Asset Informativeness and Market Valuation of Firm Assets [1]

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Abstract

We conjecture and empirically examine the hypothesis that the market valuation of firm assets is a function of the amount of information conveyed by assets about firms' future earnings generating ability (thereafter referred to as "asset informativeness.") We proxy for asset informativeness by the R-squared 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. We also find that the value of asset informativeness is stronger for growth firms, firms with better shareholder protection, fewer financial constraints, and fewer analyst coverage. These findings are consistent with the idea that financial reports provide important information about firms' earnings generating process and such information is valued by investors.

1 Introduction

This paper examines the market valuation consequence of the amount of information provided by accounting reports about firms' earnings generating process. It is motivated by one of the central questions in accounting research that seeks to identify and understand the source and type of value-revelant information provided by accounting reports. It takes the well-known perspective that accounting reports not only provide information about firms' realized performances (which can be informative about future performance/cash flows), they also provide information about the process via which realized performance is generated by firms' past decisions (e.g., operating and investment decisions). As such, the informativeness or value relevance of accounting reports can be evaluated on two related but distinct dimensions: first by how informative realized earnings (mostly shown on the income statement) are about future cash flows; and second by how informative recorded past decisions (mostly shown on the balance sheet) are about future earnings. Prior literature evaluates accounting reports' informativeness along the first dimension, i.e., focuses on how realized earnings (or other key accounting constructs) are informative about future cash flows. This study extends extant literature by evaluating the informativeness of accounting reports along the second dimension.

Specifically, we focus on the information from accounting reports about the process that maps firms' existing assets-in-place into future earnings. While simplistic, this process captures the idea that assets summarize the cumulative effects of firms' past and current operating and investment decisions (i.e., input to the value creation process) whereas earnings summarize the economic value created from these decisions (i.e., output of the process). We operationalize this mapping parsimoniously by a firm-specific linear regression of current earnings on one-year lagged assets. We use the R-squared $\left(R^2\right)$ of the regression to proxy for and quantify the amount of information provided by financial reports on the earnings generating process. Since our focus is the mapping between assets and earnings, and the regression includes only lagged assets and an intercept as independent variables, throughout the paper, we refer to the R-squared as the informativeness of assets or asset informativeness purely for notational ease.[1] The primary hypothesis that we conjecture and test is that investors place higher values on firm assets when accounting reports provide more information about the mapping from assets to future earnings (i.e., when assets are more informative).

Both our main hypothesis and measure of asset informativeness are rooted in, and motivated by,

[1] The lengthy but accurate descriptor for what we intend R^2 to measure is the total amount of information accounting reports provide about future earnings, including those directly attributable to accounting assets and those not explained by accounting assets. By definition, other than those from pure random shocks, all earnings are generated by *economic assets*.

economic theories that predict higher valuation of assets when there is more information about the assets' productivity (Hayashi (1982), Dixit and Pindyck (1993)). These theories combine the standard discounted future cash flows valuation model for assets with insights from neoclassical investment theory that endogenize future cash flows as outputs generated by firms' existing capital stocks via production technologies and future investment decisions. In Hayashi (1982), investments are made each period conditional on all information available to firm managers. It follows that as long as there is uncertainty about production technologies (e.g., uncertainty about asset productivity), more information will always improve investment efficiency (i.e., the decision-making role of information per Blackwell (1959)). Together, these theories predict that investors anticipate the positive effect of information on investment efficiency and value firm assets higher when there is more information about the production process. 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)).

These theories (i.e., Hayashi (1982), Dixit and Pindyck (1993)) do not specify either the source of information about firms' production technologies or how to quantify such information. We conjecture that firms' financial reports constitute a main source of such information. The firm-specific regression of earnings (output) on assets (input) can be interpreted as a linear approximation of more complex production technologies.[2] The intercept of the regression captures the average amount of a firm's earnings that are attributable to inputs other than accounting assets (e.g., firm-specific know-how or management skills). The noise term reflects the impact of random shocks (e.g., technological or macroeconomic shocks). The slope coefficient provides an estimate of a firm's average return on assets, a standard measure of asset utilization efficiency and productivity. The regression is estimated over a 10-year period prior to the year of investor valuation, so that its R-squared quantifies the amount of information investors can learn before they assign a value to a firm's assets.[3]

Using a large sample of U.S. firms from 1960-2010, we document significant cross-sectional variations in asset informativeness as measured by the R-squared: it averages about 38% and has an interquartile range from 8.2% to 66%. Consistent with our main hypothesis that investors assess higher value to more informative assets, we document a statistically (at better than 1% level) and economically significant positive relation between the marginal value of firm assets and the R-squared

[2] For example, it can be motivated as a linearized version of a Cobb-Douglas production function with assets as the only input factor. Economists often estimate the log-linear form of Cobb-Douglas production for its empirical tractability.

