Asset Informativeness and Market Valuation of Firm Assets [1]

Qi Chen Ning Zhang

Fuqua School of Business, Duke University

November 7, 2012

[1]Preliminary and comments welcome. We benefit greatly from helpful discussions with Hengjie Ai, Scott Dyreng, Feng Li, Katherine Schipper, Vish Viswanathan, Yun Zhang, and seminar participants at Carnegie Mellon Accounting Theory Conference, Duke University, George Washington University, and Temple University.
Please send comments to Qi Chen: qc2@duke.edu; and Ning Zhang: ning.zhang@duke.edu.

Abstract

We empirically examine whether market valuations of firm assets are higher when the accounting measurement of these assets provide more information about the efficiency of firm assets in generating future economic incomes (i.e., "asset informativeness"), holding the level of efficiency constant. We proxy for asset informativeness by the R-square from a firm-specific regression of future earnings on past assets. We document a significant (both statistically and economically) positive relation between our measure of asset informativeness and both marginal and average values of firm assets. The relation is robust to alternative estimation methods, and to the inclusion of a variety of measures controlling for firms' profitability, volatility, and risk. Cross-sectionally, we find that the value of asset informativeness is stronger for growth firms, firms with better shareholder protection, and fewer financial constraints. We do not find any significant relation between returns and asset informativeness. We interpret these findings as consistent with the idea that accounting assets provide information about the efficiency of firm decisions that generate future earnings and such information facilitates better decision-making at firm levels and increases firm values.

1 Introduction

This paper empirically examines whether market valuations of firm assets are higher when firms' accounting reports contain more information about the profitability of these assets. It takes the perspective that accounting reports not only provide information about firms' true underlying economic incomes, by measuring them with accounting earnings, they also provide information about decisions made to generate economic incomes, by disclosing and quantifying various operating, investment, and financing decisions via recognition and measurement principles and methods. While accounting system does not directly measure the efficiency of these decisions in generating earnings, how accurately it quantifies both decisions and their resulting economic incomes can provide useful information about decision efficiency. The purpose of the paper is to assess whether, and how, such information affects firm values.

This paper is related to, but distinct from, the recent literature that assesses whether and how attributes or properties of accounting earnings affect firm values (e.g., Francis, et al. (2004, 2005), Core, et al. (2006), Ogneva (2012)). This literature extends the large body of accounting research that has developed various measures of earnings properties (e.g., informativeness, persistence, accrual quality, conservatism, etc.). These measures quantify the extent to which accounting earnings are informative about true economic incomes, taking economic incomes as given.[1] Recent research further associates measures of costs of capital with measures of earnings properties and in general find that properties of accounting earnings that suggest how earnings informativeness (e.g., high accrual quality) are associated with lower costs of capital. Our study differs in both the type of information and the channel via which such information affects firm values. Instead of focusing on how informative accounting earnings are about economic incomes, we are interested in how accounting reports as a whole provide information about the efficiency of firm decisions that generate economic incomes. Instead of focusing on costs of capital effects (i.e., the denominator effect, which implicitly takes the levels of future economic incomes as exogenously given), we assess whether such information is associated with market valuation of firm assets, allowing the possibility of a numerator effect in that future economic incomes may be affected by such information.

Our analysis recognizes that firms make numerous decisions, all with the intent to affect future earnings. As such, accounting reports contain a myriad of information in various forms: textual

[1] The literature started from Ball and Brown (1968) and includes numerous studies, including, for example, Easton and Zmijewski (1989), Ou and Penman (1989), Lev (1989), and Abarbarnell and Bushee (1998), etc. See Kothari (2001) and Dechow, Ge, and Schrand (2012) for representative surveys.

or numerical, qualitative or quantitative, disclosed or recognized, etc.. Whereas it is impossible to capture these information with one measure or in one paper, we start by focusing on the amount of information accounting measurement of assets provide about future earnings and examine whether such information affects market valuations of firm assets. We believe this is a natural starting point based on both conceptual and empirical design considerations. Conceptually, all economic incomes (except those from exogenous factors outside firms' control) are generated by economic assets that result from firms' operating, investment, and financing decisions.[2] Accounting assets are meant to measure and quantify firm decisions that can result in probable future benefits whereas accounting earnings quantify these benefits when they are likely to be realized. Thus, the relation between accounting assets and future earnings can be informative about the average efficiency of firm decisions in generating true economic income. This relation can also reveal the average productivity of firm assets on the aggregate level, which is a key element in assessing the level of future economic incomes that firms can generate and therefore a key input in investors' valuation of firm assets. As such, from an empirical design prospective, this starting point is expected to provide a setting that has high power in detecting the value of information accounting reports provide about firms' decision efficiency.

We quantify the amount of information accounting measurement of assets provides about future earnings by the R-square $\left(R^2\right)$ from a firm-specific linear regression of operating earnings on one-year lagged net assets over the 10-year rolling window preceding the year of valuation. The slope coefficient of the regression provides an estimate of the average return on assets over the estimation period, which captures the productivity of firm assets and is a key construct when users analyze firms' financial statements. As such, the regression can be viewed as an empirical proxy for how accounting reports are analyzed by users, with the R^2 measuring the proportion of uncertainty about firms' future earnings that can be resolved from observing firms' accounting asset values. For this reason and for the pure purpose of notational ease, we refer to R^2 as asset informativeness, with the understanding that everything else equal, accounting reports in firms with high measures of asset informativeness provide more information about firms' decision efficiency. We are cognizant that R^2 can be viewed as a lower bound of the information financial reports reveal about firms' decision efficiency as users can also learn about how firms' decision efficiency from other elements of financial reports, including, for example, firm managements' qualitative discussions about their performance (e.g., Li (2008)).

Using a large sample of U.S. firms from 1960-2010, we document significant cross-sectional vari-

[2] The assets may be short lived, in which case, they convert to income fairly quickly; or they can be long lived in which case, they take longer to convert into income. In either case, we view it as a tautology that economic incomes are generated by economic assets.

ations in asset informativeness as measured by the R-square: it averages about 38% and has an interquartile range from 8.2% to 66%. To isolate the effect of fundamental business model that is outside firms' control (e.g., industry membership) from the effect of firm-specific decisions, most of our analysis focus on the deviation of firm-specific R^2 from their industry average. We find that the majority of the variations (90%) in R^2 is driven by how much firm-specific R^2 deviates from their industry average, and most of our results are driven by the deviation from industry average. Consistent with its interpretation as an informative measure of future earnings, we find that R^2 has strong predictive power regarding firms' future profitability: conditional on the level of realized profitability, firms with high R^2 are more likely to maintain similar levels of profitability in the future (up to 5 years) than firms with low R^2.

We find that accounting asset informativeness has a significantly positive effect on the market valuation of firm assets, after controlling for firm fundamentals including the level of profitability, volatility, and risk. The effect is significant not only statistically but also economically. For example, our results suggest that an inter-quartile increase of asset informativeness is associated with a 25% increase (from \$0.36 to \$0.46) in the marginal value of the average firm's noncash assets; a similar increase (albeit at smaller magnitude of 10%) is observed for cash assets. These valuation effects are also shown in the average value of firm assets as measured by Tobin's Q and are robust to alternative estimation methods. In contrast, we do not find these valuation effects when we use other measures of earnings quality in the literature such as accruals quality, earnings predictability, and earnings smoothness. We interpret these findings as consistent with the idea that the R^2 measure better captures the amount of information accounting measurement of assets reveal about the efficiency of firm decisions on the aggregate level.

We conduct additional analyses to shed light on the channel via which asset informativeness affects firm value. Theories suggest that information can affect firm value either by affecting the discount rate that investors apply to firms' cash flows (the denominator channel) or by affecting the cash flows that investors can obtain from firms' operations (the numerator channel). The denominator channel rests on the idea that risk-averse investors demand higher expected returns to hold stocks for which they have less information about the underlying cash flows (e.g., Lambert, Leuz and Verrecchia (2006)). This channel has been the main explanation for the extant literature documenting the pricing effect of earnings/accruals quality (e.g., Francis, et al. (2005)). The numerator channel is rooted in the role of information in assisting and improving decision-making (e.g., Blackwell (1958)). Specifically, neoclassical investment theory shows that when there is uncertainty regarding the productivity of assets, more information about asset productivity can improve the efficiency of firms' investment decisions, which would increase the expected cash flows and lead to higher firm value (Hayashi (1982), Dixit and Pindyck (1993)).[3] For this channel to explain the pricing effect of asset informativeness, two key conditions are needed. The first is that information about past decision efficiency revealed from accounting reports is used in decisions affecting firm values. These decisions include those made by firm management as well as those made by firm outsiders that affect firm values (e.g., creditors, suppliers, customers). The second condition is that investors anticipate the positive effect of information on decision efficiency and value firm assets higher when there is more information about decision efficiency. In other words, our study presumes market efficiency and investors rationality.

We find evidence consistent with the numerator channel. Specifically, asset informativeness has a stronger effect on firm values for firms with high growth opportunities, consistent with the idea that information is more valuable when there is more to gain from properly managing assets when growth opportunities are high. The effects of asset informativeness are also stronger in better governed firms, consistent with the idea that managers are more likely to optimally use valuable information when their incentives are more aligned with shareholders. Lastly, we find that while the assets on average are valued higher in financially constrained firms (consistent with prior literature and the idea that these assets can be used as collateral to relax financial constraints, see, e.g., Faulkender and Wang (2006)), the effects of asset informativeness are stronger in less financially-constrained firms. We interpret these findings as consistent with the idea that the collateral use of assets in constrained firms limits assets' productive use and therefore reduces the incremental value of information about assets' productivity.

To obtain further evidence on the numerator channel, we apply the methodology in prior literature that assesses the quality of information by the sensitivity of managers' investment decisions to the information signals (Chen, et al. (2007) and Li (2011)). We find that firm investments are more sensitive to accounting earnings and less sensitive to share prices when their asset informativeness measures are high, consistent with the idea that our measure of asset informativeness proxies the quality of information underlying firms' decision, one of the key conditions for the numerator channel.

Regarding the denominator channel, we do not find any systematic relation between asset informativeness and firm returns, suggesting that the effect of asset informativeness is not due to the systematic risk component of the discount factor. We find that whereas the absolute effect of asset informativeness on asset values is independent of alternative information such as analysts or price informativeness (Chen, et al. (2007)), it is relatively stronger for firms with no analyst coverage than for firms with analyst coverage. We interpret these findings as weak or no evidence that asset

[3] This prediction also holds in a world with frictions due to information asymmetry such as moral hazard and adverse selection (Angeletos and Pavan (2004), Rampini and Viswanathan (2010)).

informativeness affects prices by reducing firm-specific discount factor.[4]

Our paper contributes to the accounting and finance literature on the effect of information and uncertainty on asset prices.[5] It complements Pastor and Veronesi (2003) who find that firms' market-to-book ratios decrease with firm age. They interpret this finding as consistent with the idea that uncertainty about firms' future growth opportunity increases firm value.[6] Our paper focuses on the valuation of firms' assets-in-place and our results are consistent with decision-making value theory of information. We find that the effect of R^2 is robust to the inclusion of firm age, suggesting that stock prices reflect both the effect of uncertainty about future growth opportunities and the effect of uncertainty about the productivity of existing assets-in-place. Similar to Pastor and Veronesi (2003), our study is related to, but distinct from, the vast literature on event studies that documents significant price movements upon announcements of news events. These studies are about the *ex post* effects of new information arrival on stock prices, which depend on whether the news is good or bad compared to the expectation. We focus on the *ex ante* valuation effect of the quality of information, before the arrival of new information.[7]

Our paper also contributes to the broad accounting literature on assessing the source and value of accounting information.[8] Most prior literature focuses on how informative accounting earnings are about firms' true economic income and examines the valuation consequences of earnings quality in revealing the true economic income (e.g., Francis, et al. (2004, 2005), Core, et al. (2006), Ogneva (2012)). We focus instead on the information accounting reports provide about the efficiency with which firms' true economic incomes are generated and examine its valuation consequences. Unlike prior literature that takes firms' cash flows as given and motivates the valuation analysis from a discount factor channel, we show that the amount of information accounting reports provide can also have a

[4]The discount factor channel predicts a positive relation between firm values and the quality of information investors have, regardless of the source and nature of the information as long as the information helps reduces investors' uncertainty about firm earnings. This implies that the value effect of asset informativeness would be lower when investors have alternative means of information to help resolve earnings uncertainty.

[5]See Veldkamp (2011) for a recent review on how theories in information economics are applied to financial markets and their testable implications.

[6]Pastor and Veronesi (2003) derive their prediction from a continuous time version of a Gordon growth model with uncertainty, in which firms' growth rates equal returns on equity net of dividend payout ratios. Since stock price is an exponential function (hence a convex function) of growth rate, uncertainty about growth rate (in their model, uncertainty about return on equity), increases stock price.

[7]In mathematical terms, the event studies document the first-moment effect of information, whereas we focus on the second-moment effect of information.

[8]Lev (1989), Kothari (2001) and Dechow, Ge and Schrand (2010) provide excellent reviews for research in the past decades.

numerator effect in directly increasing firms' expected future cash flows.

Our paper contributes to the debate about the role of accounting reports in providing valuable information to capital markets (e.g., Lev (1989), Francis and Schipper (1999), Collins, Maydew and Weiss (1997)). Our results demonstrate that the value of accounting reports does not have to come from providing news to investors (e.g., earnings announcements) or from capturing other information that also affects stock price. Instead, they provide empirical support for the long-held belief that the value of accounting reports comes from assisting investors to better understand firms' business model (specifically, the efficiency of firm decisions), which can in turn help investors better evaluate the implications of firm decisions and predict future earnings.

Our method provides an alternative approach to address issues of interests to regulators and standard setters. Prior literature often assesses the value of accounting constructs by their associations with stock price/return, implicitly assuming that stock prices can be informative about firms' operations independent of the information provided by firms' financial reports. Our approach does not rely on this assumption. Instead, it presumes that a significant portion of information embedded in price comes from accounting reports. As such, our approach can be used to provide insight on when and how accounting information is more valuable. Our analysis on the cross-sectional effects of asset informativeness provides one such example. Although this paper focuses on the informativeness of assets, we believe our approach can potentially be adapted to quantify the value provided by other accounting constructs such as fair value measurement.

Lastly, our asset informativeness measure can be interpreted as an alternative measure for earnings persistence. The economic concept of earnings persistence is predicted to be a major input into market pricing. We find no significant pricing effects of commonly used empirical proxies for earnings persistence such as the time-series correlation coefficient of firm earnings.[9] Our analysis shows that R^2 appears to capture more accurately the economic construct of earnings persistence (i.e., firms' ability to produce consistent earnings from their past decisions), as it passes the dual tests of predicting future profitability and being correlated with market value of asset.

