

Does Forecasting Price Efficiency (FPE) Affect Revelatory Price Efficiency (RPE)?

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Background/Overview

Summary

- **Research Question:** Does Forecasting Price Efficiency (FPE) Affect Revelatory Price Efficiency (RPE)?
- Short Answer: **YES**
- RPE **decreases** after FP inefficiency (over-valuation)
- RPE decreases more in firms with
 - Worse investment opportunities
 - Poor corporate governance, more entrenched managers
 - Higher short-sale constraints
- RPE **increases** after FP inefficiency (under-valuation)
- RPE increases more in firms with
 - Better investment opportunities
 - Managers who listen to prices more

Mechanism - Arguments

- Feedback effect reduces (increases) profits on selling (buying) in bad(good) news (*Edmans et. al (2015)*)
- Mis-valuation signals from corporate events affect expected profitability of an information collector
 - Goes up after under-valuation signal (Share repurchases, M&A as target)
 - Goes down after over-valuation signal (SEOs, M&A as acquirer)
- A Profit maximizer switches information collection resources from low to high expected profitability opportunities
- Information production changes, and hence RPE

Two Role of Prices: Defining the Terms

Forecasting Price Efficiency (FPE)	Revelatory Price Efficiency (RPE)
<p><i>Definition:</i> Whether the price of a given security accurately predicts the future value of that security (Bonds et. al (2012))</p>	<p><i>Definition:</i> The extent to which prices reveal the information necessary for real efficiency (Bonds et. al (2012))</p>
Traditional Focus of PE	Real Efficiency Focused PE
Information about managers' actions and assets productivity	Information that managers do not know about or not otherwise available
Monitoring of the quality of past managerial investment policy (Dow and Gorton (1997))	Information related to an investment decision that has not yet been taken (Dow and Gorton (1997))
Retrospective Role of Prices	Prospective Role of Prices

Two Role of Prices: Few More Differences

- Traditional price efficiency models: firm value is exogenous to trading (*Stiglitz (1997), Hellwig (1980), Admati(1985), Glosten & Milgrom (1985), Kyle (1985)*)
- Price efficiency = prices reflecting true fundamental value

(FPE)	(RPE)
Reflecting fundamental value	Affecting the very same
Monitoring role	Information production role
Backward-looking	Forward-looking
Hirshleifer's foreknowledge	Hirshleifer's discovery

Tension: Direct and Indirect Effect on Real Inefficiency

- Revelatory Price Efficiency (RPE)

- RP inefficiency = Real inefficiency (*Bonds et. al (2012)*)
- RPE is necessary but not sufficient condition for real efficiency (*Bonds et. al (2012)*)

- Forecasting Price Efficiency (FPE)

- FP inefficiency affects real inefficiency only to the extent to which it is related to RP inefficiency (*Bonds et. al (2012)*)
- FP inefficiency \neq Real inefficiency (*Bonds et. al (2012)*)

- **FPE, price efficiency in traditional sense, might not be as relevant for real efficiency**

Theoretical Development

Informed Investor's Expected Profit on her Information Collection Efforts

- Model Foundations:

- In equilibrium investors collect information, trade, and profit and managers listen to prices (*Dow and Gorton (1997)*)
- Managers signal the market about their private information (*Leland and Pyle (1977), John and Mishra (1990), Oded(2005)*)
- Positive abnormal returns follow after Share Repurchases and for target firms in a M&A transaction (*Loughran and Ritter (1995), Betton et. al (2008)*)
- Negative abnormal returns follow after Secondary Equity Offerings and for acquirer firms in a M&A transaction (*Stephens and Weisbach (1998), Andrade et. al (2001)*)

Informed Investor's Expected Profit on her Information Collection Efforts

● Model Foundations:

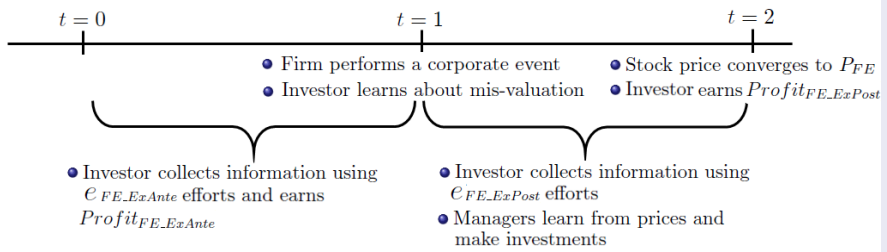
- Managers know more about decision variables related to their firms
(Steward and Majluf (1984))
- Investors as a group is more informed about broader economy than managers
(Grossman (1976), Hellwig (1980))
- Managers do listen to prices when making decisions
(Luo (2005), Chen et al. (2007))
- Feedback effect increases (reduces) the profitability in buying (selling) on good (bad) news
(Edmans et al. (2015))
- Feedback effect increases (reduces) the profitability in buying (selling) on good (bad) news
(Edmans et al. (2015))
- Information collection goes up with better investment opportunities of a firm
(Dow et al. (2017))

Model: Setup

- Model has one informed investor who employ e level of information collection efforts and whose expected profitability is given by $P(e)$ where $P(e)' > 0, P(e)'' < 0$
- Effort e is finite (investor has limited resources)
- It has one firm whose current stock price is P_C , and true fundamental price is P_F
- Mis-valuation parameter is $\alpha \sim \text{Lognormal}(\mu, \sigma_\alpha)$, $\alpha \in [1, \infty)$, and $E[\alpha] = \exp(1) \rightarrow$ such that $P_F = P_C \log \alpha$
- Feedback effect adds $\lambda(\xi) > 0$ to the firm's stock price regardless of mis-valuation level, where ξ is the profitability of the firm's investment opportunities
- Post feedback effect true fundamental price becomes $P_{FE} = P_F + \lambda(\xi) = P_C \log \alpha + \lambda(\xi)$

Model: Time Line

Events Time Line



Step 1: Baseline - No Feedback Effect, Firms are Fairly Valued on Average

- No other factors that affect sells vs buys differently
- $\alpha \sim \text{Lognormal}(\mu, \sigma_\alpha)$, $\alpha \in [1, \infty)$, $E[\alpha] = \exp(1)$: a investor is equally likely to be a buyer or a seller *Ex-post*

$$\begin{aligned}
 E[\text{Profit}_{\text{Ex Ante}}] &= \underbrace{\int_1^{\exp(1)} \frac{1}{\alpha \sigma_\alpha \sqrt{2\pi}} \exp\left(-\frac{(\log \alpha - \mu)^2}{2\sigma_\alpha^2}\right) [P_C - P_C \log \alpha] d\alpha}_{\text{Expected Sell Profit}} \\
 &+ \underbrace{\int_{\exp(1)}^{\infty} \frac{1}{\alpha \sigma_\alpha \sqrt{2\pi}} \exp\left(-\frac{(\log \alpha - \mu)^2}{2\sigma_\alpha^2}\right) [P_C \log \alpha - P_C] d\alpha}_{\text{Expected Buy Profit}}
 \end{aligned}$$