[3] This presumes a specific form of learning by investors (OLS learning). See Hansen and Sargent (2007) for a systematic treatment of learning by economic agents.

measure.[4] Our estimates indicate that the marginal value of the average firm's noncash assets would be 18% higher (from 30 to 35 cents for each dollar of noncash assets) if its R^2 value increased by one standard deviation from the sample mean. Similar increase is observed for cash assets: the average marginal value of cash for firms is \$0.818 in the lowest R^2 quartile and \$1.131 in the highest R^2 quartile, a 38% increase. A similar positive relations are also observed between R^2 and the average value of firm assets as measured by Tobin's Q.

The positive relations between R^2 and asset values are robust to the inclusion of other firm characteristics capturing business models such as the level of profitability (as measured by ROA, returns on assets), volatilities of stock return, profitability, and sales, beta risk, and the AR(1) coefficient from an earnings regression (a common measure of earnings persistence). It is worth noting that we find that asset values are higher for firms with higher ROA, but the effect of R^2 on asset values is not affected by the inclusion of ROA. This is consistent with the idea that R^2 captures the uncertainty about, not the level of, asset productivity. These findings are also robust to alternative estimation methods (i.e. Fama-MacBeth, the portfolio approach).

Although theories predict that asset informativeness affects asset valuation, they do not provide clear predictions about how the effect varies across firms. We explore these issues empirically by estimating our main regression on subsamples partitioned by firm characteristics such as growth opportunities, shareholder protections, financial constraints, other information sources, and corporate governance. These analyses can shed light on to which firms the information from accounting reports is more valuable to investors.

We find that both (marginal and average) values of assets and the effects of asset informativeness on asset values are higher for high-growth firms, consistent with the idea that high-growth firms' assets are expected to generate more future cash flows, as well as the idea that information is more valuable when there is more to gain from properly managing assets in high-growth firms. We also find that firms with better shareholder protections have both a higher value of assets and stronger effects of information. The former finding is consistent with Gompers et al. (2001) and the latter finding is consistent with the idea that managers are more likely to optimally use valuable information when their incentives are more aligned with shareholders.

Regarding the effect of financial constraints, we find that asset values are higher in financially constrained firms, consistent with the idea that in addition to their use in production, assets in these firms can be used as collateral to relax financial constraints (Faulkender and Wang (2006),

[4] We apply the methodology in the finance literature to estimate the marginal value of assets (e.g., Faulkerner and Wang (2006), Dittmar, et al. (2007)). Section 2 provides further detail on this method.

Rampini and Viswanathan (2011)). More informative assets are valued higher in both constrained and unconstrained subsamples, although the effects are stronger in unconstrained firms. This is consistent with the idea that the collateral use of assets in constrained firms also limits assets' productive use and therefore reduces the incremental value of information about assets' productivity. With respect to other competing information sources, we find that asset values are much higher for firms with analyst coverage than for firms with no analyst coverage, whereas the effects of R^2 on asset values are of similar magnitudes and are significant in both subsamples. We interpret these findings as supporting the idea that analysts provide or facilitate the transmission of information about firms' value creation process, but they do not substitute for or crowd out accounting information. Relative to the average asset valuation in each subsample, the impact of R^2 is much larger for firms with no analyst coverage, suggesting that investors rely relatively more on financial statements in valuing a firm when alternative information is deficient.

An implicit assumption behind our analysis is that information obtained from past data is useful for predicting firms' future operation outcomes and R^2 quantifies such information. To validate this assumption, we double sort sample firms into portfolios formed by their R^2 values (estimated from prior years) and their current ROAs (not used in estimating R^2). We find that within each ROA portfolio, firms with higher values of R^2 are more likely to stay within the same portfolio going 1-, 2- and 5 years forward than those with lower R^2 values. In other words, R^2 measures the persistence of firms' profitability. This result provides support for our interpretation that R^2 captures the quality and amount of information financial reports provide about firms' earnings generating process, and investors value firm assets higher when they understand better how firm values are created.