Our paper is related to prior research on fundamental analysis (e.g., Ou and Penman (1989), Lev and Thiagarajian (1993), Abarbarnell and Bushee (1997, 1998)) and on accrual quality (e.g., Dechow and Dichev (2002), Francis, et al. (2005)). Unlike our study, fundamental analysis focuses on how stock price fails to incorporate value-relevant accounting information and therefore does not address

[9] We also do not find any positive relations between the marginal (or average) value of assets and the AR(1) coefficient. In fact, the relations are significantly negative in all settings. Francis, et al. (2004) find some evidence that the AR(1) coefficient is negatively correlated with their measures of firms' costs of capital.

how much information from accounting reports *is* actually incorporated in price.[10] The approach adopted in the paper is related to, but distinct from, the approach taken in Lev and Sougiannis (1996), who use the connection between R&D expenditures and future earnings to establish the value of R&D assets and assess to what extent stock price embeds this value. We focus on the valuation of information (specifically, information about firms' income creation process), not the valuation of the economic asset generated by R&D activities.

Lastly, our study is related to recent research on how balance sheets act as constraints on firms' earnings management practices (Bartov and Simko (2002), Baber et al. (2011)). These studies focus on the discretionary component of earnings over a short period time, whereas we focus on the entire earnings sequence over a long period of time (10 years), with the implicit assumption that earnings over the long-run is a reasonable proxy for true economic income generated. Our approach is rooted in asset valuation theory that links asset valuation to the stream of all future revenues and enables us to sidestep the debate about whether temporal shifting of revenues by managerial choices (i.e., earnings management) is value creating or destructing.

The rest of the paper is organized as follows. Section 2 develops our main hypotheses. Section 3 discusses our measure for the amount of information from accounting reports about value creation process, empirical specifications, and sample descriptions. Section 4 presents our main results on the effect of asset informativeness on asset values as well as the cross-sectional differences of asset informativeness. Section 5 conducts a battery of robustness and sensitivity checks and Section 6 concludes.

2 Related Literature and Hypothesis Development

2.1 Information and asset price

Asset prices are determined by the sum of the discounted future cash flows the assets can generate. To see the main idea, consider a two-period model where price for risky asset i at date 0 (P_0^i) can be expressed as

$$P_0^i = \frac{E\left(x_{t+1}^i\right)}{R_f} + Cov\left(m_{t+1}, x_{t+1}^i\right) \tag{1}$$

where R_f is the risk-free rate, m_{t+1} is the stochastic discount factor (risk factor), and x_{t+1}^i is the payoff from the security.[11]

[10] Abarbarnell and Bernard (1992, 2000) are the few exceptions.

[11] See Cochrane (2001). In return form, the pricing equation can be equivalently expressed as $E\left(R^i\right) - R_f = -R^f Cov\left(m, R^i\right)$.

Information regarding security i affects P_0^i by affecting either expected level of future cash flow $E\left(x_{t+1}^i\right)$ (i.e., the numerator channel) or by affecting $Cov\left(m_{t+1}, x_{t+1}^i\right)$ (i.e., the denominator channel). In a large economy, information specific about security i does not affect the economy wide risk-free rate R_f or the stochastic discount factor m_{t+1}.[12] Holding $E\left(x_{t+1}^i\right)$ constant, P_0^i is lower if more information about security i reduces the correlation between x_{t+1}^i and the stochastic discount factor.

The pricing equation takes future cash flows x_{t+1}^i as given. In reality, firms generate x_{t+1}^i by making operating, investment, and financing decisions. The expected level of future cash flows therefore depends on the efficiency and profitability of these decisions. In a world of uncertainty, more information can also facilitate better decision making, either by firm management or by outsiders whose decisions affect firm values (e.g., creditors, suppliers, customers), which in turn increases the expected level of future cash flows.

To see that, introduce a simple production function where future cash flows are produced by firms' past investment decision made in the following way:

$$x_{t+1} = \theta_{t+1} I_t - \frac{A}{2} I_t^2,$$

where I_t denotes the firm's investment decision at time t, $\frac{A}{2} I_t^2$ (with $A > 0$) is the total cost of investment, and θ_{t+1} is the marginal productivity of the investment.

If θ_{t+1} is unknown when the investment is made, the optimal investment decision is

$$I_t^{\cdot} = \frac{1}{A} E\left(\theta_{t+1} | \Phi_t\right)$$

where Φ_t is the information available to the firm at the time of investment, which is for simplicity assumed to be summarized by a prior on θ_{t+1} that is normally distributed with mean $\overline{\theta}$ and variance σ_t^2. Therefore, $1/\sigma_t^2$ measures the precision, the amount, or the quality of information. Because the value of the firm's asset at time t is the discounted sum of all future cash flows, it follows that the asset should be valued higher when future investments will be made with better quality information. Substitute $I_t^{\cdot}$ into the production function, we can show that the expected cash flow at time t is

$$E\left(x_{t+1}\left(I_t^{\cdot}\right)\right) = \frac{\overline{\theta}^2 - \sigma_t^2}{2A}.$$

It is easy to see that more precise information available at the decision time (smaller σ_t^2), the higher the expected future cash flows are.

[12] Specifically, m depends on the expected marginal rate of intertemporal consumption substitution at the macro level (see Cochrane (2001)), and $R_f = 1/E\left(m\right)$.

The pricing equation (1) can be generalized to a multi-period setting. The idea that more information assists investment decisions, which leads to expected higher future cash flows and hence higher asset values are the main insights from decision-making value of information (Blackwell (1959)) and the neoclassical investment theory (e.g., Lucas (1967), Hayashi (1982), Abel (1983), Dixit and Pindyck (1990)). [13]

2.2 Accounting information and prices

Accounting reports provide information on firms' true underlying economic incomes (x_{t+1}) via various revenue and expense recognition principles. They also provide information on the decisions underlying the income generating process (e.g., I_t), either by quantifying and recognizing these decisions on various statements when the recognition criteria are met, or by disclosing events and decisions that do not meet the recognition criteria but are nonetheless considered relevant and useful for users of accounting reports.

Taking the underlying economic incomes as given, the value of accounting reports can be evaluated on how informative accounting earnings are in revealing these incomes. Starting from Ball and Brown (1968), a large accounting literature has focused on and documented evidence that accounting earnings are informative. Since accruals are the main tools for accounting earnings to capture true economic incomes that cash flows are not able to, a recent strand of literature has focused on directly measuring the quality of accounting accruals and assessing whether stock prices embed a premium for firms with higher quality of accruals (see Ge, et al. (2012) for a recent review). This line of research motivates their analysis based on finance theories that show in an exchange economy (where the random true payoff is exogenously given and unobservable to investors), more information about true payoff can reduce the discount risk-averse investors require to hold risky stocks (Grossman and Stiglitz (1980), Lambert, Leuz and Verrecchia (2006, 2011), etc.).[14]

In this paper, we focus on the amount of information accounting reports reveal about the efficiency of underlying decisions that affect firms' future incomes. These decisions can be those made by firm managers, or those made by firm outsiders, including creditors, suppliers, and customers. For example,

[13] Hayashi (1982) does not explicitly model information. For a rigorous treatment of optimal investment under uncertainty in a dynamic setting, see, e.g., Stokey, Lucas and Prescott (1989) and Dixit and Pindyck (1994). See Alti (2003) and Moyen (2004) for recent examples with learning from past. Closed-form solutions for the firm with learning in the event of uncertainty are usually unavailable. Prior literature has relied on numerical solutions to obtain comparative statics. In this paper, we argue by intuition and test the prediction in empirical data.

[14] More information about a stock's risky (random) payoff may reduce the price of stock if the riskiness of the stock's payoff cannot be diversified away. This does not imply that information itself is a risk factor (Cochrane (2001)).

creditors may reduce firms' borrowing costs, which would increase firm value, when creditors are more confident about firms' decision efficiency. Relatedly, a large literature has shown, both theoretically and empirically, that the collaterability and liquidation value of firm assets play a significant role in lowering firms' borrowing costs.[15] More information about asset productivity reduces the information asymmetry between buyers and sellers at the markets for collateral goods, increasing the collaterability and liquidation value of assets (Akerlof (1971), Kyle (1985), Rampini and Viswanathan (2010)). This in turn would lower firms' borrowing cost and increase their asset values. Anticipating these effects, investors would value firms' assets higher when accounting reports reveal more information about the productivity of firm assets. We summarize the above discussion as our first main hypothesis, stated below in alternative forms:

H1: Market valuation of firm assets is higher when accounting reports reveal more information about the productivity of firm assets, holding the level of the productivity constant.

A corollary of the decision-making value of information is that the value of information would be higher in firms with more growth opportunities. The intuition is that more is at stake from obtaining better information when growth opportunities are high. The assumption that information is used to assist production also implies that the effect of information may be lower when assets' productive use is limited, for example, for financially-constrained firms whose assets may be collateralized and hence have limited productive use. Lastly, to the extent that interest alignment is an important factor for managers to optimally utilize information, more information should increase asset values more in firms with better governance in place.

Although we motivate the above predictions by the decision-making perspective of managers or creditors, the main prediction does not have to depend exclusively on the numerator channel. Instead, it can be from the denominator channel as well, similar to the view in prior literature in that such information help investors better predict future economic incomes, which reduces the discount they apply to firm stocks. To the extent that alternative source of information helps reduce investors' uncertainty, the effect of information from accounting reports is expected to be weaker.

We summarize these predictions as our second hypothesis:

H2: The value of information about asset productivity is expected to be stronger for firms with high growth opportunities, fewer financial constraints, better governance, and less information from alternative sources.

[15] See, e.g., Rampini and Viswanathan (2010) for recent theory development; and Benmelech and Bergman (2011) for empirical evidence.

3 Measure of Information, Empirical Specification and Sample Description

3.1 Measure information from accounting reports

We quantify the information revealed by accounting firms about firm assets' productivity by the R-squared from the following firm-specific regression:

$$NOPAT_{it} = a_{0i} + a_{1i} \cdot NOA_{it-1} + \epsilon_{it} \tag{2}$$

where $NOPAT_{it}$ is the net operating earnings after tax for firm i in year t and NOA_{it-1} is the net operating assets of firm i at the beginning of period t. We define $NOPAT$ as the after-tax amount of earnings before interest and tax. We define NOA as the sum of shareholders' equity and interest-bearing debts, minus cash and marketable securities. For each firm-year, (2) is estimated using the preceding 10 years of observations for this firm, using both $NOPAT_{it}$ and NOA_{it-1} in dollar terms unscaled.

Equation (2) can be interpreted as a linear approximation of more complex production technologies. For example, it can be motivated as a linearized version of a Cobb-Douglas production function with assets as the only input factor. The intercept estimate $\widehat{a_{0i}}$ captures the average amount of a firm's earnings that are attributable to inputs other than accounting assets (e.g., firm-specific know-hows or management skills). The noise term reflects the impact of random shocks (e.g., technological or macro-economic shocks). The slope coefficient $\widehat{a_{1i}}$ provides an estimate of an firm's average return on assets, a standard measure of asset utilization efficiency and productivity. Because we estimate the regression over 10-year period (from $t-9$ to t), the R-squared of the regression (R^2_{it}) quantifies the amount of information investors can learn before they assign a value to a firm's assets in year t.

It is important to note that (2) and its R^2 are meant to measure *empirically* the amount of information investors can learn about a firm's asset productivity. It is not meant to test a specific hypothesis regarding the significance of coefficients. Regardless of the serial correlation structure of the error term, R^2 captures the sample coefficient of determination between NOA and $NOPAT$ and the coefficient estimates are unbiased. Higher R^2 means conditional on firm assets, the more confidence, less residual uncertainty investors have about the firm's next period earnings, regardless of the source of the earnings. More generally, R^2_{it} captures the degree of confidence investors would obtain from financial reports in understanding the firm's business model in general.[16]

[16] Serially correlation does not appear to be of an issue in our sample empirically: the Durbin-Watson statistics is significant in less than 2% of the R-squared estimations.

3.2 Empirical specification

Our baseline specification for estimating the marginal value of asset informativeness follows Faulkender and Wang (2006) who use it to estimate the marginal value of cash. Specifically, we estimate the following equation with the interactive terms between R^2_{it} and ΔNA_{it} and $\Delta Cash_{it}$:

$$R_{i,t} - R^b_{i,t} = \beta_0 \Delta NA_{it} + \beta_1 R^2_{it} \cdot \Delta NA_{it} + \lambda_0 \Delta Cash_{it} + \lambda_1 R^2_{it} \cdot \Delta Cash_{it} + Control_{it} + \varepsilon_{it}. \quad (3)$$

where the dependent variable $R_{i,t} - R^b_{i,t}$ is the compounded size and book-to-market adjusted realized returns (Fama and French (1993)) from fiscal year $t-1$ to fiscal year t.

In this regression, $\widehat{\beta}_0$ can be interpreted as the estimate for the marginal market value of assets for firms with $R^2_{it} = 0$, whereas $\widehat{\beta}_1$ estimates the sensitivity of the marginal values to asset informativeness (R^2_{it}). Our hypothesis predicts $\widehat{\beta}_1 > 0$.

Faulkender and Wang (2006) separate the changes in total assets into the changes in cash assets and noncash assets because their interest is in estimating the marginal value of cash (i.e., the $\widehat{\lambda}_0$ estimate). Consistent with the theoretical prediction, they find that the marginal value of cash is close to \$1 for an average U.S. firm. Our interest is in whether the marginal value of firm assets, including both cash and noncash assets, is a function of asset informativeness as measured by R^2. We follow Faulkender and Wang (2006) in separating cash from noncash assets both to facilitate comparison with their estimates, and more importantly, to account for the significant differences between cash and noncash assets in terms of their liquidity and firm-specificity (how unique assets are to firm-specific operations).

Following Faulkender and Wang (2006), we include in all estimations year fixed effects (α_t). The set X_{it} includes ΔE_{it}, the change in earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits in year t; ΔRD_{it}, the change in research and development expense in year t; ΔInt_{it}, the change in interest expense in year t; ΔDiv_{it}, the change in common dividends paid in year t; $Leverage_{i,t-1}$, the market leverage at the end of year $t-1$ defined as total debt divided by the sum of total debt and the market value of equity. Following Faulkender and Wang (2006), we scale ΔNA_{it}, $\Delta Cash_{it}$, ΔE_{it}, ΔRD_{it}, ΔDiv_{it} and ΔInt_{it} by market value of equity in year t-1, so that the coefficient estimates are interpreted as the marginal value of right-hand-side independent variables.