- $E[\text{Sell Profit}] = E[\text{Buy Profit}]$
- Example: Investor I spends $A = B = C = 20$ hrs/week

Step 2: Adding Feedback Effects

- $\alpha \sim \text{Lognormal}(\mu, \sigma_\alpha)$, $\alpha \in [1, \infty)$, $E[\alpha] = \exp(1)$, $\lambda(\xi) > 0$: the investor is equally likely to be a buyer or seller *Ex-Post*

$$\begin{aligned}
 E[\text{Profit}_{FE_ExAnte}] &= \underbrace{\int_1^{\exp(1)} \frac{1}{\alpha \sigma_\alpha \sqrt{2\pi}} \exp\left(-\frac{(\log \alpha - \mu)^2}{2\sigma_\alpha^2}\right) \left[P_C - \left\{ P_C \log \alpha + \lambda(\xi) \right\} \right] d\alpha}_{\text{Expected Sell Profit}} \\
 &+ \underbrace{\int_{\exp(1)}^{\infty} \frac{1}{\alpha \sigma_\alpha \sqrt{2\pi}} \exp\left(-\frac{(\log \alpha - \mu)^2}{2\sigma_\alpha^2}\right) \left[\left\{ P_C \log \alpha + \lambda(\xi) \right\} - P_C \right] d\alpha}_{\text{Expected Buy Profit}}
 \end{aligned}$$

- $E[\text{Sell Profit}] < E[\text{Buy Profit}]$
- Example: Investor I still spends $A = B = C = 20$ hrs/week

Other Factors Affecting Asymmetry in Profitability

- Short-selling costs decrease (do not impact) the profits in Sell-Region (Buy-Region)
- Owning shares provide additional benefits (e.g., voting rights, share lending fees)
- If we assume short-selling costs of $C_{ss} > 0$ and benefits of voting rights ($VR > 0$), then
- $E[\text{Sell Profit}] - C_{ss} \ll E[\text{Buy Profit}] + VR$
- Short-selling costs and voting rights increase the asymmetry in profitability between sell and buy trades

Step 3: Adding Mis-valuation (Under-Valuation) Signal

- The investor is more likely to be a buyer post information collection
- $\alpha \sim \text{Lognormal}(\mu + \kappa, \sigma_\alpha)$, $\alpha \in [1, \infty)$, where $\kappa > 0$;

$$\begin{aligned}
 E[\text{Profit}_{FE_ExPost}] &= \underbrace{\int_1^{\exp(1)} \frac{1}{\alpha \sigma_\alpha \sqrt{2\pi}} \exp\left(-\frac{(\log \alpha - \mu - \kappa)^2}{2\sigma_\alpha^2}\right) \left[P_C - \left\{ P_C \log \alpha + \lambda(\xi) \right\} \right] d\alpha}_{\text{Expected Sell Profit}} \\
 &+ \underbrace{\int_{\exp(1)}^\infty \frac{1}{\alpha \sigma_\alpha \sqrt{2\pi}} \exp\left(-\frac{(\log \alpha - \mu - \kappa)^2}{2\sigma_\alpha^2}\right) \left[\left\{ P_C \log \alpha + \lambda(\xi) \right\} - P_C \right] d\alpha}_{\text{Expected Buy Profit}}
 \end{aligned}$$

Implication I: Resource Reallocation

- $E[Profit_{FE_ExAnte}] < E[Profit_{FE_ExPost}] \rightarrow e_{FE_ExAnte} < e_{FE_ExPost}$, because
 - (i) $\kappa > 0$
 - (ii) $E[\text{Sells Profit}] < E[\text{Buys Profit}]$
 - (iii) $\alpha \sim \text{Lognormal}(\mu + \kappa, \sigma_\alpha)$ with $\kappa > 0$ have more probability mass for buy trades than $\alpha \sim \text{Lognormal}(\mu, \sigma_\alpha)$
- Example: Now, Investor I spends $A = 25$ hrs and $B = C = 17.5$ hrs/week

Step 3: Adding Mis-valuation (Over-Valuation) Signal

- The investor is more likely to be a seller post information collection
- $\alpha \sim \text{Lognormal}(\mu + \kappa, \sigma_\alpha)$, $\alpha \in [1, \infty)$, where $\kappa < 0$;

$$\begin{aligned}
 E[\text{Profit}_{FE_ExPost}] = & \underbrace{\int_1^{\exp(1)} \frac{1}{\alpha \sigma_\alpha \sqrt{2\pi}} \exp\left(-\frac{(\log \alpha - \mu - \kappa)^2}{2\sigma_\alpha^2}\right) \left[P_C - \left\{ P_C \log \alpha + \lambda(\xi) \right\} \right] d\alpha}_{\text{Expected Sell Profit}} \\
 & + \underbrace{\int_{\exp(1)}^\infty \frac{1}{\alpha \sigma_\alpha \sqrt{2\pi}} \exp\left(-\frac{(\log \alpha - \mu - \kappa)^2}{2\sigma_\alpha^2}\right) \left[\left\{ P_C \log \alpha + \lambda(\xi) \right\} - P_C \right] d\alpha}_{\text{Expected Buy Profit}}
 \end{aligned}$$

Implication I: Resource Reallocation

- $E[Profit_{FE_ExAnte}] > E[FE_Profit_{ExPost}] \rightarrow e_{FE_ExAnte} > e_{FE_ExPost}$, because
 - (i) $\kappa < 0$
 - (ii) $E[\text{Sells Profit}] < E[\text{Buys Profit}]$
 - (iii) $\alpha \sim \text{Lognormal}(\mu + \kappa, \sigma_\alpha)$ with $\kappa < 0$ have less probability mass for buy trades than $\alpha \sim \text{Lognormal}(\mu, \sigma_\alpha)$
- Example: Now, Investor I spends $A = 25$ hrs and $B = 20$ hrs, and $C = 15$ hrs/week

Implication II: Resource Reallocation & Extent of Feedback Effect

$$\text{If } H(\cdot) = \underbrace{\int_1^{\exp(1)} \frac{1}{\alpha\sigma_\alpha\sqrt{2\pi}} \exp\left(-\frac{(\log \alpha - \mu)}{2\sigma_\alpha^2}\right) \left[P_C - \left\{ P_C \log \alpha + \lambda(\xi) \right\} \right] dt;}_{\text{Expected Sell Profit}}$$

$$\text{Then, } \frac{\partial H(\cdot)}{\partial \lambda(\xi)} < 0 \rightarrow \frac{\partial H(\cdot)}{\xi} < 0$$

$$\text{If } G(\cdot) = \underbrace{\int_{\exp(1)}^{\infty} \frac{1}{\alpha\sigma_\alpha\sqrt{2\pi}} \exp\left(-\frac{(\log \alpha - \mu)}{2\sigma_\alpha^2}\right) \left[\left\{ P_C \log \alpha + \lambda(\xi) \right\} - P_C \right] d\alpha;}_{\text{Expected Buy Profit}}$$

$$\text{Then, } \frac{\partial G(\cdot)}{\partial \lambda(\xi)} > 0 \rightarrow \frac{\partial G(\cdot)}{\xi} > 0$$