Our paper contributes to the 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 age. They interpret their findings 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 predictions are derived from basic valuation theory and 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

[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.

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 makes several contributions to the broad accounting literature on assessing the source and value of accounting information.[8] First, our paper is the first to analyze the information in accounting reports about firms' value generating process. It contributes by measuring the amount and quantifying the value of such information. Our analysis and 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. Therefore, our paper empirically substantiates that long-held belief that the value of accounting reports comes from assisting investors to better understand firms' business model (i.e., value creation process), which can in turn help investors better predict future earnings and evaluate the implications of firm decisions. As such, 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 support the perspective that accounting reports take a primitive role in providing information to capital markets.

Our paper also makes a methodological contribution to the literature. Unlike prior literature that establishes the value of accounting constructs by their associations with stock price/return on stand-alone basis, this paper assesses the value of accounting reports by the degree to which key accounting constructs, when viewed together, illustrate firms' value creation process. The association studies assume that stock prices can be informative about firms' operations independent of the information provided by firms' financial reports, whereas our approach presumes that a significant portion of information embedded in price comes from accounting reports. To capture the value creation process, our empirical design builds on economic theories and makes meaningful connections between accounting constructs and their economic counterparts. These connections enable us to design measures for the value of accounting information and form testable hypotheses from theories based on information

[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.

economics.[9]

Our method provides an alternative approach to address issues of interests to regulators and standard setters. For example, it 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 comprehensive income or fair-value measurement.

Lastly, our paper contributes to the research on earnings persistence by reconciling an apparent conflict on the measurement and pricing effects of earnings persistence. Conceptually, earnings persistence refers to firms' ability to generate similar earnings as the past and is predicted to be a major input into market pricing. However, empirical studies have failed to document any significant pricing effects of commonly used empirical proxies for earnings persistence (Francis, et al. (2004)).[10] Our analysis shows that R^2 captures the concept of earnings persistence more accurately, as it passes the dual tests of predicting the persistence of profitability and being correlated with asset values. For researchers interested in identifying alternative measures of earnings persistence, our results suggest that a fruitful way is to focus on measures that capture "the persistence of firms' earnings generating ability" as opposed to measures that capture the statistical time-series properties of earnings.

Our study 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)). Like these lines of research, we study the market pricing effect of mappings between accounting constructs. Unlike these studies, the mapping we study is more rooted by economic theory and captures more about the value creating process. Furthermore, fundamental analysis research focuses on how stock price fails to incorporate value-relevant accounting information and therefore is unable to address how much information from accounting reports *is* actually incorporated in price and to shed light on where financial reporting can be improved to communicate value-relevant information.[11] As in our study, the mapping studied in the accrual quality research is also not motivated by statistical association (it is motivated by the accounting property

[9] Our approach is related to 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 and assess to what extent stock price embeds this value. We focus on the valuation of information about the value creation process (to which R&D contributes), not the valuation of a physical economic asset such as the actual output of R&D activities.

[10] 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.

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

of accruals mapping into cash flow). However, this line of studies takes the stream of cash flows as exogenously given, whereas we explicitly recognize and model earnings generating process. Therefore, our hypothesis and approach are more closely related to economic theories and our results can be more readily interpretable by economic theories.

In addition, our study is also 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 value 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 Hypothesis Development

Our main hypothesis is that investors value firm assets higher when financial reports provide them with more information about the firm's earnings generation process. It follows from combining the decision-making value of information (Blackwell (1959)) and the neoclassical investment theory (e.g., Lucas (1967), Hayashi (1982), Abel (1983), Dixit and Pindyck (1990)). The Blackwell Theorem states that more or higher quality information can increase the expected payoff of the decision maker. The intuition is straight-forward: the worst that the decision maker can do is to ignore the information and obtains the status quo payoff, so more information will make him at least as well off, if not strictly better off.