Faulkender and Wang (2006) include the interactive terms of $Cash_{it-1} \cdot \Delta Cash_{it}$ and $Leverage_{it-1} \cdot \Delta Cash_{it}$ to capture the effects of cash balance and leverage on the marginal value of cash. Follow the similar logic, we also include $NA_{it-1} \cdot \Delta NA_{it}$ and $Leverage_{it-1} \cdot \Delta NA_{it}$ where NA_{it-1} is the logarithm of net assets in year t-1. To summarize, our baseline specification for the marginal value test is given by Equation (3) with control variables defined as follows:

$$Control_{it} = \alpha_t + NA_{it-1} \cdot \Delta NA_{it} + Leverage_{it-1} \cdot \Delta NA_{it} + Cash_{it-1} \cdot \Delta Cash_{it} + Leverage_{it-1} \cdot \Delta Cash_{it} + R^2_{it} + NA_{it-1} + Cash_{it-1} + Leverage_{it-1} + \Delta E_{it} + \Delta RD_{it} + \Delta Int_{it} + \Delta Div_{it} + NF_{it} \quad (4)$$

where R^2_{it}, $Cash_{it-1}$, NA_{it-1} and $Leverage_{it-1}$ are included to ensure that their interactive terms with changes in assets are not capturing the main effects. To facilitate interpretation, for all interactive control variables, we use the demeaned values when they are interacted with either ΔNA_{it} or $\Delta Cash_{it}$, where the demeaned values are calculated as the difference between the variables and their sample averages. This way, the estimate $\widehat{\lambda}_0$ is directly interpreted as the market valuation of cash for an average firm with all characteristics at sample average values. $\widehat{\beta}_0$ is the estimated marginal value of net assets for a firm with average characteristics and assets that have no predictive ability for future earnings (i.e., $R^2 = 0$), whereas $\widehat{\beta}_0 + \widehat{\beta}_1$ estimate the marginal value of net assets for a firm with average characteristics and assets that have perfect foresight for future earnings ($R^2 = 1$). Throughout the paper, all standard errors are two-way clustered by both firm and year (Gow et al. (2010)).

3.3 Sample selection and description

We begin our analysis by estimating Equation (2) for all non-financial (SIC code: 6000-6999) and non-utility (SIC code: 4900-4999) firms in Compustat from 1960 to 2010. Equation (2) is estimated for each firm i in year t using data in the preceding ten years (i.e., $t-9$ to t). We require at least five observations in each estimation to obtain a meaningful estimate of R^2. By design, this R^2 is firm-year specific and is indexed throughout the paper by subscript i and t. The final sample for the main analysis of market valuation consists of 85,652 firm-year observations from 1970 to 2010.

Table 1, Panel A provides the summary statistics for the estimated R^2 and $\widehat{a_1}$ (i.e., the estimate for return on assets, ROA henceforth) for each of the Fama-French 48 industries (Fama and French (1997)). It shows that R^2 exhibits both significant cross-industry and within-industry variations. The tobacco products industry has the highest average (median) R^2 at 57.0% (64.5%), followed by alcohol (beer and liquor) with an industry average (median) at 55.5% (63.3%). The coal mining industry has the lowest average (median) R^2 at 24.2% (16.1%), preceded by the steel products industry (average at 28.6% and median at 19.6%). Interestingly, these are also the industries with the respective highest and lowest within-industry standard deviations, with 35.4% for the tobacco industry and 24.2% for the coal industry. Many other customer-related industries also exhibit high R^2, including, for example, the retail and restaurant industries. In contrast, industrial product industries such as the shipping and defense industries tend to have low R^2.

Panel A also lists the average estimate of ROA for each industry. The precious metals industry has the lowest average ROA at -7%, followed by fabricated products (e.g., metal forging and stamping) at -3.4%. By contrast, the tobacco industry leads with the highest ROA of 16.1%, followed by the soft drink industry at 11.5%. These results show that while ROA and R^2 are correlated (by design), they have different information content. Whereas ROA provides the estimated mean of return on assets, R^2 estimates the amount of information accounting reports produce for users to understand the sources of future earnings.

Table 1, Panel B presents the summary statistics for all the main variables used in the analysis. The sample average R^2 is 37.9% with a standard deviation of 31.6%. To isolate the effect of industry membership, we also calculate a firm-specific R-squared (R^2_{Firm}) defined as the difference between R^2_{it} and the median of R^2 for all firms in that year and the same Fama-French 48-industry (denoted as $R^2_{Industry}$). By design, the average $R^2_{Industry}$is close to the average unadjusted R^2 whereas the average R^2_{Firm} is relatively small (the median is close to 0). However, the cross-sectional variations of R^2 are mostly driven by firm-specific R^2_{Firm} and not their industry component; the standard deviation is 30.7% for R^2_{Firm} and only 14.1% for $R^2_{Industry}$.

Table 2 presents the correlation table for all main variables. Consistent with the observation that cross-sectional variations in the unadjusted R^2 are mostly driven by firm-specific R^2_{Firm}, the correlation between these two measures is at 90%. R^2_{Firm} is negatively correlated with $R^2_{Industry}$, consistent with the early observation that within-industry variation in R^2 is positively correlated with the industry average of R^2.

All R^2 measures are highly correlated with measures of key firm characteristics, including firm size ($Size$, measured in logarithm of total assets), profitability (measured by ROA), earnings persistence ($Persistence$, estimated as the AR(1) coefficient from a firm-specific time-series autoregression of earnings per share in the rolling window of 10 years preceding year t), sales volatility ($Std(Sales)$, defined as the standard deviation of sales scaled by total assets in the rolling window of 10 years preceding year t), ROA volatility ($Std(ROA)$, defined as the standard deviation of actual realized return on assets in the rolling window of 10 years preceding year t), the stock return's correlation with the market ($Beta$, estimated as the CAPM beta using monthly returns in the rolling window of 10 years preceding year t) and idiosyncratic return volatility ($Sigma$, defined as the standard deviation of CAPM model residuals). In untabulated results, we find that the relations between R^2 and R^2_{Firm} and these characteristics remain the qualitatively the same (in significance level and in signs) in a multiple variable regression with R^2 and R^2_{Firm} as the dependent variable, with and without including firm-specific fixed effects. However, the explanatory power of the regression is much higher (at about 42%) with firm-fixed effects than without (at about 12%), suggesting that the R-squared contains incremental information about firm fundamentals than the other variables. Lastly, Table 2 shows that both R^2 and R^2_{Firm} are positively significantly related to both the market-to-book ratio and the measure of average asset value (Q, Tobin's Q, defined as the sum of market value of equity, liquidation value of preferred equity and book value of total liabilities scaled by total assets), consistent with our basic hypothesis. We will formally test and examine this in the next section.

4 Main Results

4.1 Effect of asset informativeness on marginal value of assets

4.1.1 Baseline results

Table 3, Panel A presents the results for estimating Equation (3). Column (1) reports the estimation results for Equation (3) with control variables specified by Equation (4). It shows that the coefficient on the interaction term between R^2 and ΔNA is 0.175 and is statistically significant at less than a 1% level, consistent with our main hypothesis that investors value firm assets higher when the informativeness of assets is high. The economic magnitude is significant: the coefficient estimate for ΔNA is 0.296, suggesting that an additional dollar of net noncash assets is valued at 29.6 cents by equity investors for a firm with $R^2 = 0$. An interquartile increase of R^2 of 57.3% (from 8.2% at the twenty-five percentile value of R^2 to 65.5% at the seventy-five percentile value of R^2, see Table 1, Panel B) would increase the marginal value of assets by more than 10 cents (=0.175*57.3%).

The coefficient estimate on $\Delta Cash$ in Column 1 indicates that the marginal value of cash for our sample firm is 93 cents per dollar. This estimate is very similar to that reported in Faulkender and Wang (2006) and is not statistically different from $1, just as predicted by theory. The coefficients on $\Delta EBIT$ and $\Delta Dividend$ are both positive and significant (at less than 1% level), consistent with investors assigning higher values for firms with strong earnings and dividend growth. The coefficient on $Cash_{t-1} \cdot \Delta Cash$ is negative, consistent with the diminishing marginal value of cash when a firm's cash position improves. The coefficient on $Leverage \cdot \Delta Cash$ is negative, consistent with the notion that as the leverage ratio becomes higher, some value of cash will accrue to debt holders. Results for other control variables are also very similar to findings in Faulkender and Wang (2006). Similar decreasing marginal returns are also observed for noncash assets, as the coefficient estimates for $NA_{it-1} \cdot \Delta NA_{it}$

and for $Leverage_{i,t-1} \cdot \Delta NA_{it}$ are also significantly negative at less than a 1% level.

Column (2) of Table 3 repeats the above estimation by substituting R^2 with R^2_{Firm}. The coefficient estimate for β_1 in this case would be interpreted as the marginal effect of an additional unit of informativeness relative to the industry average. Column (3) estimates the baseline equation using the industry-average $R^2_{Industry}$ as well as its interaction with ΔNA_{it}. The coefficient on β_1 in both columns is positive and statistically significant. Finally, Column 4 includes both $R^2_{Firm}$and $R^2_{Industry}$ and the coefficients on both $R^2_{Firm} \cdot \Delta NA_{it}$ and $R^2_{Industry} \cdot \Delta NA_{it}$ are positive and statistically significant.

4.1.2 Controlling for business fundamentals

Table 3, Panel B adds additional variables controlling for firm business fundamentals and their interactive terms with ΔNA_{it} to the baseline specification. Specifically, we estimate Equation (3) by adding six additional control variables of $W^{DM}_{it} \cdot \Delta NA_{it}$ and W^{DM}_{it}, whereas W^{DM}_{it} is a vector of sample-demeaned business fundamental variables. We use asset productivity (ROA), earnings persistence ($Persistence$), sales volatility ($Std(Sales)$), ROA volatility ($Std(ROA)$), CAPM Beta ($Beta$) and idiosyncratic return volatility ($Sigma$) as controls for business models.

As before, in all columns, the coefficient on $R^2 * \Delta NA$ remains positive and statistically significant. The coefficient on $ROA \cdot \Delta NA$ is always positive and statistically significant, suggesting that investors assign higher values for firms with higher ROA. The inclusion of ROA does not affect the significance of β_1, consistent with the idea that R^2 captures the uncertainty about, but not the level of, asset productivity. For intuition, consider an example of two otherwise identical firms with the same average ROA in the past 10 years. Our results indicate that investors value higher the assets at the firm with the higher R^2, as there is less uncertainty about this firm's asset productivity. The coefficient on $Persistence \cdot \Delta NA$ is negative but less significant in Columns (2) and (3). The coefficient on $Std(Sales) \cdot \Delta NA$ is negative in all columns, consistent with assets in firms with volatile sales being valued less. The coefficient on $Std(ROA) \cdot \Delta NA$ is insignificant in all models, reinforcing the idea that it is the mapping from assets in place to future earnings, rather than the property of earnings itself, that reduces uncertainty. The coefficients on $Beta \cdot \Delta NA$ and $Sigma \cdot \Delta NA$ are not significant at conventional levels. In sum, we conclude that findings in Table 3 are consistent with H1 in that assets in firms with more asset informativeness captured by higher R^2 are valued higher.

4.2 Cross-sectional variation in marginal value of asset informativeness

Table 4 present evidence on H2, which addresses whether the marginal value of accounting information varies cross-sectionally with firm characteristics. The specific characteristics we examine are firms' growth opportunities, the degree of shareholder protections, the degree of financial constraints, the availability of alternative information, and corporate governance. To the extent that theories predict certain channels via which asset informativeness affects firm values, these analyses can help shed light on the validity of these channels. From a practical point of view, these analyses also add empirical evidence on how information from accounting reports about firms' earnings generating process affect firm values differentially.

4.2.1 Effect of growth opportunities

Table 4, Panel A presents results from estimating Equation (3) on subsamples of firms partitioned by their growth opportunities. We measure growth opportunity with three proxies: sales growth rate (defined as change in sales deflated by sales from last year), investment growth rate (defined as capital expenditure deflated by net PP&E from last year), and assets growth rate (defined as change in total assets deflated by total assets from last year). All growth measures are calculated in year $t-1$ before compounding monthly returns. For each measure, we classify firms with growth measures higher (lower) than the annual median value as high (low) growth firms. We include all control variables specified in Equation (4) and business fundamental variables in our estimation but do not report their coefficient estimates in the table for the sake of brevity.

Columns 1–2 of Panel A show that the marginal value of assets is higher for firms with above median level of investment growth: the coefficient estimate ΔNA is 0.268 for and 0.343 for below- and above-median subsamples, respectively, consistent with the general notion that Tobin's Q captures investment opportunities. The effect of R^2 on the marginal value of assets is much higher in high-growth firms too. The coefficient estimate for $R^2 \cdot \Delta NA$ is 0.201 (t-statistic = 5.33) for the high-growth firms, whereas that for the low-growth firms is 0.117 (t-statistic = 3.46). Similar results are observed when growth opportunities are proxied by sales growth or asset growth. We interpret these results as supportive of Hypothesis 2 and as consistent with idea that asset informativeness represented by R^2 is incrementally useful for high growth firms relative to low growth firms as high-growth firms have more to gain from better utilizing information. [17]

[17] Since our hypotheses take the market values of firms as endogenous to asset informativeness, we do not proxy growth opportunities by common measures such as market-to-book ratio. Our results, however, can be viewed as empirically validating the use of these measures as investors' expectation of the effects of growth opportunities on firm value:

4.2.2 Effect of corporate governance

To the extent that managers learn from accounting information and make better investment decision is one of the channels underlying the positive relation between market value of assets and asset informativeness, Hypothesis 2 predicts that managers (or firm insiders in general) are more likely to learn and take optimal decisions when their incentives are more aligned with those of outside investors. The intuition is that without incentive alignment, managers have no incentive to learn from valuable information and adjust their decisions accordingly.

Panel B of Table 4 provides evidence testing with this prediction on a smaller sample of firms covered by Investor Responsibility Research Center (IRRC, now RiskMetrics). We measure firms' corporate governance quality by their G-index (Gompers et al. (2003)) and BCF-index (Bebchuk et al. (2009)) values.[18] We follow prior literature and partition firm-year observations with G-index (BCF-index) higher than 9 (2) are classified as with poor corporate governance (e.g., Masulis et al. (2007)).