Implication II: Extent of Feedback Effect

- Higher the ξ higher the feedback effect ($\lambda(\xi)$)
- Higher the feedback effect ($\lambda(\xi)$), higher the asymmetry in profitability of sell versus buy trades
- Higher the asymmetry in profitability of sell versus buy trades, higher the resource allocation switching post receiving signal
- **Case I:** where the corporate event signals **under-valuation**
 - Since $\kappa > 0$, as ξ increases $\rightarrow |e_{FE_ExPost} - e_{FE_ExAnte}|$ increases
- **Case I:** where the corporate event signals **over-valuation**
 - Since $\kappa < 0$, as ξ increases $\rightarrow |e_{FE_ExPost} - e_{FE_ExAnte}|$ increases, excluding the independent effect of ξ

Empirical Predictions

Empirical Predictions: Firm Level Corporate Events & Resource Reallocation

- *Prediction 1: Market Learning from a Firm's Corporate Events:*
An informed investor's information collection in firms that perform Under-Value (Over-Value) events goes up (down)

Empirical Predictions: Industry Level Corporate Events & Resource Reallocation

- *Prediction 2: Market Learning from Industry-Wide Corporate Events: An informed investor's information collection in firms whose **peers** perform Under-Value (Over-Value) events goes up (down)*

Empirical Predictions: Resource Reallocation & Investment Opportunities

- *Prediction 3: Information Collection on Growth vs. Value Firms:*
Increase (decrease) in an informed investor's information collection for the firms that perform Under-Value (Over-Value) events is higher for those firms with lower (higher) book-to-market ratio or growth (value) firms

Empirical Predictions: Other Mis-Valuation Proxies

- *Prediction 4: Implications of information from other mis-valuation proxies:* When direction of mis-valuation from other widely used mis-valuation proxies match that of mis-valuation signaled by the corporate events, information collection resource switching intensifies

Empirical Predictions: Resource Reallocation & Short-Selling Costs

- *Prediction 5: Implications of Short-Sale Constraints of Information Collection:* Decrease in an informed investor's information collection for the firms that perform Over-Value events is higher for those firms with higher (lower) short-sales costs/constraints

Empirical Results

FP Inefficiency Signals & RPE Measure

- Four corporate events as FP inefficiency signal
 - Secondary Equity Offerings (SEO)
 - Share Repurchases (SREP)
 - M&A Transaction as Acquirer (ACQ) (Asset mergers or acquisitions, acquisition of majority interest)
 - M&A Transaction as Target (TGT)

- Three Measures of RPE (*(Chen et. al., (2007), Dow et. al. (2017))*)
 - PIN (*Venter De Jongh (2006)*) (PIN_VDJ)
 - PIN (*Easley et. al (1996)*) (PIN_EKOP)
 - Return Non-Synchronicity (*Roll (1988)*)

Data & Measurements

- Corporate events from SDC Platinum
- PIN data from Prof. Stephen Brown - Maryland
- Other data from WRDS data services
- Sample Period: Jan 1993 - Dec 2010
- ACQ - 108,847; TGT - 60,498; SEO - 76,134; SREP - 24,909

Prediction 1: PIN Change & a Firm's Corporate Events

Market Learning

Panel A: Dependent Variable PIN (Venter & De Jongh 2006)

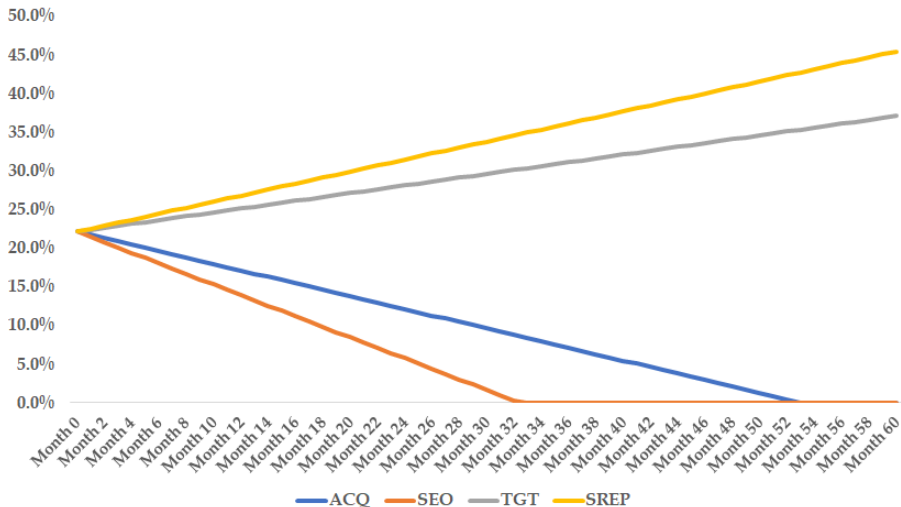
	Over-Value Events		Under-Value Events	
	(1)	(2)	(3)	(4)
Ln_ACQ _{t-3}	-0.00601*** (-9.512)			
Ln_SEO _{t-3}		-0.00984*** (-9.795)		
Ln_TGT _{t-3}			0.00360*** (5.080)	
Ln_SREP _{t-3}				0.00561*** (4.933)

Controls: Firm FE, Month FE, MB_{t-12} , $Volatility_{t-3}$, Ln_Assets_{t-12} , $Leverage_{t-12}$, $Profit_{t-12}$, Tobin's Q_{t-12} , $Inst_Hold_{t-3}$, Ln_Anlst_{t-12} , Ln_Age_{t-1} , $Turnover_{t-1}$, Ind_Ret_{t-1} , $Returns_{t-1}$, $MKT_β_{t-12}$, $SMB_β_{t-12}$, $HML_β_{t-12}$, $RMW_β_{t-12}$, $CMA_β_{t-12}$, $MOM_β_{t-12}$

PIN Change in Next 12 Months (PP): -5.0%; -8.2%; +3.0%; +4.7%

Prediction 1: PIN Change & a Firm's Corporate Events

Implied PIN_VDJ Change by the Coefficients in Table 2A



Prediction 2: PIN Change & Peer Group's Corporate Events

Market Learning from Peers

	Over-Value Events		Under-Value Events	
	(1)	(2)	(3)	(4)
Ln.ACQ_IND _{t-3}	-0.00501*** (-2.616)			
Ln.SEO_IND _{t-3}		-0.00859*** (-8.956)		
Ln.TGT_IND _{t-3}			0.00327* (1.737)	
Ln.SREP_IND _{t-3}				0.00590*** (4.361)

