growth over the past three years is above the annual median, and zero otherwise. The other variables are defined in Table 1. Controls including MV and MTB as well as firm and year fixed effects are included in all regressions. The t-statistics, displayed in parentheses below coefficient estimates, are calculated based on standard errors adjusted for heteroskedasticity and clustered by firm. ***(**)(*) indicates significance at the 1% (5%) (10%) level using two-tailed tests.

	(1)	(2)	(3)
ROA_t	-5.26***	-7.01***	-5.46***
	(-4.34)	(-5.96)	(-4.68)
ROA_t*$\Delta HOUSE_t$	-4.47***		-4.57***
	(-3.33)		(-3.34)
ROA_t*$\Delta INDGDP_t$		0.74	1.20
		(0.40)	(0.64)
$\Delta HOUSE_t$	0.17*		0.17*
	(1.71)		(1.75)
$\Delta INDGDP_t$		-0.07	-0.11
		(-0.61)	(-0.87)
Intercept	12.44***	12.61***	12.50***
	(10.69)	(11.06)	(10.90)
Controls	Included	Included	Included
Firm and year fixed effects	Included	Included	Included
Observations	8,677	8,677	8,677
Wald-statistics	370.16	359.59	390.88

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