Panel B of Table 4 present results from estimating Equation (3) on subsamples of firms partitioned by their corporate governance indices. It shows that across both indices, the coefficients on ΔNA and $\Delta Cash$ are higher in the strong governance group, consistent with prior findings that better corporate governance mechanisms enhance investors' valuation of corporate assets (Gompers, et al. (2003), Dittmar, et al. (2007), ec.). The coefficients on $R^2 \cdot \Delta NA$ are positive and statistically significant in the strong governance groups (Columns 2 and 4), both significantly higher than their counterparts in the weak shareholder protection groups (Columns 1 and 3). We interpret these results as consistent with Hypothesis 2 that the separation of ownership and control affects the usefulness of asset informativeness: managers at well-governed firms are more likely to take optimal investment decisions and the effect of asset informativeness on firm values in these firms is stronger as a result.

managers' decision to invest more is reflected by higher market values only when investors have more information to gauge the value-consequences of these investment.

[18] Specifically, Gompers et al. (2003) and Bebchuk et al. (2009) construct their index based on 24 and 6 antitakeover provisions covered by IRRC repectively. Higher index indicates that it is more difficult and more costly to remove managers, representing weaker corporate governance. IRRC publishes volumes every six years from 1990. We assume that between each consecutive IRRC publication, a firm's corporate governance provisions remain the same as the previous publication year. Empirical results, however, are not sensitive to this assumption.

4.2.3 Effect of financial constraints

Prior literature finds that the valuation of firm assets (e.g., cash specifically) differs significantly depending on whether firms are financially constrained (e.g., Faulkender and Wang (2006), Almeida, et al. (2004)). Firms that are financially constrained have higher marginal values of assets as one additional dollar of assets would reduce the cost of obtaining external funds. Panel C of Table 4 assesses whether our results are robust to controlling for financial constraints, and whether the effect of asset informativeness changes with proxies for firms' financial constraints. Furthermore, to the extent that financially constrained firms have limited productive assets due to collateral, Hypothesis 2 also predicts that the value of asset informativeness is higher when firms are financially constrained.

Following Faulkender and Wang (2006), we measure the degree to which firms are financially-constrained by one of the four criteria: payout ratio[19] (measured as total dividends (common dividends plus repurchases) over earnings, firm size[20] (measure by the annual sales revenues), bond ratings (as reported in Compustat since 1985), and commercial paper ratings (as reported in Compustat since 1985). For each year in our sample, we sort firms according to their payout ratios (or sales revenue) at the end of their previous fiscal year and assign to the financially constrained (unconstrained) group those firms whose payout ratios (or sales revenues) are less (greater) than or equal to those of the firm at the bottom (top) three deciles of the annual distribution. Alternatively, an firm-year observation is classified as financially-constrained if the firm does not have a bond rating (commercial paper rating) but reports positive amounts of debt in that year.

Table 4, Panel B presents results from estimating Equation (3) on subsamples of firms partitioned by four financial constraint metrics, respectively. First, similar to findings in Faulkender and Wang (2006), the coefficient on $\Delta Cash$ is higher in the constrained group, consistent with each additional dollar of cash and net assets being valued higher for financially constrained firms. Regarding our main variable of interest, across all metrics, the coefficient on $R^2 \cdot \Delta NA$ remains positive and statistically significant. Except in the bond ratings partition, the coefficient estimate on $R^2 \cdot \Delta NA$ is higher in the unconstrained group than the constrained group. Comparing the coefficient on $R^2 \cdot \Delta NA$ with that on ΔNA reveals that a one unit increase in R^2 is incrementally useful across all financial

[19] Firms with high payout ratios are more likely to have ample internal funds to cover their debt obligations and to finance their investments, and should therefore receive lower benefits from cash holdings than firms with low payout ratios. Empirically, Fazzari et al. (1988) document that financially constrained firms have significantly lower payout ratios.

[20] Larger firms are more likely to have better access to capital markets than smaller firms, and should therefore face fewer constraints in raising external capital to fund investments.

constraint measures. Using the payout ratio as an example, the coefficient on $R^2 \cdot \Delta NA$ divided by the coefficient on ΔNA is 0.78 in the unconstrained group whereas the same ratio in the constrained group is only 0.27. We interpret this result as consistent with the collateral use of net assets limiting assets' productive use as well as reducing the incremental value of asset informativeness. Firms that are not financially constrained may employ their assets in more positive-NPV projects and R^2 provides more value-relevant information in these firms.

4.2.4 Effect of alternative information source

So far our analyses have been motivated by the decision-making role of information for individuals (managers/creditors) whose actions directly affect firms' future cash flows. This prediction holds even when the decision-makers have other sources of information, as long as the other sources of information are not a sufficient statistic for the information provided by firms' financial reports. Section 2 also discusses that our main hypothesis can also be motivated by the decision-making role from theory models based on an exchange economy (e.g., Grossman and Stiglitz (1980), Lambert et al. (2011)). In these models, equity investors buy and sell stocks for portfolio balancing and their actions do not directly impact on firms' operations. This type of model predicts that firm value will be lower when investors have overall less information about firms' future cash flows, regardless of the source of the information. To the extent that investors have other sources of information that subsume the information provided by accounting reports, for example, financial analysts, the effect of asset informativeness on asset value can be smaller.

We consider two proxies for alternative information source: analyst coverage (measured by the logarithm of one plus total number of analysts issuing earnings forecasts for a given firm in year t and price nonsynchronicity (measured as the variation in returns that is not explained by market-wide variations, i.e. one minus the coefficient of determination from the CAPM model). An important role of analysts is to help investors digest and understand firm operations. Price nonsynchronicity measures the amount of firm-specific private information impounded in stock prices (Roll (1988)) and has been used in prior literature to proxy for the amount of private information possessed by informed investors (e.g., Durnev et al. (2003), Chen et al. (2007)).

Table 5, Panel D presents results from estimating Equation (3) with additional variables controlling for other information sources. We examine a smaller sample since I/B/E/S does not start to provide analyst forecast data until the mid-1980s. In Column (1), we estimate Equation (3) by adding *Analyst* and its interaction with ΔNA for the whole sample. The coefficient on $R^2 \cdot \Delta NA$ remains positive and statistically significant. The coefficient on $Analyst \cdot \Delta NA$ is positive and statistically significant, indicating that firms covered by more analysts have higher marginal value of assets. In Columns 2–3, we repeat the analysis on subsamples partitioned by whether the firm has analyst following or not. We find that the average marginal value of asset is much lower in firms with no analyst coverage: the coefficient estimate for ΔNA is only 0.281 (t-statistic = 6.56), compared with 0.392 (t-statistic = 7.66) in firms with at least one analyst following. This is consistent with the idea that analyst coverage provides more information to investors which reduces overall uncertainty and hence increasing firms' marginal value of assets. Column 2 shows that the coefficient estimate for $Analyst \cdot \Delta NA$ is no longer statistically significantly positive at conventional levels, suggesting that the number of analysts following has no incremental effect on firm valuation, conditional on at least one analyst following.

In both Columns 2–3, we find that the coefficients on $R^2 \cdot \Delta NA$ remain positive and statistically significant with similar magnitudes (0.180 and 0.184 in Columns 2 and 3, respectively), suggesting that information from analyst coverage does not subsume information from accounting reports. This complements findings in Francis et al. (2002) who argue that the informativeness of earnings announcements is not eroded by competing information in the form of analyst reports. Furthermore, comparing the coefficient on $R^2 \cdot \Delta NA$ with that on ΔNA reveals that a one unit increase in R^2 is relatively more valuable at firms with no analyst coverage. The coefficient on $R^2 \cdot \Delta NA$ divided by the coefficient on ΔNA is 0.65 in the no analyst group whereas the same ratio in the analyst group is only 0.45. We interpret this result as investors rely relatively more on asset informativeness captured by R^2 when an alternative information source, as proxied by analyst coverage, is not present.

Column (4) adds $Nonsync$ and its interaction with ΔNA to Equation (3). The coefficient on $Nonsync \cdot \Delta NA$ is positive but statistically insignificant. Taken together, we find that asset informativeness captured by R^2 is robust and is not substituted for or subsumed by alternative information sources.

5 Robustness and Sensitivity Analyses

5.1 The retention rate analysis

An implicit assumption for our prediction is that information revealed from past accounting report and specifically captured by our R-squared measures is informative about firms' future. If high R^2 reduces information uncertainty in the mapping from firm assets to future earnings, then we should expect future profitability should be close to the current realized profitability. In other words, higher R^2 means that the past profitability level is more likely to be repeated in the future.

To empirically validate this assumption, we perform a retention rate analysis. Specifically, for each year t, we first independently sort firms into four quintiles based on $R^2(R^2_{Firm})$ and their realized return on assets (ROA) ratio. For each R^2 quartile, we then calculate the percentage of firms remaining in the same ROA quartile in years $t+1$, $t+2$ and $t+5$. We repeat the same calculation each year and present the average retention rate in Table 5. The 1-year retention rate for firms with lowest R^2 staying in the lowest ROA quartile is 56.5%. This suggests that on average, among firms with lowest R^2 and lowest ROA, 56.5% of them still stay in the lowest ROA quartile next year. This retention rate increases almost monotonically as we move to higher R^2 quartiles. In particular, among firms with highest R^2 staying in the lowest ROA quartile, 83.3% of them still stay in the lowest ROA quartile next year. Results for other ROA quartiles exhibit a similar pattern. This confirms our hypothesis that firms with high R^2 are more likely to have more similar profitability in the future. The right half of the table sorts firms based on firm specific R^2_{Firm} and the results are qualitatively similar. The 2-year (5-year) retention rate is generally lower than the 1-year retention rate, consistent with the notion that a firm's profitability is more likely to change when there is a longer time interval between measurements.

5.2 The investment sensitivity test

So far, our analysis is predicated on the argument that better information (captured by higher R^2) benefits managers in providing them with investment and operation guidance. In this section, we provide direct evidence on this assumption. Specifically, we estimate the investment sensitivity on earnings and assess the effect of R^2 on this sensitivity as follows:

$$I_{i,t} = \alpha_t + \eta_i + \beta_1 E_{it} + \beta_2 Q_{i,t-1} + \beta_3 R^2_{it} \cdot E_{it} + \beta_4 R^2_{it} \cdot Q_{i,t-1} + \gamma Controls_{i,t} + \epsilon_{it}. \tag{5}$$

whereas $I_{i,t}$ is capital investment, defined as capital expenditure plus R&D expense scaled by total assets in year t-1. E is net income before extraordinary item plus depreciation and amortization expenses and R&D expenses, scaled by total assets in year t-1. Q is Tobin's Q. In the control list, we include the inverse of total asset in year t-1 ($1/Asset$) to isolate the correlation induced by the scaling variable. We also include Ret defined as value-weighted market return adjusted firm returns for the next three years to accommodate evidence that overvalued firms tend to invest more (Loughran and Ritter (1995), Baker and Wurgler (2002)). To control for difference in price informativeness reflected in Tobin's Q, we add two measures of private information, nonsynchronicity and PIN and interact them with Q. To keep consistency Chen et al. (2007), $Nonsyn$ is defined as one minus R-squared from the CAPM model using returns from the past one year. PIN is the measure of probability of informed trading, defined as in Brown and Hillegeist (2007). α_t and η_i are year and firm fixed effects. This design also has similar features to the investment-based earnings quality measure constructed as in Li (2011). If earnings provide more information that helps investment decisions, investment should be more sensitive to earnings as managers rely more on earnings numbers. Therefore, we expect that the coefficient on $R^2_{it} \cdot E_{it}$ is positive.

We present results of estimating Equation (5) in Table 6. First, the coefficients on both Q and E are positive, consistent with findings that investments are positively related with prices and earnings. As predicted, the coefficient on $R^2_{it} \cdot E_{it}$ is positive and statistically significant in all columns. This shows that investment-earnings sensitivity is higher for firms with higher R^2, consistent with the idea that more asset informativeness increases the use of earnings information in making capital investment. The coefficients on $Q_{i,t-1} * R^2$ and $Q_{i,t-1} * R^2_{Firm}$ are negative (although less significant in some specifications), consistent with the idea that as earnings provide more accurate information, managers rely less on prices. Also consistent with findings in Chen et al. (2007), the coefficients on $Q_{i,t-1} * Nonsyn_{i,t-1}$ are positive in all columns and statistically significant in columns (1) and (4). The coefficients on $Q_{i,t-1} * PIN_{i,t-1}$ are positive and statistically significant in columns (2) to (3) and (5) to (6). This suggests that more private information contained in stock prices, facilitates managers' investment decision. Results on other control variables are similar to findings in Chen et al. (2007). In summary, results in Table 6 support the idea that better asset informativeness enhances the use of earnings information in capital investment.

5.3 Assets-in-place or growth opportunities

Based on a continuous time version of a standard Gorton growth rate valuation model, Pastor and Veronesi (2003) argue that uncertainty about firms' growth opportunities increases firm value. Unlike our setting, their model and prediction take firms' future cash flows and hence future growth rates as given. While investors learn this growth rate over time, this learning has no effect on the growth rate itself. In their model, stock price is an exponential function (hence a convex function) of growth rate and uncertainty about growth rate (in their model, uncertainty about return on equity) increases firm value. Our setting rests on the assumption that learning from accounting reports provides valuable information to managers and investors to take actions that affect firms' future cash flows, and more information leads to higher asset valuation.

Pastor and Veronesi (2003) shows that market-to-book ratio is lower for older firms. They theorize this to less information uncertainty for future growth for older firms. Our R^2 is meant to capture uncertainty of the productivity of assets in place. It is rooted in the decision-making role of information. Therefore, our prediction speaks to the value of firms' assets in place whereas theirs is more about the option value of growth opportunity.

To ensure that the results we document about R^2 are distinct from those in Pastor and Veronesi (2003), we replicate their main results, with R^2 added as the additional independent variable. Specifically, firm values are proxied by the logarithm of the market-to-book ratio (MTB), market-to-book ratio, Tobin's Q and logarithm of Tobin's Q, respectively in Columns (1) to (4). *Age* is one minus the reciprocal of one plus the number of years appeared in CRSP database. *Dividend* is a dummy variable that takes a value of one if a firm-year pays dividends and zero otherwise. *Leverage* is market leverage defined as total debt over the sum of total debt and the market value of equity. *Size* is the logarithm of total assets. $VOLP$ is the volatility of profitability defined as the standard deviation of return on equity (assets) five years ahead. ROE (ROA) is the current-year return on equity (assets) and $ROE(i)$ ($ROA(i)$) is the return on equity (assets) in the i^{th} year in the future (up to five years). To accommodate the effect of capital structure, we use ROE (ROA) if the dependent variable is market-to-book ratio or in logarithm form (Tobin's Q or in logarithm form). $RET(i)$ is the compounded annual return in the i^{th} year in the future. Regressions are estimated annually and averages of coefficient estimates are presented (Fama-MacBeth method).