Controls: Firm FE, Month FE, MB_{t-12} , $Volatility_{t-3}$, Ln_Assets_{t-12} , $Leverage_{t-12}$, $Profit_{t-12}$, Tobin's Q_{t-12} , $Inst_Hold_{t-3}$, Ln_Anlst_{t-12} , Ln_Age_{t-1} , $Turnover_{t-1}$, Ind_Ret_{t-1} , $Returns_{t-1}$, $MKT_β_{t-12}$, $SMB_β_{t-12}$, $HML_β_{t-12}$, $RMW_β_{t-12}$, $CMA_β_{t-12}$, $MOM_β_{t-12}$

PIN Change in Next 12 Months (PP): -4.2%; -7.1%; +2.7%; +4.9%

Prediction 3: Corporate Events, PIN change, & Investment Opportunities

Better Investment Opportunities proxied by Book-to-Market Ratio

	Over-Value Events				Under-Value Events			
	Growth (1)	Value (2)	Growth (3)	Value (4)	Growth (5)	Value (6)	Growth (7)	Value (8)
Ln.ACQ _{t-3}	-0.00221*** (-3.724)	-0.00390*** (-4.894)						
Ln.SEO _{t-3}			-0.00410*** (-4.313)	-0.00712*** (-5.889)				
Ln.TGT _{t-3}					0.00205*** (3.209)	0.00116 (1.277)		
Ln.SREP _{t-3}							0.00171* (1.695)	0.00163 (1.054)

Controls: Firm FE, Month FE, MB_{t-12} , $Volatility_{t-3}$, Ln_Assets_{t-12} , $Leverage_{t-12}$, $Profit_{t-12}$, Tobin's Q_{t-12} , $Inst_Hold_{t-3}$, Ln_Anlst_{t-12} , Ln_Age_{t-1} , $Turnover_{t-1}$, Ind_Ret_{t-1} , $Returns_{t-1}$, $MKT_β_{t-12}$, $SMB_β_{t-12}$, $HML_β_{t-12}$, $RMW_β_{t-12}$, $CMA_β_{t-12}$, $MOM_β_{t-12}$

Prediction 4: Corporate Events, PIN change, & Other Mis-Valuation Proxies

Tobin's Q as Mis-Valuation Proxy

	High Tobin's Q				Low Tobin's Q			
	Over-Value		Under-Value		Over-Value		Under-Value	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln_ACQ _{t-3}	-0.0119*** (-16.852)				0.00390*** (5.214)			
Ln_SEO _{t-3}		-0.0137*** (-11.424)				0.000135 (0.107)		
Ln_TGT _{t-3}			-0.00672*** (-8.664)				0.0115*** (12.335)	
Ln_SREP _{t-3}				-0.00425*** (-3.417)				0.0151*** (8.933)

Controls: Firm FE, Month FE, MB_{t-12} , $Volatility_{t-3}$, Ln_Assets_{t-12} , $Leverage_{t-12}$, $Profit_{t-12}$, $Tobin's\ Q_{t-12}$, $Inst_Hold_{t-3}$, Ln_Anlst_{t-12} , Ln_Age_{t-1} , $Turnover_{t-1}$, Ind_Ret_{t-1} , $Returns_{t-1}$, $MKT_β_{t-12}$, $SMB_β_{t-12}$, $HML_β_{t-12}$, $RMW_β_{t-12}$, $CMA_β_{t-12}$, $MOM_β_{t-12}$

Prediction 5: Corporate Events, PIN change, & Short-Selling Constraints

Two Forms of Short-Selling Constraints Proxies

	Breadth - S12 Holdings				Breadth - Mutual Funds Holdings			
	Low (1)	High (2)	Low (3)	High (4)	Low (5)	High (6)	Low (7)	High (8)
Ln_ACQ_{t-3}			-0.00691*** (-7.229)	-0.00336*** (-7.197)			-0.00207 (-1.172)	-0.00177*** ⁱ (-3.094)
Ln_SEO_{t-3}	-0.0160*** (-10.297)	-0.00436*** (-5.311)			-0.0159*** (-6.351)	-0.000398 (-0.414)		

Controls: Firm FE, Month FE, MB_{t-12} , Volatility_{t-3} , Ln_Assets_{t-12} , Leverage_{t-12} , Profit_{t-12} , Tobin's Q_{t-12} , Inst_Hold_{t-3} , Ln_Anlst_{t-12} , Ln_Age_{t-1} , Turnover_{t-1} , Ind_Ret_{t-1} , Returns_{t-1} , $\text{MKT-}\beta_{t-12}$, $\text{SMB-}\beta_{t-12}$, $\text{HML-}\beta_{t-12}$, $\text{RMW-}\beta_{t-12}$, $\text{CMA-}\beta_{t-12}$, $\text{MOM-}\beta_{t-12}$

Other Validation Tests/Robustness

- Managers' tendency to listen to prices: incentives align for Buys, but does not for Sells
- Corporate Governance: Disciplining role of prices and resource reallocation.
- Corporate event announcement abnormal returns and resource reallocation
- Corporate event variable as binary variable - pre-post type analysis
- Price inefficiency validation - weak and semi-strong for price efficiency post corporate events
- Controlling for the information that managers already have

Conclusion

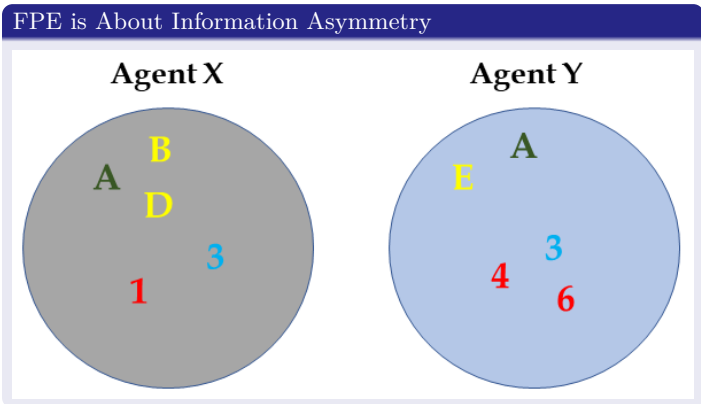
- RPE decreases after market over-valuation signal
- RPE decreases more in firms with
 - Worse investment opportunities
 - Poor corporate governance, more entrenched managers
 - Higher short sale constraints
- RPE increases after market under-valuation signal
- RPE increases more in firms with
 - Better investment opportunities
 - Managers who listen to prices more
- **Next Steps:** Cleaner measure of pre vs post event PIN, extend sample to recent years

Thank You!