The decision-making value of information can be applied to a dynamic neoclassical investment setting in which the value of a firm's assets is the discounted sum of all cash flows to be generated by the firm's depreciable capital stock (assets-in-place) in the future. Specifically, the stream of cash flows is generated by a production technology whose output increases with the amount of capital stocks the firm has at each point in time. Capital stocks decrease each period by depreciation and increase with new investment. Investment is chosen optimally per-period to maximize the expected value of the future cash flows, subject to the cost of the investment (i.e., the adjustment cost of capital). Since investment is made per-period based on all information available at the time of the investment, it follows that ex ante when there is more information about the uncertain aspects of the cash flow process (e.g., uncertainty about asset productivity or the adjustment costs), investment efficiency will be high and so will the value of assets.[12] We provide a simple analytical model that illustrates the value of information in the appendix.

Theories do not specify the source or type of information. We conjecture that a major source of such information is firms' financial reports. This conjecture is based on the commonly accepted idea that information provided in accounting reports assists decision-making of managers and investors. Managers learn from financial reports the outcomes (in the form accounting earnings) of their past investment and operations decisions (the cumulative effects of which are measured by the accounting assets). They adjust their future decisions according to the amount of information they learn from the past returns. Anticipating this effect, investors would value firms' assets higher when they know managers have better information to base their future decisions on. 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 firms' earnings generating process.

While the above argument is developed under the assumption that managers' incentives are perfectly aligned with those of outside investors, the prediction does not have to depend on this assumption. To see this, note that the adjustment cost of investment in Hayashi (1982) can result from frictions in the capital markets that arise due to agency conflicts between outside investors and firm insiders. This type of cost can be lowered when there is more information about the assets' productivity. For example, one type of adjustment cost is the cost of accessing external capital. 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.[13] More information about asset

[12] 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.

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

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.

A key assumption in the above discussion is that individuals whose decisions affect firms' cash flows learn information about the earnings generating process and apply the learning to improve the productive use of assets. A corollary 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 on this channel. Instead, it can be obtained from a simple model of an exchange economy as in Grossman and Stiglitz (1980). As illustrated recently in Lambert et al. (2011), as long as investors are risk averse and have incomplete information regarding firms' future cash flows, investors would value a firm's assets higher when they have more information about firms' future cash flows. That is, the effect we hypothesize can also come from the decision-making role of information for investors. The difference here is that investors use such information to achieve better portfolio balancing and not to affect the actual cash flows produced by firms. 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 effect of asset informativeness on market value of assets is expected to be stronger for firms with high growth opportunities, fewer financial constraints, better governance, and less information from alternative sources.

3 Measure of Information, Empirical Specification and Sample Description

3.1 Measure information from accounting reports

We proxy for the earnings generating process with a linear regression of future earnings on past assets. We quantify the information available to investors about firm assets' productivity by the R-squared from the following firm-specific regression:

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

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 shareholders' equity minus cash and marketable securities, plus total debt. For each firm-year, (1) 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 (1) 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 (1) and its R^2 are meant to measure *empirically* the amount of information investors can learn about a firm's business model. 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.[14]

[14] 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 $\Delta Cash_{it}$:

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

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 (2) with control variables defined as follows:

$$\begin{aligned} Control_{it} &= \alpha_t + NA_{it-1} \cdot \Delta NA_{it} + Leverage_{it-1} \cdot \Delta NA_{it} + Cash_{it-1} \cdot \Delta Cash_{it} \\ &\quad + Leverage_{it-1} \cdot \Delta Cash_{it} + R^2_{it} + NA_{it-1} + Cash_{it-1} + Leverage_{it-1} \\ &\quad + \Delta E_{it} + \Delta RD_{it} + \Delta Int_{it} + \Delta Div_{it} + NF_{it} \end{aligned} \tag{3}$$

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 (1) for all non-financial (SIC code: 6000-6999) and non-utility (SIC code: 4900-4999) firms in Compustat from 1960 to 2010. Equation (1) 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 tabacco 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 (2). Column (1) reports the estimation results for Equation (2) with control variables specified by Equation (3). 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 $\ln(NA_{it-1}) \cdot \Delta NA_{it}$ 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 addtional 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 (2) by adding six additional control variables of $W^{DM}_{it} \cdot \Delta NA_{it}$ and W^{DM}_{it} (where 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 $ROA \cdot \Delta NA_{it}$ 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 $Persistence \cdot \Delta NA_{it}$ is negative but less significant in Columns (2) and (3). The coefficient on $Std(Sales) \cdot \Delta NA_{it}$ is negative in all columns, consistent with assets in firms with volatile sales being valued less. The coefficient on $Std(ROA) \cdot \Delta NA_{it}$ 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 $Beta \cdot \Delta NA_{it}$ and $Sigma \cdot \Delta NA_{it}$ 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 (2) 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 (3) 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. [15]

[15] 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.[16] 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 (2) 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.