Table 7 presents the estimation results. As predicted, the coefficient on R^2 is positive and statistically significant in all columns, after controlling for measures of future growth. Results on other variables are similar to results in Pastor and Veronesi (2003), Specifically, *Age* is estimated with a negative and statistically significant coefficient, consistent with learning over a firm's lifetime reducing uncertainty about future profitability. All coefficients on ROE (ROA), current and future, are positive, consistent with more profitable firms being valued higher. All coefficients on RET are negative, consistent with higher firm value today lowering future expected stock returns. The coefficient on $VOLP$ is positive and statistically significant, consistent with volatile profitability increasing expected future cash flows.

Finally, results in Table 7 also support the idea that asset informativeness has a significant positive effect on the average value of firm assets. In untabulated tests, we further verify that this conclusion is robust to different specification of the average valuation test.

5.4 Controlling for other earnings quality measures

To further establish that asset informativeness captured by R^2 is distinct from previously identified earnings quality metrics, in this section, we add several earnings quality measures and present results in Table 8. The earnings quality measures (EQ) we consider include predictability, accruals quality, and earnings smoothness. We measure predictability ($Predict$) as the coefficient of determination (R-squared) from the firm-specific time-series autoregression of earnings per share in the rolling window of 10 years preceding year t. Accruals Quality (AQ) is defined as the negative of the ten-year rolling-window standard deviation of the residual terms from estimating changes in working capital accruals (ΔWAC) on lagged, current and future cash flows from operations (CFO), i.e., the Dechow and Dichev (2002) specification: $\Delta WAC_{i,t}$=$\phi_0 + \phi_1 CFO_{i,t-1}$+$\phi_2 CFO_{i,t}$+$\phi_3 CFO_{i,t+1}$+$\varepsilon_{i,t}$. Earnings smoothness ($Smooth$) is defined as the ratio of the standard deviation of net income before extraordinary items scaled by total assets to the standard deviation of cash flows from operations scaled by total assets, following Leuz et al. (2003). All earnings quality measures are defined such as the higher EQ is, the better earnings quality. To serve as a benchmark, Column (1) repeats the result with no earnings quality measure added. Columns (2) to (4) add earnings quality measures one at a time and Column (6) adds all measures in one regression. Throughout all specifications, our main variable of interest $R^2 \cdot \Delta NA$ remains at the same magnitude and is statistically significant. The coefficient on EQ*ΔNA is either negative or statistically insignificant. Taken together, we conclude that R^2 captures a unique aspect of asset informativeness and its effect on marginal asset valuation is not dominated by other earnings quality measures.

5.5 Alternative estimation approaches

To assess the sensitivity of our main results to alternative estimation method, we apply the Fama-MacBeth (1973) approach and re-estimate Equation (3). Table 9, Panel A reports the time-series averages of coefficient estimates and t-statistics from the 41 annual regression results, with Columns (1) to (4) corresponding to the same specification as those reported in Table 3, Panel B (i.e., all business fundamental control variables included). As before, the coefficient on $R^2 \cdot \Delta NA$ is 0.178 and statistically significant in Column (1). When we replace R^2 with firm specific R^2_{Firm} in Column (2), the coefficient on $R^2_{Firm} \cdot \Delta NA$ is still positive and significant. When both R^2_{Firm} and $R^2_{Industry}$ are included in the Column (4), coefficients on $R^2_{Firm} \cdot \Delta NA$, $R^2_{Industry} \cdot \Delta NA$ are 0.135 and 0.317, respectively and both statistically significant. The coefficients on other control variables and business fundamental variables (untabulated) are similar to Table 3, Panel B.

To guard against the possibility that our results in Table 3 are driven by outliers, we sort firm-year observations by R^2 into four quartiles and re-estimate the Equation (3) for each quartile. All business fundamental variables are included in the regression. As clearly seen from the table, from columns (1) to (4), the coefficient on ΔNA increases monotonically as moving from the lowest R^2 quartile (0.284) to the highest R^2 quartile (0.444). These results again emphasize the role of informativeness in valuing firms' net assets: the marginal value of firm assets increases as the informativeness of firm assets improves as indicated by a higher R^2. Columns (5) to (8) reports similar portfolio results, based on R^2_{Firm}. The marginal value of net assets increases monotonically from 0.292 in the lowest R^2_{Firm} quartile to 0.456 in the highest R^2_{Firm} quartile. [21] In essence, we conclude that the informativeness of assets about future earnings has a strong positive effect on the valuation of firm assets and results are robust to alternative estimation methods.

6 Conclusion

In this paper, we empirically evaluate the extent and value of information provided by firms' accounting reports about firms' decision efficiency. We hypothesize that such information is valuable for multiple channels. It can assist managers in improving their operating and investment efficiency, reduce costs due to information asymmetry between firm insiders and outside investors, or reduce the premium that risk-averse investors demand due to uncertainty about firms' future payoffs. We quantify the amount of such information by the R-squared from a firm-specific regression of current earnings on one-year lagged total assets. We find that consistent with our hypothesis, the R-squared is statistically positively correlated with both the marginal and average values of firm assets, with significant economic magnitude. We also find that consistent with theoretical predictions, the value of such information is higher in high-growth firms, firms facing less financial constraints, firms with fewer alternative information sources such as analyst coverage, and better governed firms. In addition to their robustness to alternative estimation methods, these results are further supported by our findings that the R-squared measure predicts future profitability, and its valuation effect is distinct and separate from the effect of uncertainty documented in prior studies (Pastor and Veronesi (2003)).

Our paper contributes to the literature by hightlighting and quantifying a different type of information provided by financial reports (i.e., the information about firms' decision efficiency, not just about the output of these decisions in the form of accounting earnings). Our evidence on the cross-sectional

[21] Results are slightly weaker when portfolios are sorted on $R^2_{Industry}$, with the marginal valuation of net assets increases from the lowest $R^2_{Industry}$ quartile to the third quartile, but then decreases in the highest quartile.

variations of the value of information offers information on where such information can be most useful to investors. Our methodology to quantify the amount of such information also has the potential to be used to address issues of interest to regulators and standard setters.

References

[1] Almeida, H., Campello, M., Weisbach, M. (2004). The Cash Flow Sensitivity of Cash, *Journal of Finance*, 59, 1777–1804.

[2] Angeletos, G., Pavan. A. (2004). Transparency of Information and Coordination in Economies with Investment Complementarities". *American Economic Review* 94, 91-98.

[3] Abarbanell, J., and Bernard, V. (1992). Test of Analysts' Overreaction/Underreaction to Earnings Information as an Explanation for Anomalous Stock Price Behavior. *Journal of Finance*, 47, 1181-1207.

[4] Abarbanell, J., and Bernard, V. (2000). Is the US stock market Myopic? *Journal of Accounting Research*, 38, 221-242.

[5] Abarbanell, J., Bushee. R. (1997). Fundamental Analysis, Future Earnings, and Stock Prices. *Journal of Accounting Research*, 35, 1-24.

[6] Abarbanell, J., Bushee. R. (1998). Abnormal Returns to a Fundamental Analysis Strategy. *The Accounting Review*, 73, 19-45.

[7] Abel, A. (1983). Optimal Investment under Uncertainty. *American Economic Review*, 73, 228-233.

[8] Akerlof, G. (1970). The Market for 'Lemons': Qualitative Uncertainty and the Market Mechanism. *Quarterly Journal Economics*. 84, 488–500.

[9] Alti, A., (2003). How Sensitive is Investment to Cash Flow When Financing is Frictionless. *Journal of Finance*, 58, 707–722.

[10] Baber, W. Kang, S., Li, Y., (2011) Modeling Discretionary Accrual Reversal and the Balance Sheet as an Earnings Management Constraint. *The Accounting Review* 86, 1189-1212.

[11] Baker, M., Stein, J., Wurgler, J. (2003). When Does the Market Matter? Stock Prices and the Investment of Equity-Dependent Firms. *Quarterly Journal of Economics*, 118, 969–1006.

[12] Barton, J., Simko, P. 2002. The Balance Sheet as an Earnings Management Constraint. *The Accounting Review*, 77, 1-27.

[13] Bebchuk, L., Coates, J., Subramanian, G. (2009). The Power of Takeover Defenses. *Review of Financial Studies*, 22, 783-827.

[14] Benmelech, E., Bergman, N. (2011). Bankruptcy and the Collateral Channel. *Journal of Finance*, 66, 337-378.

[15] Brown, S., Hillegeist, S. (2007). How Disclosure Quality Affects the Level of Information Asymmetry. *Review of Accounting Studies*, 443-477.

[16] Blackwell, D. (1953). Equivalent Comparisons of Experiments. *The Annals of Mathematical Statistics*, 24, 265-272.

[17] Chen, Q. Jiang, W. Goldstein, I. (2007). Price Informativeness and Investment Sensitivity to Stock Price. *Review of Financial Studies*, 20, 619-650.

[18] Collins, D., Maydew, E., Weiss, I.(1997). Changes in the Value-relevance of Earnings and Book Values over the Oast Forty Years. *Journal of Accounting and Economics*, 39-67.

[19] Dechow, P., and I. Dichev, 2002, The Quality of Accruals and Earnings: The Role of Accrual Estimation Errors," *The Accounting Review*, 77, 35-59.

[20] Dittmar, A., Mahrt-Smith. J. (2007). Corporate governance and the Value of Cash Holdings. *Journal of Financial Economics*, 83, 599-634.

[21] Dixit, A., Pindyck, R. (1994). Investment under Uncertainty. Princeton University Press.

[22] Fama E., MacBeth J., (1973). Risk, Return, and Equilibrium: Empirical Tests. *Journal of Political Economy*, 81, 607-636.

[23] Fama, E., French, K. (1993). Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics*, 33, 3–56.

[24] Fama, E., French, K. (1997). Industry Costs of Equity. *Journal of Financial Economics*, 43, 153–193.

[25] Faulkender, M., and R. Wang. (2006). Corporate Financial Policy and the Value of Cash. *Journal of Finance*, 61, 1957–1990.

[26] Francis, J., LaFond, R., Olsson, P., Schipper, K. (2004). Costs of Equity and Earnings Attributes. *The Accounting Review*, 967-1010.

[27] Francis, J., LaFond, R., Olsson, P., Schipper, K. (2005). The Market Pricing of Accruals Quality. *Journal of Accounting and Economics*, 39, 295-327.

[28] Francis, J., Schipper, K., (1999). Have Financial Statements Lost Their Relevance? *Journal of Accounting Research*, 37, 319-352.

[29] Francis, J., Schipper, K., Vincent, L. (2002). Earnings Announcements and Competing Information. *Journal of Accounting and Economics*, 33, 313-342.

[30] Gompers, P., Ishii, J., Metrick, A. (2003). Corporate Governance and Equity Prices. *Quarterly Journal of Economics*, 118, 107–155.

[31] Gow, I., Taylor, D., Ormazabal, G. (2010). Correcting for Cross-sectional and Time-series Dependence in Accounting Research. *The Accounting Review*, 85, 483-512.

[32] Grossman, S., Stiglitz, J. (1980). On the impossibility of informationally efficient markets. *American Economic Review*, 70, 393-408.

[33] Hansen, L., Sargent, T. (2007). Robustness. *Princeton University Press.*

[34] Hayashi, F. (1982). Tobin's Marginal Q and Average Q: a Neoclassical Interpretation. *Econometrica*, 50, 213-224.

[35] Himmelberg, C., Hubbard, R., Palia, D. (1999). Understanding the Determinants of Managerial Ownership and the Link Between Ownership and Performance. *Journal of Financial Economics*, 53, 353-384.

[36] Kyle, P. (1985). "Continuous Auctions and Insider Trade," *Econometrica* 53, 1315-1335.

[37] Lambert, R. Leuz, C., Verrecchia, R. (2011). Information Asymmetry, Information Precision and the Cost of Capital. *Review of Finance*, 16, 1-29.

[38] Lev, B. (1989). On the Usefulness of Earnings and Earnings Research: Lessons and Directions from two Decades of Empirical Research. *Journal of Accounting Research*, 1989, 153-192.

[39] Leuz, C., Nanda, D., Wysocki, P. (2003). Earnings Management and Investor Protection: an International Comparison. *Journal of Financial Economics*, 69, 505-527.

[40] Lev, B., Sougiannis, T. (1996). The capitalization, amortization and value-relevance of R&D. *Journal of Accounting and Economics*, 21, 107-138.

[41] Lev, B., Thiagarajan, S. (1993). Fundamental Information Analysis. *Journal of Accounting Research*, 31, 190-215.

[42] Li, F. (2011). Earnings Quality Based on Corporate Investment Decisions. *Journal of Accounting Research*, 49, 721-752.

[43] Loughran, T., Ritter, J. (1995). The New Issues Puzzle. *Journal of Finance*, 50, 23–51.

[44] Lucas, R. (1967). Adjustment Costs and the Theory of Supply. *Journal of Political Economy*, 75, 321-334.

[45] Masulis, R., Wang, C. Xie, F., (2007). Corporate Governance and Acquirer Returns. *Journal of Finance*, 62, 1851-1899.

[46] Moyen. N. (2004). Investment–Cash Flow Sensitivities: Constrained versus Unconstrained Firms. *Journal of Finance*, 59, 2061-2092.

[47] Ogneva, M. (2012). Accrual Quality and Expected Returns: the Importance of Controlling for Cash Flow Shocks. *The Accounting Review* forthcoming.

[48] Ou, J., Penman, S. (1989). Financial Statement Analysis and the Prediction of Stock Returns. *Journal of Accounting and Economics*, 11, 295-330.

[49] Pastor, L., Veronesi, P. (2003). Stock Valuation and Learning about Profitability. *Journal of Finance*, 58, 1749-1789.

[50] Rampini, A., Viswanathan, S. (2010). Collateral, Risk management, and the Distribution of Debt capacity, *Journal of Finance*, 65, 2293-2322.

[51] Stokey, N., Lucas, R., Prescott, E. (1989). Recursive Methods in Economic Dynamics. *Harvard University Press.*

[40] Lev, B., Sougiannis, T. (1996). The capitalization, amortization and value-relevance of R&D. *Journal of Accounting and Economics*, 21, 107-138.

[41] Lev, B., Thiagarajan, S. (1993). Fundamental Information Analysis. *Journal of Accounting Research*, 31, 190-215.