Appendix

Investors Learning about Manager's Actions, Firm Productivity

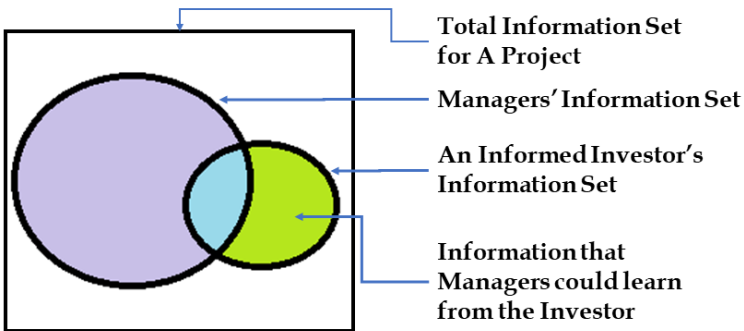
- Manager's Actions: A, B, C, D, E, F
- Firm's Productive Assets: 1, 2, 3, 4, 5, 6
- Each time agents trade, they reveal some of their information



Managers Learning from Investors on Decision Variables

- Market collectively know more than managers (*Grossman 1976*)
- RPE does not require managers to know less in absolute sense
- RPE decreases information uncertainty for managers

RPE is About Level of Information



Forecasting Price Efficiency vs Revelatory Price Efficiency

- FP inefficiency → RP inefficiency
 - \$1 investment, price reflects $<$ \$1
 - Manager under-invests
- FP efficiency → RP efficiency
 - \$1 investment, price reflects \$1
 - Manager optimally invests
- FP inefficiency → RP efficiency
 - Blockholder's intervention, ability to buy additional shares at lower prices (*Maug (1998)*)
 - Lower FPE - lower price impacts leads more blockholder formation (*Kyle & Vila (1991), Kahn & Winton (1998)*)

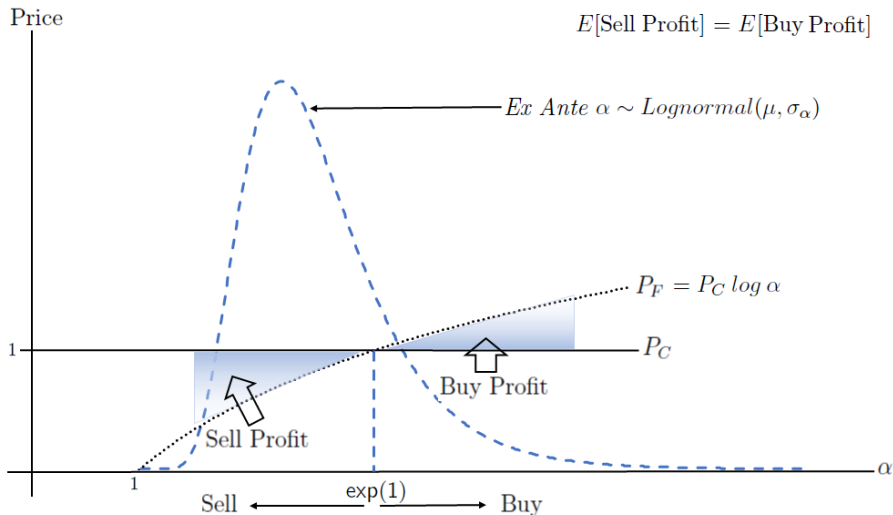
Forecasting Price Efficiency vs Revelatory Price Efficiency

- FP efficiency \rightarrow RP inefficiency
 - FPE increase with respect to productivity reduces manager's incentive to act (*Singh and Yerramilli (1992)*)
 - Even if FPE perfectly holds, market weights information incorrectly (*Paul (1992)*)
 - Even if FPE perfectly holds, manager have incentive to manipulate prices (*Stein (1998)*)
 - Manager have incentive to ignore his own (superior) signal (*Brandenburger & Polak (1998)*)
 - Disclosure that discloses unobservable shock reduces real efficiency (*Kanodia & Lee (1998)*)
 - Real side care about marginal project; speculator care about totality of firms' projects (*Bresnahan, Milgrom & Paul (1992)*)

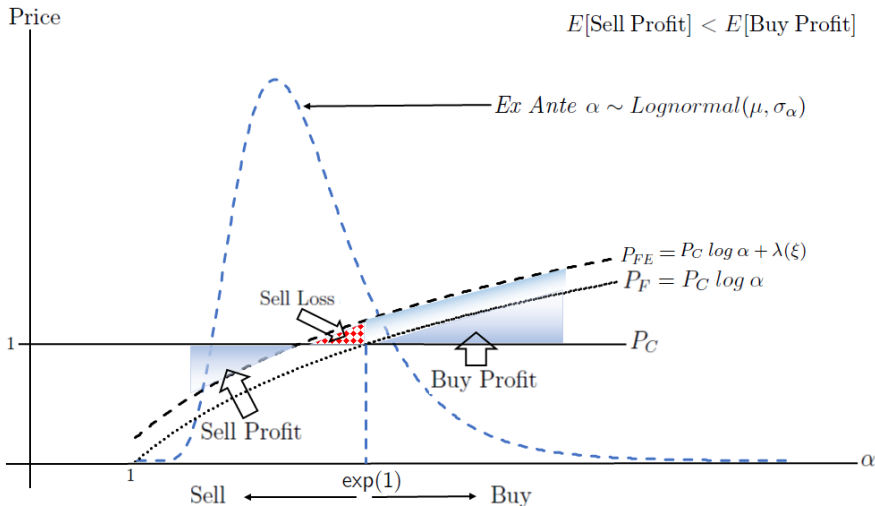
Forecasting Price Efficiency vs Revelatory Price Efficiency

- FP efficiency \rightarrow RP inefficiency
 - Firm value is nonmonotonic in the state variables under the efficient decision (*Bond, Goldstein & Prescott (1992), Bernanke & Woodford (1997)*)
 - Firm's response destroy speculators' incentives to collect information (*Dow & Gorton (1997)*)
 - Regulator's total information decreases if he acquires information from market prices (*Faure-Grimaud (2002), Lehar, Seppi & Strobl(2008)*)
 - Prices do not efficient aggregate speculators' information (*Bond Goldstein (2015)*)