[16] 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 collaterals, 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[17] (measured as total dividends (common dividends plus repurchases) over earnings, firm size[18] (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 (2) 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

[17] 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.

[18] 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 (2) 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 (2) 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 (2). 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:

$$I_{i,t} = \alpha_t + \eta_i + \beta_1 E_{it} + \beta_2 Q_{i,t-1} + \beta_3 R^2_{it} \cdot E_{it} + \beta_4 R^2_{it} \cdot Q_{i,t-1} + \gamma Controls_{i,t} + \epsilon_{it}. \tag{4}$$

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 accomodate 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). 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 (4) 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 $Q * R^2$ and $Q * R^2_{Firm}$ 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 $Q{*}Nonsyn_{i,t}$ are positive in all columns and statistically significant in columns (1) and (4). The coefficients on $Q_{i,t} * PIN$ 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 informatiness 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 valualtion test.

5.4 Controlling for other earnings quality measures

To futher 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 (2). 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 (2) 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. [19] 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' value creation process. 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' value creation process, not just about the output of such process). Our evidence on the cross-sectional variations of the value

[19] 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.

of information offers valuable information on where accounting 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 great interest to regulators and standard setters.

7 Appendix: A Simple Example of Value of Information

To apply to investors' valuation of firm assets, consider a firm with a single production technology (an asset) that when combined with a per-period investment I_{t-1}, generates per-period cash flows of c_t net of investment cost according to

$$c_t = CF_t - \left(\theta_t I_{t-1} + \frac{A}{2} I_{t-1}^2\right).$$

Here CF_t is the gross cash flow generated by the asset and $\theta_t I_t + \frac{A}{2} I_{t-1}^2$ (with $A > 0$) is the total cost of investment per period that is needed to produce the cash flows in addition to having the technology.

Assume that part of the adjustment cost θ_t is a random variable and the investment is made before θ_t is observed. Then the optimal investment decision for each period is

$$I_{t-1}^{\cdot} = -\frac{1}{A} E\left(\theta_t | \Phi_{t-1}\right)$$

where Φ_{t-1} is the information set available to the firm at the time of investment, which is for simplicity assumed to be summarized by a prior on θ_t that is normally distributed with mean $\overline{\theta}$ and variance σ_{t-1}^2. Therefore, $1/\sigma_{t-1}^2$ measures the precision, the amount, or the quality of information. It is easy to show that the expected cash flow at time $t-1$ before investment is taken is given by

$$E\left(c_t\left(I_{t-1}^{\cdot}\right)\right) = CF_t + \frac{\overline{\theta}^2 - \sigma_{t-1}^2}{2A}.$$

That is, the better quality information the firm has (lower σ_{t-1}^2), the more efficient its investment will be and the higher the expected cash flows (see, e.g., Chen, et al. (2007)). 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.

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Table 1: Summary Statistics

Panel A: Industry Classification and R^2

Fama-French Industry	R^2 Mean	R^2 Median	R^2 Standard Dev	ROA Mean	ROA Median	ROA Standard Dev	Average number of firms per year
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)
$Leverage_t$	-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_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. 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_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. 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*ΔNA_t		-0.00848			-0.0232
		(-0.38)			(-0.54)
Predict*$\Delta Cash_t$		-0.126**			-0.0959
		(-1.97)			(-1.35)
AQ*ΔNA_t			-0.104		-0.0856
			(-0.45)		(-0.36)
AQ*$\Delta Cash_t$			-1.254*		-0.879
			(-1.78)		(-1.26)
Smooth*ΔNA_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)
$R^2 * \Delta NA_t$	0.178***			
	(5.23)			
$R^2_{Firm} * \Delta NA_t$		0.118***		0.135***
		(3.81)		(4.14)
$R^2_{Industry} * \Delta NA_t$			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.