[42] Li, F. (2011). Earnings Quality Based on Corporate Investment Decisions. *Journal of Accounting Research*, 49, 721-752.

[43] Loughran, T., Ritter, J. (1995). The New Issues Puzzle. *Journal of Finance*, 50, 23–51.

[44] Lucas, R. (1967). Adjustment Costs and the Theory of Supply. *Journal of Political Economy*, 75, 321-334.

[45] Masulis, R., Wang, C. Xie, F., (2007). Corporate Governance and Acquirer Returns. *Journal of Finance*, 62, 1851-1899.

[46] Moyen. N. (2004). Investment–Cash Flow Sensitivities: Constrained versus Unconstrained Firms. *Journal of Finance*, 59, 2061-2092.

[47] Ogneva, M. (2012). Accrual Quality and Expected Returns: the Importance of Controlling for Cash Flow Shocks. *The Accounting Review* forthcoming.

[48] Ou, J., Penman, S. (1989). Financial Statement Analysis and the Prediction of Stock Returns. *Journal of Accounting and Economics*, 11, 295-330.

[49] Pastor, L., Veronesi, P. (2003). Stock Valuation and Learning about Profitability. *Journal of Finance*, 58, 1749-1789.

[50] Rampini, A., Viswanathan, S. (2010). Collateral, Risk management, and the Distribution of Debt capacity, *Journal of Finance*, 65, 2293-2322.

[51] Stokey, N., Lucas, R., Prescott, E. (1989). Recursive Methods in Economic Dynamics. *Harvard University Press.*

Table 1: Summary Statistics

Panel A: Industry Classification and R^2

Fama-French Industry	R^2			ROA			Average number of firms per year
	Mean	Median	Standard Dev	Mean	Median	Standard Dev	
Tobacco Products	0.570	0.645	0.354	0.161	0.121	0.267	5
Beer	0.555	0.633	0.343	0.092	0.097	0.138	12
Retails	0.460	0.435	0.339	0.056	0.064	0.203	142
Healthcare	0.458	0.426	0.353	0.059	0.070	0.231	28
Communication	0.454	0.411	0.337	0.058	0.057	0.233	59
Shipping Containers	0.452	0.450	0.322	0.049	0.070	0.148	11
Books	0.451	0.418	0.332	0.055	0.072	0.204	28
Restaurants and Hotels	0.441	0.402	0.351	0.040	0.053	0.178	44
Soda	0.439	0.413	0.315	0.115	0.065	0.271	7
Drugs	0.431	0.388	0.331	0.015	0.074	0.525	91
Food	0.430	0.389	0.332	0.065	0.075	0.179	59
Personal Services	0.428	0.381	0.333	0.057	0.049	0.218	20
Chemicals	0.418	0.387	0.319	0.059	0.066	0.227	59
Medical Equipment	0.418	0.375	0.327	0.058	0.074	0.344	60
Household	0.414	0.375	0.319	0.048	0.061	0.211	59
Transportation	0.385	0.321	0.314	0.045	0.045	0.180	69
Entertainment	0.383	0.325	0.314	0.039	0.043	0.196	28
Wholesale	0.382	0.299	0.325	0.041	0.047	0.166	96
Electrical Products	0.381	0.319	0.310	0.025	0.050	0.227	37
Business Supplies	0.378	0.310	0.311	0.044	0.054	0.167	51
Business Services	0.372	0.304	0.312	0.009	0.036	0.327	172
Rubber and Plastic Products	0.360	0.294	0.304	0.029	0.042	0.223	31
Measuring and Control Equipment	0.358	0.286	0.299	0.006	0.030	0.298	61
Energy	0.355	0.274	0.305	0.046	0.053	0.219	102
Clothes	0.354	0.285	0.299	0.032	0.039	0.215	48
Aircraft	0.352	0.261	0.315	0.046	0.050	0.167	22
Computers	0.349	0.266	0.302	-0.011	0.024	0.333	78
Building Materials	0.346	0.282	0.294	0.031	0.046	0.206	80
Automobiles	0.343	0.248	0.298	0.031	0.042	0.192	51
Construction	0.341	0.248	0.310	0.032	0.035	0.208	25
Agriculture	0.334	0.231	0.305	0.032	0.034	0.237	9
Machinery	0.329	0.254	0.291	0.019	0.032	0.233	109
Miscellaneous	0.328	0.261	0.284	-0.004	0.025	0.248	37
Electrical Equipment	0.326	0.238	0.296	-0.014	0.005	0.286	144
Toys	0.323	0.259	0.279	-0.020	0.006	0.215	22
Defense	0.323	0.238	0.291	0.026	0.021	0.194	6
Precious Metal	0.317	0.232	0.281	-0.070	-0.038	0.246	12
Textiles	0.309	0.233	0.275	0.017	0.028	0.166	26
Nonmetallic Mines	0.306	0.235	0.270	0.053	0.046	0.229	16
Fabricated Products	0.305	0.204	0.295	-0.034	-0.002	0.249	13
Ships	0.291	0.174	0.290	-0.008	0.004	0.265	7
Steel	0.286	0.196	0.271	0.015	0.022	0.194	51
Coal	0.242	0.161	0.242	0.025	0.033	0.319	4

Panel A of Table 1 reports the mean, median and standard deviation for the main variables R^2 and ROA developed in this paper for each Fama and French (1997) 48-industry. R^2 is the coefficient of determination of Equation (1) and ROA is the coefficient on NOPAT in Equation (1). Industries in this panel are sorted based on the mean value of R^2.

Panel B: Summary Statistics for Main Variables

Variable	N	Mean	Std Dev	P5	P25	Median	P75	P95
R_i-R_b	85652	0.020	0.505	-0.606	-0.276	-0.051	0.205	0.892
R^2	85652	0.379	0.316	0.003	0.082	0.309	0.655	0.933
R^2_{Firm}	85652	0.055	0.307	-0.378	-0.185	0.001	0.289	0.602
$R^2_{Industry}$	85652	0.325	0.141	0.149	0.225	0.293	0.388	0.607
ΔNA_t	85652	0.096	0.408	-0.439	-0.022	0.059	0.196	0.733
$\Delta Cash_t$	85652	0.017	0.131	-0.155	-0.024	0.003	0.044	0.229
ΔE_t	85652	0.018	0.179	-0.210	-0.024	0.010	0.048	0.259
NA_{t-1}	85652	5.305	2.076	2.154	3.780	5.122	6.692	9.066
$Cash_{t-1}$	85652	0.167	0.212	0.007	0.037	0.094	0.211	0.587
$Leverage_t$	85652	0.252	0.227	0.000	0.052	0.201	0.402	0.700
ΔRD_t	85652	0.002	0.016	-0.014	0.000	0.000	0.002	0.024
ΔInt_t	85652	0.003	0.026	-0.027	-0.002	0.000	0.006	0.040
ΔDiv_t	85652	0.001	0.011	-0.008	0.000	0.000	0.002	0.014
NF_t	85652	0.011	0.081	-0.063	-0.003	0.000	0.006	0.134
Size	85652	5.567	2.014	2.554	4.064	5.387	6.906	9.234
ROA	85652	0.030	0.260	-0.382	-0.058	0.046	0.136	0.373
Persistence	85652	0.349	0.417	-0.326	0.077	0.352	0.604	1.050
Std(sales)	85652	0.228	0.172	0.052	0.112	0.181	0.289	0.575
Std(ROA)	85652	0.060	0.067	0.010	0.021	0.038	0.071	0.190
Beta	85652	1.143	0.545	0.331	0.781	1.096	1.445	2.100
Sigma	85652	0.125	0.055	0.059	0.084	0.113	0.153	0.230
MTB	85652	2.302	2.500	0.485	0.964	1.580	2.665	6.440
Q	85652	1.603	1.132	0.741	0.979	1.249	1.783	3.645
Log(MTB)	85652	0.496	0.783	-0.724	-0.037	0.457	0.980	1.863
Log(Q)	85652	0.325	0.494	-0.300	-0.021	0.222	0.578	1.293

Panel B of Table 1 reports the summary statistics for the main variables used in this paper. R_i-R_b is the size and book-to-market adjusted compounded annual realized returns from fiscal year t-1 to t. R^2, R^2_{Firm}, $R^2_{Industry}$ are the main variables defined in the text. ΔNA is change in net assets where net assets are defined as total assets minus cash holdings. ΔCash is change in cash. $Cash_{t-1}$ is the cash balance from last year. ΔE is change in earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits. ΔInterest is change in interest expense. ΔDiv is change in common dividends paid. Leverage is market leverage defined as total debt over the sum of total debt and the market value of equity. NF is the total equity issuance minus repurchases plus debt issuance minus debt redemption. ΔRD is change in R&D expenditures. Earnings persistence is defined as the AR(1) coefficient from the autoregression of earnings per share: $EPS_{i,t}=\rho EPS_{i,t-1}+\varepsilon$ using earnings data in the rolling window of 10 years preceding year t. ROA is the estimated coefficient on NOPAT in Equation (1). Size is the logarithm of total assets in year t. Std(Sales) is defined as the standard deviation of sales scaled by total assets in the rolling window of 10 years preceding year t. Std(ROA) is defined as the standard deviation of realized return on assets in the rolling window of 10 years preceding year t. Beta is estimated using monthly return data in the rolling window of 10 years preceding year t. Sigma is the standard deviation of CAPM model residual in the rolling window of 10 years preceding year t. MTB is the market-to-book ratio. Q is Tobin's Q, defined as the sum of market value of equity, liquidation value of preferred equity and book value of total liabilities scaled by total assets.

Table 2 Correlation Table

Variable	R^2	R^2_{Firm}	$R2_{Industry}$	Size	ROA	Persistence	Std(Sales)	Std(ROA)	Beta	Sigma	MTB	Q	Analysts
R^2	1	0.90	0.27	0.15	0.21	0.18	-0.08	-0.16	-0.02	-0.17	0.10	0.15	0.23
R^2_{Firm}	0.90	1	-0.17	0.18	0.16	0.14	-0.07	-0.09	-0.02	-0.10	0.12	0.17	0.22
$R^2_{Industry}$	0.25	-0.15	1	-0.05	0.12	0.10	-0.03	-0.17	0.01	-0.15	-0.05	-0.03	0.05
Size	0.15	0.18	-0.07	1	0.16	0.02	-0.23	-0.26	-0.06	-0.43	0.08	0.01	0.64
ROA	0.40	0.34	0.18	0.20	1	0.07	-0.06	-0.24	-0.07	-0.20	0.07	0.13	0.19
Persistence	0.18	0.15	0.09	0.03	0.11	1	0.01	-0.06	0.00	-0.09	-0.03	-0.01	0.03
Std(Sales)	-0.11	-0.09	-0.04	-0.29	-0.11	0.00	1	0.24	0.10	0.26	0.00	-0.01	-0.14
Std(ROA)	-0.30	-0.20	-0.25	-0.31	-0.34	-0.10	0.35	1	0.27	0.60	0.28	0.32	-0.13
Beta	-0.01	-0.03	0.03	-0.06	-0.06	0.01	0.14	0.22	1	0.40	0.05	0.09	0.22
Sigma	-0.18	-0.13	-0.13	-0.48	-0.23	-0.10	0.33	0.63	0.36	1	0.15	0.19	-0.24
MTB	0.17	0.21	-0.06	0.20	0.21	-0.03	-0.04	0.17	0.02	0.051	1	0.81	0.17
Q	0.20	0.23	-0.06	0.16	0.24	-0.01	-0.05	0.17	0.03	0.07	0.96	1	0.18
Analysts	0.21	0.21	0.04	0.67	0.26	0.04	-0.14	-0.18	0.22	-0.26	0.32	0.31	1

Table 2 reports the sample correlation for variables used in the main test. Pearson correlations are presented in the upper-right corner and Spearman correlations are presented in the lower-left corner, respectively. R^2, R^2_{Firm}, $R^2_{Industry}$ are the main variables defined in the text. Size is the logarithm of total assets in year t. ROA is the estimated coefficient on NOPAT in Equation (1). Earnings persistence is defined as the AR(1) coefficient from the autoregression of earnings per share: $EPS_{i,t}=\rho EPS_{i,t-1}+\varepsilon$ using earnings data in the rolling window of 10 years preceding year t. Std(Sales) is defined as the standard deviation of sales scaled by total assets in the rolling window of 10 years preceding year t. Std(ROA) is defined as the standard deviation of realized return on assets in the rolling window of 10 years preceding year t. Beta is estimated using monthly return data in the rolling window of 10 years preceding year t. Sigma is the standard deviation of CAPM model residual in the rolling window of 10 years preceding year t. MTB is the market-to-book ratio. Q is Tobin's Q, defined as the sum of market value of equity, liquidation value of preferred equity and book value of total liabilities scaled by total assets. Analyst is the logarithm of 1 plus the number of analysts covering of firm in year t reported in I/B/E/S.