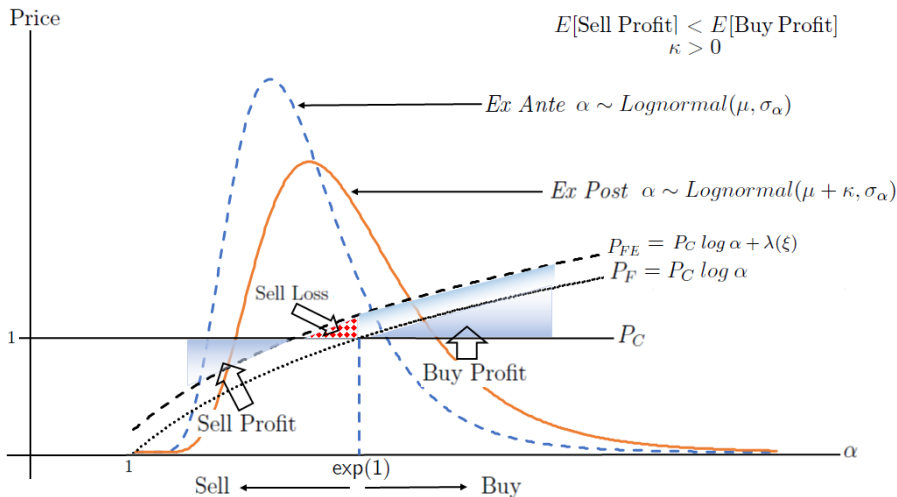
Step 1: Baseline - No Feedback Effect



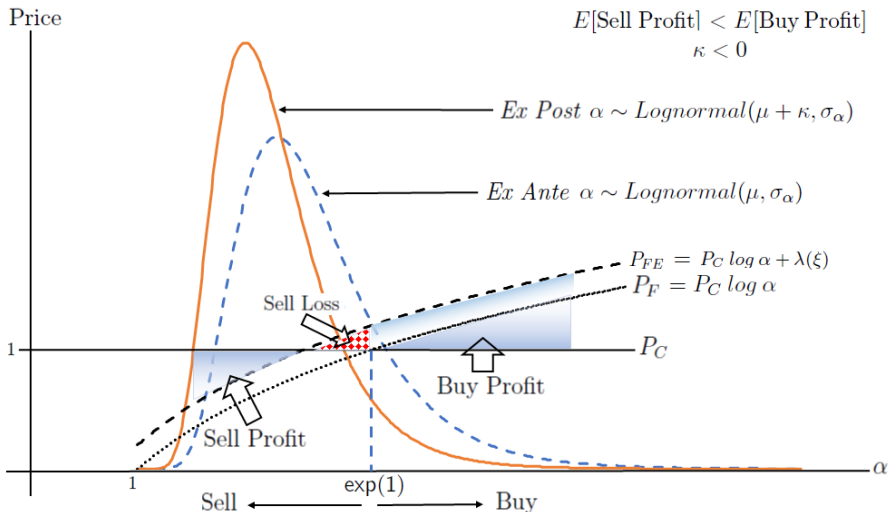
Step 2: Adding Feedback Effects



Step 3: Adding Mis-valuation (Under-Valuation) Signal



Step 3: Adding Mis-valuation (Over-Valuation) Signal



Summary Statistics

Summary Statistics

	Mean	Std. Dev	1 %ile	25 %ile	Median	75 %ile	99 %ile	N
ACQ	2.237	2.667	1	1	1	2	12	566,048
SEO	1.430	0.904	1	1	1	2	4	248,830
TGT	1.572	1.285	1	1	1	2	7	410,898
SREP	1.139	0.403	1	1	1	1	3	162,548
PIN_EKO	0.228	0.145	0	0.133	0.206	0.289	0.769	1,506,902
PIN_VDJ	0.249	0.159	0	0.137	0.213	0.322	0.791	1,517,051
RET_NSYNCH	0.833	0.200	0.161	0.762	0.920	0.973	0.999	1,553,945
MB	1.585	7.995	0.0873	0.554	0.972	1.646	10.34	1,062,613
Volatility	0.00175	0.00694	1.47e-05	0.000232	0.000636	0.00170	0.0162	1,590,109
Assets	7,051	64,204	3.738	69.02	315.0	1,449	111,815	1,321,728
Leverage	0.177	1.671	0	0.00425	0.0981	0.273	0.856	1,299,334
Profit	0.0949	15.78	-1.264	0.0235	0.106	0.186	0.637	949,921
Total Q	0.00489	0.114	-0.00399	0.000332	0.000769	0.00167	0.0380	1,108,038
INST_HOLD	0.346	1.147	0.000209	0.0742	0.262	0.553	1.044	1,541,490
ANLST_Count	5.684	4.805	2	2	4	7	24	359,698
Firm_Age	150.0	162.5	4	40	97	198	851	1,554,393
Turnover	1.747	15.83	0.0154	0.283	0.674	1.560	13.30	1,582,098

Prediction 1: PIN Change & a Firm's Corporate Events

Market Learning

Panel B: Dependent Variable PIN (Easley et. al., (1996))

	Over-Value Events		Under-Value Events	
	(1)	(2)	(3)	(4)
Ln_ACQ_{t-3}	-0.00453*** (-8.475)			
Ln_SEO_{t-3}		-0.00768*** (-8.804)		
Ln_TGT_{t-3}			0.00201*** (3.289)	
Ln_SREP_{t-3}				0.00278*** (2.764)

Controls: Firm FE, Month FE, MB_{t-12} , Volatility_{t-3} , Ln_Assets_{t-12} , Leverage_{t-12} , Profit_{t-12} , Tobin's Q_{t-12} , Inst_Hold_{t-3} , Ln_Anlst_{t-12} , Ln_Age_{t-1} , Turnover_{t-1} , Ind_Ret_{t-1} , Returns_{t-1} , $\text{MKT-}\beta_{t-12}$, $\text{SMB-}\beta_{t-12}$, $\text{HML-}\beta_{t-12}$, $\text{RMW-}\beta_{t-12}$, $\text{CMA-}\beta_{t-12}$, $\text{MOM-}\beta_{t-12}$

PIN Change in Next 12 Months (PP): -3.8%; -6.4%; +1.7%; +2.3%

Prediction 1: PIN Change & a Firm's Corporate Events

Market Learning

Panel C: Dependent Variable Return Non-Synchronicity				
	Over-Value Events		Under-Value Events	
	(1)	(2)	(3)	(4)
Ln-ACQ _{t-1}	-0.00464*** (-4.623)			
Ln_SEO _{t-1}		-0.00332* (-1.939)		
Ln_TGT _{t-1}			0.00867*** (7.872)	
Ln_SREP _{t-1}				0.00295 (1.647)

Controls: Firm FE, Month FE, MB_{t-12} , $Volatility_{t-3}$, Ln_Assets_{t-12} , $Leverage_{t-12}$, $Profit_{t-12}$, Tobin's Q_{t-12} , $Inst_Hold_{t-3}$, Ln_Anlst_{t-12} , Ln_Age_{t-1} , $Turnover_{t-1}$, Ind_Ret_{t-1} , $Returns_{t-1}$, $MKT_β_{t-12}$, $SMB_β_{t-12}$, $HML_β_{t-12}$, $RMW_β_{t-12}$, $CMA_β_{t-12}$, $MOM_β_{t-12}$