Table 3 Effect of Information on Marginal Value of Assets

Panel A: The Baseline Test

	(1)	(2)	(3)	(4)
	$R_{i,t}$-$R_{i,t}^B$			
ΔNA_t	0.296***	0.346***	0.305***	0.286***
	(10.77)	(14.08)	(11.00)	(9.93)
R^2*ΔNA_t	0.175***			
	(6.05)			
R^2_{Firm}*ΔNA_t		0.137***		0.155***
		(6.21)		(6.39)
$R^2_{Industry}$*ΔNA_t			0.143***	0.203***
			(2.59)	(3.49)
$\Delta Cash_t$	0.927***	0.970***	1.039***	1.025***
	(15.89)	(15.26)	(11.14)	(11.17)
R2*$\Delta Cash_t$	0.162			
	(1.60)			
$R2_{Firm}$*$\Delta Cash_t$		0.169*		0.142
		(1.89)		(1.45)
$R2_{Industry}$*$\Delta Cash_t$			-0.225	-0.170
			(-1.19)	(-0.83)
NA_{t-1}*ΔNA_t	-0.0358***	-0.0363***	-0.0330***	-0.0351***
	(-5.40)	(-5.46)	(-5.11)	(-5.43)
$Leverage_t$*ΔNA_t	-0.587***	-0.589***	-0.606***	-0.592***
	(-9.27)	(-9.37)	(-9.70)	(-9.36)
$Cash_{t-1}$*$\Delta Cash_t$	-0.314***	-0.318***	-0.336***	-0.327***
	(-5.84)	(-5.81)	(-5.68)	(-5.89)
$Leverage_t$*$\Delta Cash_t$	-1.345***	-1.341***	-1.334***	-1.335***
	(-10.38)	(-10.58)	(-10.51)	(-10.59)
R^2	-0.00427			
	(-0.41)			
R^2_{Firm}		-0.0112		-0.00712
		(-1.48)		(-0.78)
$R^2_{Industry}$			0.0756**	0.0697*
			(2.25)	(1.92)
NA_{t-1}	0.0141***	0.0145***	0.0139***	0.0138***
	(6.03)	(6.36)	(6.04)	(5.95)
$Cash_{t-1}$	0.268***	0.266***	0.267***	0.269***
	(6.80)	(6.66)	(6.74)	(6.85)
$Levearge_t$	-0.444***	-0.444***	-0.438***	-0.442***
	(-12.48)	(-12.76)	(-12.48)	(-12.24)
ΔE_t	0.634***	0.636***	0.633***	0.633***
	(14.65)	(14.77)	(14.70)	(14.60)
ΔRD_t	0.699***	0.682***	0.709***	0.709***
	(3.14)	(3.07)	(3.20)	(3.16)
ΔInt_t	-1.408***	-1.388***	-1.406***	-1.407***
	(-5.41)	(-5.33)	(-5.35)	(-5.37)
ΔDiv_t	1.787***	1.830***	1.785***	1.773***
	(5.22)	(5.27)	(5.16)	(5.19)
NF_t	0.346***	0.351***	0.354***	0.344***
	(3.03)	(3.11)	(3.15)	(3.03)
Year-fixed effects	Yes	Yes	Yes	Yes
N	85652	85652	85652	85652
adj. R-sq	0.232	0.231	0.231	0.232

Panel A of Table 3 reports results from an OLS regression of annual stock returns on R^2 plus firm characteristics. The dependent variable R_t-R_b is the size and book-to-market adjusted compounded annual realized returns from fiscal year *t*-1 to *t*. R^2, R^2_{Firm}, $R^2_{Industry}$ are the main variables defined in the text. ΔCash is change in cash. $Cash_{t-1}$ is the cash balance from last year. ΔE is change in earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits. ΔNA is change in net assets where net assets are defined as total assets minus cash holdings. ΔInterest is change in interest expense. ΔDiv is change in common dividends paid. Leverage is market leverage defined as total debt over the sum of total debt and the market value of equity. NF is the total equity issuance minus repurchases plus debt issuance minus debt redemption. ΔRD is change in R&D expenditures. All independent variables except Leverage and R^2 are deflated by the lagged market value of equity. All standard errors are two-way clustered by both firm and year and t-statistics are presented in the parentheses below the coefficient estimates. ***, **, and * indicate that estimates are significantly different from zero (two-tailed test) at 1%, 5%, and 10% level, respectively.

Panel B: The Baseline Test with Controls for Business Fundamental

	(1)	(2)	(3)	(4)
		$R_{i,t}$-$R_{i,t}^B$		
ΔNA_t	0.296***	0.343***	0.303***	0.284***
	(12.19)	(14.65)	(12.97)	(11.74)
$R^2*\Delta NA_t$	0.162***			
	(6.32)			
$R^2_{Firm}*\Delta NA_t$		0.123***		0.143***
		(6.09)		(6.42)
$R^2_{Industry}*\Delta NA_t$			0.133**	0.197***
			(2.26)	(3.22)
$\Delta Cash_t$	0.909***	0.953***	1.023***	1.007***
	(16.09)	(15.51)	(11.05)	(11.04)
$R^2*\Delta Cash_t$	0.158			
	(1.51)			
$R^2_{Firm}*\Delta Cash_t$		0.165*		0.140
		(1.77)		(1.38)
$R^2_{Industry}*\Delta Cash_t$			-0.233	-0.174
			(-1.20)	(-0.83)
ROA*ΔNA_t	0.110***	0.123***	0.122***	0.112***
	(4.04)	(4.32)	(4.26)	(4.05)
ROA	0.0468***	0.0484***	0.0491***	0.0456***
	(3.90)	(3.90)	(4.02)	(3.83)
Persistence*ΔNA_t	-0.0250**	-0.0202*	-0.0141	-0.0248**
	(-2.33)	(-1.87)	(-1.25)	(-2.24)
Persistence	-0.00217	-0.000775	-0.00172	-0.00216
	(-0.40)	(-0.14)	(-0.31)	(-0.39)
Std(Sales)*ΔNA_t	-0.0925***	-0.0935***	-0.0977***	-0.0943***
	(-2.98)	(-2.97)	(-3.09)	(-3.02)
Std(Sales)	-0.0127	-0.0126	-0.0110	-0.0123
	(-0.67)	(-0.67)	(-0.58)	(-0.65)
Std(ROA)*ΔNA_t	0.0193	-0.0336	0.0245	0.0371
	(0.11)	(-0.20)	(0.14)	(0.21)
Std(ROA)	-0.319***	-0.320***	-0.330***	-0.322***
	(-4.92)	(-4.90)	(-5.08)	(-4.97)
Beta*ΔNA_t	0.0256	0.0300	0.0240	0.0242
	(1.15)	(1.34)	(1.10)	(1.10)
Beta	-0.0322	-0.0324	-0.0304	-0.0308
	(-1.45)	(-1.46)	(-1.37)	(-1.39)
Sigma*ΔNA_t	0.308	0.259	0.327	0.327
	(1.04)	(0.86)	(1.09)	(1.09)
Sigma	1.096***	1.102***	1.088***	1.087***
	(6.36)	(6.41)	(6.29)	(6.28)
Control variables	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes
N	85652	85652	85652	85652
adj. R-sq	0.239	0.238	0.238	0.239

Panel B of Table 3 reports results from an OLS regression of annual stock returns on R^2 plus firm characteristics. The dependent variable R_t-R_b is the size and book-to-market adjusted compounded annual realized returns from fiscal year *t*-1 to *t*. R^2, R^2_{Firm}, $R^2_{Industry}$ are the main variables defined in the text. ΔNA is change in net assets where net assets are defined as total assets minus cash holdings. ΔCash is change in cash. ROA is the estimated coefficient on net operating assets from Equation (1). Earnings persistence is defined as the AR(1) coefficient from the autoregression of earnings per share: $EPS_{i,t}=\rho EPS_{i,t-1}+\varepsilon$ using earnings data in the rolling window of 10 years preceding year t. Std(Sales) is defined as the standard deviation of sales scaled by total assets in the rolling window of 10 years preceding year t. Std(ROA) is defined as the standard deviation of realized return on assets in the rolling window of 10 years preceding year t. Beta is estimated using monthly return data in the rolling window of 10 years preceding year t. Sigma is the standard deviation of CAPM model residual in the rolling window of 10 years preceding year t. All control variables in Panel A are included but are not reported for the sake of brevity. All standard errors are two-way clustered by both firm and year and t-statistics are presented in the parentheses below the coefficient estimates. ***, **, and * indicate that estimates are significantly different from zero (two-tailed test) at 1%, 5%, and 10% level, respectively.

Table 4: Cross-Sectional Variations in Marginal Value of Information

Panel A: Effect of Growth opportunities

	(1)	(2)	(3)	(4)	(5)	(6)
	$R_{i,t}$-$R_{i,t}^B$					
	Investment Growth		Sales Growth		Asset Growth	
	Low	High	Low	High	Low	High
ΔNA_t	0.268***	0.343***	0.265***	0.352***	0.279***	0.350***
	(8.96)	(14.96)	(9.28)	(13.43)	(10.19)	(13.25)
R^2*ΔNA_t	0.117***	0.201***	0.112**	0.166***	0.0989**	0.174***
	(3.46)	(5.33)	(2.47)	(4.82)	(2.37)	(4.22)
$\Delta Cash_t$	0.821***	1.049***	0.827***	1.033***	0.841***	1.007***
	(12.44)	(16.62)	(11.68)	(15.25)	(12.47)	(16.94)
R^2*$\Delta Cash_t$	-0.0147	0.176	0.0378	0.130	0.0405	0.138
	(-0.16)	(1.13)	(0.45)	(0.83)	(0.50)	(0.82)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Business fundamentals	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
N	42816	42836	42818	42834	42818	42834
adj. R-sq	0.244	0.245	0.237	0.255	0.242	0.256

Panel A of Table 4 reports results from an OLS regression of annual stock returns on R^2 plus firm characteristics. Firm-year observations are partitioned into low and high growth groups based on three proxies: sales growth rate (change in sales in year t deflated by sales in year t-1), investment growth rate (capital expenditure in year t deflated by net PP&E in year t-1), assets growth rate (change in total asset in year t-1 deflated by total assets in year t-2). We calculate all growth measures in year t-1 before compounding monthly returns. For each measure, we designate firms with growth measures higher (lower) than the annual median value as high (low) growth firms. All control variables and business fundamental variables are included but are not reported for the sake of brevity. All standard errors are two-way clustered by both firm and year and t-statistics are presented in the parentheses below the coefficient estimates. ***, **, and * indicate that estimates are significantly different from zero (two-tailed test) at 1%, 5%, and 10% level, respectively.

Panel B: Effect of Corporate Governance

	(1)	(2)	(3)	(4)
	$R_{i,t}$-$R_{i,t}^B$			
	Governance (G-index)		Governance (BCF-index)	
	Poor	Strong	Poor	Strong
ΔNA_t	0.168*	0.418***	0.262***	0.357***
	(1.68)	(4.54)	(3.30)	(3.30)
R^2*ΔNA_t	0.250*	0.349***	0.136**	0.431***
	(1.83)	(3.90)	(2.07)	(4.10)
$\Delta Cash_t$	1.127***	1.487***	1.086***	1.513***
	(5.55)	(11.39)	(4.90)	(10.33)
R^2*$\Delta Cash_t$	0.335	0.382	0.506	0.353
	(0.85)	(0.70)	(1.43)	(0.59)
Control variables	Yes	Yes	Yes	Yes
Business fundamentals	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes
N	7070	10722	7319	10473
adj. R-sq	0.287	0.348	0.311	0.336

Panel B of Table 4 reports results from an OLS regression of annual stock returns on R^2 plus firm characteristics. Firm-year observations are partitioned into poor and strong corporate governance groups based on two proxies: G-index and BCF-index. Firm-year observations with G-index (BCF-index) higher than 9 (2) are classified as with poor corporate governance. All control variables and business fundamental variables are included but are not reported for the sake of brevity. All standard errors are two-way clustered by both firm and year and t-statistics are presented in the parentheses below the coefficient estimates. ***, **, and * indicate that estimates are significantly different from zero (two-tailed test) at 1%, 5%, and 10% level, respectively.

Panel C: Effect of Financial Constraints

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$R_{i,t}$-$R_{i,t}^B$							
	Payout ratio		Sales		Bond Ratings		Commercial paper Ratings	
	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
ΔNA_t	0.334***	0.246***	0.430***	0.134***	0.366***	0.102*	0.303***	0.118**
	(9.58)	(11.41)	(9.43)	(4.21)	(9.45)	(1.82)	(8.20)	(2.21)
R2*ΔNA_t	0.0915***	0.193***	0.167***	0.221***	0.215***	0.183***	0.185***	0.263**
	(2.70)	(5.52)	(3.17)	(4.09)	(4.93)	(2.90)	(5.19)	(2.56)
$\Delta Cash_t$	0.968***	0.781***	1.028***	0.794***	1.134***	0.872***	1.070***	0.546***
	(15.84)	(8.93)	(14.31)	(12.99)	(11.37)	(13.83)	(12.92)	(5.40)
R2*$\Delta Cash_t$	0.108	0.156*	0.128	0.0165	0.256	-0.0714	0.171	-0.0400
	(0.89)	(1.81)	(1.25)	(0.12)	(1.24)	(-0.38)	(0.92)	(-0.19)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Business fundamentals	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	33073	25686	25685	25687	31941	16350	41649	6642
adj. R-sq	0.254	0.218	0.248	0.217	0.248	0.252	0.249	0.167

Panel C of Table 4 reports results from an OLS regression of annual stock returns on R^2 plus firm characteristics. Firm-year observations are partitioned into constrained and unconstrained groups based on four proxies: payout ratio, sales, bond ratings and commercial paper ratings. We describe the partitioning method in the main text. All control variables and business fundamental variables are included but are not reported for the sake of brevity. All standard errors are two-way clustered by both firm and year and t-statistics are presented in the parentheses below the coefficient estimates. ***, **, and * indicate that estimates are significantly different from zero (two-tailed test) at 1%, 5%, and 10% level, respectively.

Panel D: Effect of Competing Information

	(1)	(2)	(3)	(4)
	$R_{i,t}$-$R_{i,t}^B$			
	Full sample	With analyst	No analyst	Full sample
ΔNA_t	0.340***	0.392***	0.281***	0.295***
	(7.66)	(7.44)	(6.56)	(12.29)
R^2*ΔNA_t	0.194***	0.180***	0.184***	0.163***
	(5.19)	(4.20)	(2.59)	(6.41)
$\Delta Cash_t$	1.110***	1.319***	0.776***	0.908***
	(15.35)	(15.36)	(9.59)	(16.06)
R^2*$\Delta Cash_t$	0.181	0.0855	0.178	0.156
	(1.05)	(0.38)	(1.21)	(1.49)
Analysts*ΔNA_t	0.0261**	0.0187		
	(2.28)	(0.94)		
Analysts	-0.0169**	-0.0292***		
	(-2.52)	(-3.17)		
Nonsyn*ΔNA_t				0.137
				(1.23)
Nonsyn				0.0287
				(0.59)
Control variables	Yes	Yes	Yes	Yes
Business fundamentals	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes
N	55059	41176	13883	85652
adj. R-sq	0.234	0.254	0.213	0.239

Panel D of Table 4 reports results from an OLS regression of annual stock returns on R^2 plus firm characteristics controlling for other information sources. Analyst is the logarithm of 1 plus the number of analysts covering of firm in year t reported in I/B/E/S. Nonsyn is the non-synchronicity measure and is defined as 1 minus R2 of the CAPM regression in the rolling window of 10 years preceding year t. Age is one minus the reciprocal of one plus the number of years appeared in CRSP database. All standard errors are two-way clustered by both firm and year and t-statistics are presented in the parentheses below the coefficient estimates. ***, **, and * indicate that estimates are significantly different from zero (two-tailed test) at 1%, 5%, and 10% level, respectively.