Prediction 4: Corporate Events, PIN change, & Other Mis-Valuation Proxies

Price-to-Value(P/V) Ratio as Mis-Valuation Proxy

	High P/V				Low P/V			
	Over-Value		Under-Value		Over-Value		Under-Value	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln_ACQ_{t-3}	-0.00862*** (-12.445)				0.000278 (0.319)			
Ln_SEO_{t-3}		-0.0137*** (-10.964)				-0.00558*** (-3.284)		
Ln_TGT_{t-3}			-0.00237*** (-2.909)				0.00559*** (5.271)	
Ln_SREP_{t-3}				-0.00270** (-2.098)				0.0100*** (4.829)

Controls: Firm FE, Month FE, MB_{t-12} , Volatility_{t-3} , Ln_Assets_{t-12} , Leverage_{t-12} , Profit_{t-12} , Tobin's Q_{t-12} , Inst_Hold_{t-3} , Ln_Anlst_{t-12} , Ln_Age_{t-1} , Turnover_{t-1} , Ind_Ret_{t-1} , Returns_{t-1} , $\text{MKT-}\beta_{t-12}$, $\text{SMB-}\beta_{t-12}$, $\text{HML-}\beta_{t-12}$, $\text{RMW-}\beta_{t-12}$, $\text{CMA-}\beta_{t-12}$, $\text{MOM-}\beta_{t-12}$

Other Validations: Managers' Tendency to Listen to Prices

Incentive Alignment for Buys but not in Sells

	Over-Value Events				Under-Value Events			
	High Inv-Q (1)	Low Inv-Q (2)	High Inv-Q (3)	Low Inv-Q (4)	High Inv-Q (5)	Low Inv-Q (6)	High Inv-Q (7)	Low Inv-Q (8)
Ln_ACQ _{t-3}	-0.00324*** (-4.649)	-0.00592*** (-7.599)						
Ln_SEO _{t-3}			-0.00759*** (-6.756)	-0.00790*** (-5.609)				
Ln_TGT _{t-3}					0.00469*** (5.170)	0.00127 (1.286)		
Ln_SREP _{t-3}							0.00778*** (5.010)	0.00254 (1.515)

Controls: Firm FE, Month FE, MB_{t-12} , $Volatility_{t-3}$, Ln_Assets_{t-12} , $Leverage_{t-12}$, $Profit_{t-12}$, Tobin's Q_{t-12} , $Inst_Hold_{t-3}$, Ln_Anlst_{t-12} , Ln_Age_{t-1} , $Turnover_{t-1}$, Ind_Ret_{t-1} , $Returns_{t-1}$, $MKT_β_{t-12}$, $SMB_β_{t-12}$, $HML_β_{t-12}$, $RMW_β_{t-12}$, $CMA_β_{t-12}$, $MOM_β_{t-12}$

Other Validations: Disciplining Manager Role of Prices

- Asymmetric Information Collection and Corporate Governance*: Decrease in an informed investor's information collection for the firms that perform secondary equity offerings or are acquirers in a M&A transaction is less (more) in firms with poor (strong) corporate governance or more (less) entrenched managers

Two Forms of Corporate Governance Proxies

	Over-Value Events							
	Strong-E (1)	Poor-E (2)	Strong-G (3)	Poor-G (4)	Strong-E (5)	Poor-E (6)	Strong-G (7)	Poor-G (8)
Ln_ACQ _{t-3}	-0.00201** (-2.425)	-0.00150* (-1.830)	-0.00223*** (-2.618)	-0.00134* (-1.804)				
Ln_SEO _{t-3}					-0.00187 (-1.610)	0.00198 (1.443)	-0.000445 (-0.351)	0.000219 (0.162)

Controls: Firm FE, Month FE, MB_{t-12} , $Volatility_{t-3}$, Ln_Assets_{t-12} , $Leverage_{t-12}$, $Profit_{t-12}$, Tobin's Q_{t-12} , $Inst_Hold_{t-3}$, Ln_Anlst_{t-12} , Ln_Age_{t-1} , $Turnover_{t-1}$, Ind_Ret_{t-1} , $Returns_{t-1}$, $MKT-\beta_{t-12}$, $SMB-\beta_{t-12}$, $HML-\beta_{t-12}$, $RMW-\beta_{t-12}$, $CMA-\beta_{t-12}$, $MOM-\beta_{t-12}$

Other Validations: Corporate Event Announcement Returns

Returns in the Direction of Mis-Valuation & Increase in Resource Allocation

	Over-Value Events				Under-Value Events			
	High BHAR (1)	Low BHAR (2)	High BHAR (3)	Low BHAR (4)	High BHAR (5)	Low BHAR (6)	High BHAR (7)	Low BHAR (8)
Ln.ACQ _{t-3}	-0.00746*** (-11.101)	-0.00355*** (-5.428)						
Ln.SEO _{t-3}			-0.0131*** (-11.613)	-0.00704*** (-5.700)				
Ln.TGT _{t-3}					0.000835 (0.965)	0.00443*** (5.650)		
Ln.SREP _{t-3}							0.00332** (2.351)	0.00735*** (5.329)

Controls: Firm FE, Month FE, MB_{t-12} , $Volatility_{t-3}$, Ln_Assets_{t-12} , $Leverage_{t-12}$, $Profit_{t-12}$, Tobin's Q_{t-12} , $Inst_Hold_{t-3}$, Ln_Anlst_{t-12} , Ln_Age_{t-1} , $Turnover_{t-1}$, Ind_Ret_{t-1} , $Returns_{t-1}$, $MKT_β_{t-12}$, $SMB_β_{t-12}$, $HML_β_{t-12}$, $RMW_β_{t-12}$, $CMA_β_{t-12}$, $MOM_β_{t-12}$

Other Validations: Corporate Event Variables as Dummy Variables

Pre-Post Type Analysis

	Dependent Variable PIN (Venter & De Jongh 2006)			
	Overvalue Corporate Events		Undervalue Corporate Events	
	(1)	(2)	(3)	(4)
ACQ_D _{t-3}	-0.00406*** (-6.094)			
SEO_D _{t-3}		-0.00957*** (-10.907)		
TGT_D _{t-3}			0.00343*** (5.193)	
SREP_D _{t-3}				0.00411*** (4.799)

Controls: Firm FE, Month FE, MB_{t-12} , $Volatility_{t-3}$, Ln_Assets_{t-12} , $Leverage_{t-12}$, $Profit_{t-12}$, Tobin's Q_{t-12} , $Inst_Hold_{t-3}$, Ln_Anlst_{t-12} , Ln_Age_{t-1} , $Turnover_{t-1}$, Ind_Ret_{t-1} , $Returns_{t-1}$, $MKT_β_{t-12}$, $SMB_β_{t-12}$, $HML_β_{t-12}$, $RMW_β_{t-12}$, $CMA_β_{t-12}$, $MOM_β_{t-12}$