Table 5: The Retention Analysis

	R^2				Firm R^2			
1-year ahead retention rate	Lowest ROA	ROA Q2	ROA Q3	Highest ROA	Lowest ROA	ROA Q2	ROA Q3	Highest ROA
Lowest R^2	0.565	0.600	0.383	0.623	0.601	0.602	0.418	0.640
R^2 Q2	0.716	0.655	0.530	0.651	0.700	0.637	0.533	0.662
R^2 Q3	0.802	0.688	0.654	0.701	0.796	0.664	0.662	0.708
Highest R^2	0.833	0.674	0.746	0.758	0.835	0.691	0.736	0.755
2-year ahead retention rate	Lowest ROA	ROA Q2	ROA Q3	Highest ROA	Lowest ROA	ROA Q2	ROA Q3	Highest ROA
Lowest R^2	0.430	0.417	0.240	0.446	0.456	0.420	0.270	0.451
R^2 Q2	0.532	0.487	0.356	0.467	0.518	0.463	0.362	0.477
R^2 Q3	0.612	0.520	0.466	0.510	0.606	0.500	0.474	0.524
Highest R^2	0.658	0.488	0.582	0.581	0.660	0.521	0.571	0.575
5-year ahead retention rate	Lowest ROA	ROA Q2	ROA Q3	Highest ROA	Lowest ROA	ROA Q2	ROA Q3	Highest ROA
Lowest R^2	0.241	0.199	0.137	0.204	0.233	0.198	0.152	0.195
R^2 Q2	0.245	0.228	0.192	0.194	0.247	0.222	0.186	0.201
R^2 Q3	0.267	0.226	0.236	0.229	0.263	0.213	0.251	0.246
Highest R^2	0.257	0.202	0.313	0.292	0.263	0.241	0.305	0.286

This table reports the retention rate of portfolios formed on ROA (the coefficient on NOPAT in Equation (1)) and R^2 (on the left), or on ROA and Firm R^2 (on the right). Portfolios are formed each year based on R^2 and ROA estimated from the preceding ten years. Reported in each cell is the average percentage of firms in each portfolio whose ROAs in the next 1- (2-, or 5-) years ahead remained in the same quartile when compared to other firms in those years.

Table 6: The Effect of R^2 in Capital Investment

	(1)	(2)	(3)	(4)	(5)	(6)
	Investment					
E	28.52***	18.83***	17.57***	31.64***	20.59***	19.23***
	(10.95)	(7.51)	(7.39)	(11.39)	(9.00)	(7.57)
Q	0.986***	0.669***	0.476**	0.913***	0.639***	0.466**
	(4.76)	(3.14)	(2.11)	(4.57)	(3.22)	(2.17)
E*R^2	8.877***	6.505**	6.479**			
	(5.02)	(2.39)	(2.37)			
E*R^2_{Firm}				6.142***	6.865***	6.812***
				(3.65)	(2.85)	(2.82)
Q*R^2	-0.507***	-0.183	-0.172			
	(-2.84)	(-0.84)	(-0.80)			
Q*R^2_{Firm}				-0.738***	-0.259	-0.244
				(-3.64)	(-1.04)	(-0.99)
E*Nonsyn	-10.22***		1.560	-10.70***		1.685
	(-3.73)		(0.50)	(-3.74)		(0.54)
Q*Nonsyn	0.613***		0.262	0.587**		0.238
	(2.67)		(0.91)	(2.50)		(0.83)
E*PIN		-17.23	-17.43		-17.39	-17.65
		(-1.55)	(-1.53)		(-1.56)	(-1.55)
Q*PIN		5.489***	5.353***		5.464***	5.341***
		(5.76)	(5.28)		(5.64)	(5.20)
1/Asset	0.0196***	0.0634***	0.0632***	0.0187***	0.0625***	0.0623***
	(3.27)	(4.03)	(4.06)	(3.14)	(3.99)	(4.01)
Ret	-0.153*	0.0312	0.0292	-0.154*	0.0300	0.0280
	(-1.81)	(0.31)	(0.29)	(-1.82)	(0.30)	(0.28)
R^2	0.240	-0.102	-0.120			
	(0.88)	(-0.24)	(-0.28)			
R^2_{Firm}				0.632**	-0.334	-0.357
				(2.17)	(-0.88)	(-0.95)
Nonsyn			-0.400	-0.0152		-0.371
			(-0.70)	(-0.03)		(-0.65)
PIN	-0.0963	-4.198***	-3.991***		-4.195***	-4.000***
	(-0.22)	(-3.04)	(-2.82)		(-2.96)	(-2.76)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	Yes	Yes	Yes	Yes	Yes	Yes
N	58122	25594	25594	58122	25594	25594
adj. R-sq	0.191	0.195	0.195	0.191	0.194	0.195

This table reports results from an OLS regression of investment on R^2 and R^2_{Firm} plus firm characteristics. The dependent variable is capital investment, defined as capital expenditure plus R&D expenses. Q is Tobin's Q. E is net income before extraordinary item plus depreciation and amortization expenses and R&D expenses, scaled by total assets. Nonsyn is nonsynchronicity calculated as one minus the coefficient of determination (R-squared) from CAPM model using past one-year returns. PIN a measure of probability of informed trading, defined as in Brown and Hillegeist (2007). 1/Asset is the inverse of total assets. Ret is value-weighted market return adjusted firm return for the next three years. All standard errors are two-way clustered by both firm and year and t-statistics are presented in the parentheses below the coefficient estimates. ***, **, and * indicate that estimates are significantly different from zero (two-tailed test) at 1%, 5%, and 10% level, respectively.

Table 7: Effects of Information on Assets-in-Place and on Growth Opportunities

	(1)	(2)	(3)	(4)
	Log(MTB)	MTB	Q	Log(Q)
R^2	0.297***	0.681***	0.435***	0.227***
	(30.35)	(14.97)	(12.53)	(23.32)
Age	-1.232***	-2.781***	-1.788***	-0.938***
	(-8.79)	(-9.73)	(-12.61)	(-13.19)
Dividend	-0.0597***	-0.172***	-0.124***	-0.0528***
	(-4.75)	(-5.77)	(-7.20)	(-6.06)
Size	0.0483***	0.0625***	0.0280***	0.0290***
	(12.32)	(5.36)	(5.90)	(10.95)
Leverage	-1.198***	-2.445***	-1.515***	-0.807***
	(-22.77)	(-10.34)	(-7.15)	(-9.14)
ROE/ROA	0.172**	-0.0632	0.911***	0.476***
	(2.37)	(-0.31)	(3.48)	(4.71)
ROE(1)/ROA(1)	0.952***	2.189***	1.401***	0.809***
	(9.86)	(9.82)	(7.56)	(8.55)
ROE(2)/ROA(2)	0.758***	1.634***	0.937***	0.569***
	(5.61)	(6.81)	(5.41)	(5.55)
ROE(3)/ROA(3)	0.483***	1.051***	0.572***	0.395***
	(8.00)	(8.66)	(3.40)	(4.40)
ROE(4)/ROA(4)	0.457***	1.071***	0.740***	0.403***
	(7.81)	(7.29)	(3.76)	(4.33)
ROE(5)/ROA(5)	0.495***	1.236***	0.817***	0.413***
	(7.08)	(6.84)	(3.70)	(4.45)
VOLP	2.144***	6.039***	1.918***	1.002***
	(41.86)	(16.28)	(20.53)	(23.98)
Ret(1)	-0.327***	-0.701***	-0.300***	-0.168***
	(-9.58)	(-9.37)	(-8.02)	(-8.17)
Ret(2)	-0.257***	-0.572***	-0.233***	-0.127***
	(-8.07)	(-7.76)	(-5.67)	(-6.30)
Ret(3)	-0.196***	-0.472***	-0.202***	-0.102***
	(-6.95)	(-6.01)	(-4.69)	(-5.32)
Ret(4)	-0.140***	-0.332***	-0.142***	-0.0700***
	(-6.11)	(-5.36)	(-3.87)	(-4.43)
Ret(5)	-0.0855***	-0.217***	-0.114***	-0.0490***
	(-4.71)	(-3.92)	(-3.51)	(-3.62)
Year fixed-effects	YES	YES	YES	YES
Average N	1427	1427	1427	1427
Number of Years	35	35	35	35

This table reports results from an OLS regression of firm value on R^2 plus control variables characteristics. Firm values are proxied by the logarithm of the market-to-book ratio (MTB), market-to-book ratio, Tobin's Q and logarithm of Tobin's Q, respectively. Age is one minus the reciprocal of one plus the number of years appeared in CRSP database. Dividend is a dummy variable that takes 1 if a firm-year pays dividends. Leverage is market leverage defined as total debt over the sum of total debt and the market value of equity. Size is the logarithm of total assets. VOLP is the volatility of profitability defined as the standard deviation of return on equity (assets) five years ahead. ROE (ROA) is the current-year return on equity (assets). ROE(i) (ROA(i)) is the return on equity (assets) in the i^{th} year in the future (up to five years). RET(i) is the compounded annual return in the i^{th} year in the future. Regressions are estimated annually and averages of coefficient estimates are presented (Fama-MacBeth method). T-statistics are presented in the parentheses below the coefficient estimates. ***, **, and * indicate that estimates are significantly different from zero (two-tailed test) at 1%, 5%, and 10% level, respectively.

Table 8: Comparison with other measures of earnings quality

	(1)	(2)	(3)	(4)	(5)
			$R_{i,t}$-$R_{i,t}^{B}$		
ΔNA_t	0.296***	0.297***	0.289***	0.318***	0.313***
	(12.19)	(11.45)	(10.00)	(11.77)	(8.30)
$R^2*\Delta NA_t$	0.162***	0.165***	0.169***	0.160***	0.169***
	(6.32)	(6.49)	(5.23)	(6.38)	(5.30)
$\Delta Cash_t$	0.909***	0.928***	0.809***	0.849***	0.778***
	(16.09)	(16.10)	(12.49)	(12.54)	(10.82)
$R2*\Delta Cash_t$	0.158	0.190*	0.192**	0.177*	0.229***
	(1.51)	(1.90)	(2.28)	(1.69)	(2.65)
$Predict*\Delta NA_t$		-0.00848			-0.0232
		(-0.38)			(-0.54)
$Predict*\Delta Cash_t$		-0.126**			-0.0959
		(-1.97)			(-1.35)
$AQ*\Delta NA_t$			-0.104		-0.0856
			(-0.45)		(-0.36)
$AQ*\Delta Cash_t$			-1.254*		-0.879
			(-1.78)		(-1.26)
$Smooth*\Delta NA_t$				0.0257*	0.0220
				(1.65)	(1.07)
$Smooth*\Delta Cash_t$				-0.0639	-0.0694*
				(-1.44)	(-1.80)
Predict		-0.0356***			-0.0510***
		(-2.79)			(-3.26)
AQ			-0.160		-0.165
			(-1.22)		(-1.25)
Smooth				0.00193	-0.00382
				(0.47)	(-0.98)
Intercept	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes
Business fundamental variables	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
N	85652	85652	85652	66505	85501
adj. R-sq	0.239	0.239	0.236	0.239	0.237

This table reports results from an OLS regression of annual stock returns on R^2 plus firm characteristics with earnings quality measures augmented. The dependent variable R_i-R_b is the size and book-to-market adjusted compounded annual realized returns from fiscal year *t*-1 to *t*. ΔNA is change in net assets where net assets are defined as total assets minus cash holdings. ΔCash is change in cash. R^2 is the main variables defined in the text. Predict is earnings predictability, defined as the coefficient of determination of the autoregression of earnings per share: $EPS_{i,t}=\rho EPS_{i,t-1}+\varepsilon$ using earnings data in the rolling window of 10 years preceding year t. AQ is accruals quality, defined as the negative of the ten-year rolling-window standard deviation of the residual terms from estimating changes in working capital accruals on lagged, current and future cash flows from operations. Smooth is earnings smoothness, defined as the ratio of the standard deviation of net income before extraordinary items divided by beginning total assets to the standard deviation of cash flows from operations divided by beginning total assets. All control variables and business fundamental variables are included but are not reported for the sake of brevity. All standard errors are two-way clustered by both firm and year and t-statistics are presented in the parentheses below the coefficient estimates. ***, **, and * indicate that estimates are significantly different from zero (two-tailed test) at 1%, 5%, and 10% level, respectively.

Table 9: Alternative Estimation Methods

Panel A: Fama-MacBeth Averages of Annual Regressions

	(1)	(2)	(3)	(4)
	$R_{i,t}$-$R_{i,t}^{B}$			
ΔNA_t	0.291***	0.343***	0.274***	0.256***
	(11.86)	(17.16)	(13.95)	(11.58)
R^2*ΔNA_t	0.178***			
	(5.23)			
R^2_{Firm}*ΔNA_t		0.118***		0.135***
		(3.81)		(4.14)
$R^2_{Industry}$*ΔNA_t			0.263***	0.317***
			(3.86)	(4.47)
Control variables	Yes	Yes	Yes	Yes
Business fundamentals	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes
N	2089	2089	2089	2089

Panel A of Table 9 reports Fama-MacBeth results from annual regressions of annual stock returns on R^2 plus firm characteristics. All control variables and business fundamental variables are included but are not reported for the sake of brevity. T-statistics are presented in the parentheses below the coefficient estimates. ***, **, and * indicate that estimates are significantly different from zero (two-tailed test) at 1%, 5%, and 10% level, respectively.

Panel B: Portfolio assigned by rankings of R^2 and R^2_{Firm}

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$R_{i,t}$-$R_{i,t}^{B}$							
	Lowest R^2	R^2 Q2	R^2 Q3	Highest R^2	Lowest R^2_{Firm}	R^2_{Firm} Q2	R^2_{Firm} Q3	Highest R^2_{Firm}
ΔNA_t	0.284***	0.309***	0.386***	0.444***	0.292***	0.328***	0.344***	0.456***
	(8.91)	(11.04)	(11.65)	(15.74)	(8.98)	(12.99)	(13.35)	(14.41)
$\Delta Cash_t$	0.818***	0.915***	1.019***	1.131***	0.780***	0.947***	1.028***	1.131***
	(17.31)	(12.55)	(12.32)	(9.78)	(16.09)	(15.65)	(13.80)	(8.44)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Business fundamentals	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	21413	21413	21413	21413	21413	21413	21413	21413
adj. R-sq	0.234	0.253	0.254	0.219	0.240	0.257	0.238	0.225

Panel B of Table 9 reports results from an OLS regression of annual stock returns on R^2 plus firm characteristics, partitioned by R^2 and R^2_{Firm} quartiles. Firm-year observations are partitioned based on R^2 quartiles. All control variables and business fundamental variables are included but are not reported for the sake of brevity. All standard errors are two-way clustered by both firm and year and t-statistics are presented in the parentheses below the coefficient estimates. ***, **, and * indicate that estimates are significantly different from zero (two-tailed test) at 1%, 5%, and 10% level, respectively.