Other Validations: Weak and Semi-Strong Form Efficiency

Increase in Weak and Semi-Strong Form Efficiency Post Events

	Semi-Strong Form Market Efficiency				Weak Form Market Efficiency			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln.ACQ _{t-1}	-0.0131*** (-7.187)				-0.00862*** (-8.598)			
Ln.SEO _{t-1}		-0.0139*** (-5.217)				-0.00573*** (-4.076)		
Ln.TGT _{t-1}			0.000447 (0.212)				-0.00855*** (-7.283)	
Ln.SREP _{t-1}				-0.0102*** (-3.118)				-0.00708*** (-4.184)

Controls: Firm FE, Month FE, MB_{t-12} , $Volatility_{t-3}$, Ln_Assets_{t-12} , $Leverage_{t-12}$, $Profit_{t-12}$, Tobin's Q_{t-12} , $Inst_Hold_{t-3}$, Ln_Anlst_{t-12} , Ln_Age_{t-1} , $Turnover_{t-1}$, Ind_Ret_{t-1} , $Returns_{t-1}$, $MKT_β_{t-12}$, $SMB_β_{t-12}$, $HML_β_{t-12}$, $RMW_β_{t-12}$, $CMA_β_{t-12}$, $MOM_β_{t-12}$

Other Validations: Controlling for Insider's Information

Three Days Absolute CAR returns around Earnings Announcement

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Ln.ACQ _{t-3}	-0.00544*** (-8.492)	-0.00465*** (-8.039)	-0.00440*** (-7.697)									
Ln.SEO _{t-3}				-0.00997*** (-9.806)	-0.00808*** (-8.240)	-0.00750*** (-8.022)						
Ln.TGT _{t-3}							0.00386*** (5.538)	0.00387*** (5.820)	0.00376*** (5.887)			
Ln.SREP _{t-3}										0.00609*** (5.392)	0.00532*** (5.232)	0.00514*** (5.123)
EAR_SURP_RDQ	-0.0661*** (-6.819)		-0.0589*** (-3.210)	-0.0648*** (-6.690)		-0.0577*** (-3.149)	-0.0654*** (-6.745)		-0.0584*** (-3.173)	-0.0651*** (-6.698)		-0.0580*** (-3.150)
EAR_SURP_IBES		-0.0553*** (-5.424)	-0.00519 (-0.293)		-0.0540*** (-5.319)	-0.00492 (-0.278)		-0.0546*** (-5.354)	-0.00497 (-0.280)		-0.0543*** (-5.325)	-0.00500 (-0.282)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm, Mo. FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	0.327*** (28.578)	0.300*** (23.365)	0.310*** (26.835)	0.331*** (29.069)	0.304*** (23.838)	0.314*** (27.231)	0.329*** (28.609)	0.301*** (23.481)	0.312*** (26.945)	0.329*** (28.607)	0.301*** (23.476)	0.312*** (26.945)
Observations	798,758	625,483	616,836	798,758	625,483	616,836	798,758	625,483	616,836	798,758	625,483	616,836

Controls: Firm FE, Month FE, MB_{t-12} , $Volatility_{t-3}$, Ln_Assets_{t-12} , $Leverage_{t-12}$, $Profit_{t-12}$, Tobin's Q_{t-12} , $Inst_Hold_{t-3}$, Ln_Anlst_{t-12} , Ln_Age_{t-1} , $Turnover_{t-1}$, Ind_Ret_{t-1} , $Returns_{t-1}$, $MKT-\beta_{t-12}$, $SMB-\beta_{t-12}$, $HML-\beta_{t-12}$, $RMW-\beta_{t-12}$, $CMA-\beta_{t-12}$, $MOM-\beta_{t-12}$

Empirical Results: Other Controls in Prediction 1

MB _{t-12}	-0.000720 (-1.220)	-0.000760 (-1.300)	-0.000745 (-1.258)	-0.000757 (-1.276)
Volatility _{t-3}	-0.00591*** (-13.583)	-0.00577*** (-13.236)	-0.00580*** (-13.291)	-0.00574*** (-13.164)
Ln_Assets _{t-12}	-0.0310*** (-29.317)	-0.0313*** (-29.864)	-0.0318*** (-30.298)	-0.0317*** (-30.226)
Leverage _{t-12}	0.0370*** (10.359)	0.0386*** (10.757)	0.0382*** (10.706)	0.0385*** (10.766)
Profit _{t-12}	-0.00103* (-1.773)	-0.00114* (-1.951)	-0.00102* (-1.659)	-0.00104* (-1.714)
Tobin's Q _{t-12}	-0.00290*** (-6.147)	-0.00284*** (-6.089)	-0.00291*** (-6.156)	-0.00290*** (-6.133)
Inst_Hold _{t-3}	-0.00127 (-1.361)	-0.00126 (-1.375)	-0.00127 (-1.366)	-0.00128 (-1.365)
Ln_AnInst _{t-12}	-0.00464*** (-9.914)	-0.00479*** (-10.225)	-0.00470*** (-10.018)	-0.00474*** (-10.080)
Ln_Age _{t-1}	0.0134*** (9.165)	0.0127*** (8.664)	0.0136*** (9.204)	0.0136*** (9.225)
Turnover _{t-1}	-0.00329*** (-8.090)	-0.00326*** (-8.090)	-0.00329*** (-8.092)	-0.00329*** (-8.092)
Ind_Ret _{t-1}	-0.00381 (-0.507)	-0.00401 (-0.539)	-0.00377 (-0.503)	-0.00376 (-0.503)
Returns _{t-1}	-0.0205*** (-10.395)	-0.0206*** (-10.461)	-0.0203*** (-10.313)	-0.0203*** (-10.316)
MKT_β _{t-12}	-0.00368*** (-9.347)	-0.00365*** (-9.297)	-0.00366*** (-9.293)	-0.00367*** (-9.305)
SMB_β _{t-12}	-0.000685*** (-2.889)	-0.000675*** (-2.847)	-0.000683*** (-2.878)	-0.000681*** (-2.867)
HML_β _{t-12}	0.00114*** (6.396)	0.00115*** (6.414)	0.00114*** (6.343)	0.00114*** (6.328)
RMW_β _{t-12}	-0.0000396 (-0.244)	-0.0000529 (-0.328)	-0.0000415 (-0.256)	-0.0000480 (-0.295)
CMA_β _{t-12}	0.000774*** (5.377)	0.000779*** (5.447)	0.000770*** (5.354)	0.000776*** (5.391)
MOM_β _{t-12}	-0.000817*** (-3.133)	-0.000801*** (-3.103)	-0.000836*** (-3.204)	-0.000844*** (-3.231)
Constant	0.319*** (31.106)	0.323*** (31.700)	0.320*** (31.130)	0.320*** (31.121)
Firm, Mo. FE	YES	YES	YES	YES
Observations	900,214	900,214	900,214	900,214