Corporate savings and price informativeness*

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Abstract

This paper examines the process whereby firms accumulate their cash reserves, i.e. their savings decisions. The investigation illustrates that stock prices, and more importantly, the private information they contain, play a crucial role in explaining firms' savings choices. I start by documenting that a firm' savings are highly sensitive to its stock price. This positive association indicates that firms tend to transfer more resources into their cash balances when the market foresees valuable future prospects. Strikingly, such a precautionary mechanism turns out to be amplified when the market price contains a larger content of private investors' information. Hence, the findings are consistent with the view that managers learn from observing the level of their stock price. Moreover, further test show that this defensive learning is not due to the uncaptured effect of market mispricing or financing constraints. Overall, the analysis importantly highlights that the nature and precision of the available information about firms' future prospects are crucial ingredients of their saving choices.

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1. Introduction

Recent surveys of CFOs highlight that the most important driver of firms' financial choices is the desire to attain and preserve financial flexibility.[1] Concomitantly, an important research effort has been developed to understand how firms optimally maintain their ability to finance current and future growth opportunities at a low cost. In this context, researchers and practitioners have naturally paid a close attention to firms' cash policy since the management of internal resources constitutes a major element of firms' financial flexibility. Arguably, this growing focus has considerably broadened our understanding of the determinants of cash holdings and their consequences for firm valuation.[2] However, many dimensions of firms' cash management are not yet fully understood. In particular, prior work has paid relatively little attention to the process whereby firms accumulate their cash, i.e. their saving decisions.

This paper aims at shedding fresh light on this important question by concentrating on the role played by the information contained in stock prices in explaining firms' decision to save. Indeed, both economic intuition and previous work indicate that corporate savings are largely determined by managers' *expectations* about the value of future investment opportunities as well as their anticipations of future financing costs. In view of that, the nature and precision of available information about the firm's future prospects is likely to be a crucial ingredient of firms' savings choices. In this spirit, I argue that stock prices represent a relevant source of information that may guide managers and affect their decisions to allocate resources towards cash savings.

As a matter of fact, Dow and Gorton (1997) and Subrahmanyam and Titman (1999) suggest that by aggregating information from many different sources, stock prices may contain some information that is new to managers. This information, in turn, can guide them to make more efficient decisions. This "learning" hypothesis has recently received substantial empirical support. In particular, Durnev, Morck and Yeung (2004), Luo (2005) and Chen, Goldstein and Jiang (2007) report that

[1] See Graham and Harvey (2001) and Bancel and Mittoo (2004).
[2] See Bates, Kahle and Stulz (2008) for a comprehensive survey of the literature on corporate cash holdings.

managers integrate some information extracted from their stock price into their capital investment decisions.

To gauge whether managers infer new information by observing stock prices and whether they incorporate this incremental information into their savings decisions, I examine the relation between the amount of private information revealed by prices and the sensitivity of corporate savings to price. The logic of this approach follows closely that of Chen, Goldstein and Jiang (2007), and is based on the premise that firms' savings decisions are sensitive to shocks in their stock price. Indeed, Almeida, Campello and Weisbach (2004) and Riddick and Whited (2008) document that, on average, firms allocate more resources to their cash savings when the market foresees more valuable future prospects. On this ground, if managers glean valuable information from their market price and integrate it into their savings decisions, one would expect savings to be more responsive to stock price when the price encloses a larger content of private information.

Using firm-specific return variation – or price nonsynchronicity – to identify the quantity of private information incorporated into prices,[3] I report strong evidence that the sensitivity of savings to stock price is positively associated with price informativeness. More specifically, after controlling for size, cash flow, the stock of cash as well as firm- and time-specific effects, I find that the estimated savings-to-price sensitivity is magnified substantially when prices contain a large portion of private information. Noticeably, this result turns out to be economically significant. The estimates reveal that corporate savings become 60 percent more sensitive to stock price if one moves from the 25^{th} to the 75^{th} percentile of price informativeness. Various additional specifications confirm that this result is robust to different measures of price informativeness, to the potential effect of outliers in the measurement of firm-specific return variation as well as to several estimation methods.

To further strengthen my interpretation and rule out alternative explanations, I conduct various ancillary analyses. First, I reject the possibility that the documented positive association between stock

[3] See Chen, Goldstein and Jiang (2007) for a detailed presentation of the papers supporting the use of firm-specific return variation to capture private information in prices.

price informativeness and savings originates from the fact that managers act on market mispricing to issue overvalued stocks and save part of the proceeds into their cash accounts. In particular, I report that while firms indeed funnel a significant fraction of their issuance proceeds into cash savings, the effect of price informativeness on the saving-to-price sensitivity remains equally strong when I control for firms issuance activity. In a similar vein, my conclusion is not altered by the inclusion of different proxies for market mispricing.

Next, I offer evidence that the effect of private information in prices on savings is not a by-product of binding financing constraints. Specifically, I conduct the analysis on various sub-samples where firms are classified according to their degree of financial constraints. Across different specifications, the regressions reveal that financially constrained firms exhibit larger saving-to-price sensitivities. Accordingly, firms that foresee binding financing constraints in the future increase their savings more intensively when their stock price point towards more valuable future growth options. However, the estimations reveal a positive and significant relation between the amount of private information in their prices and their saving-to-price sensitivity for *both* constrained and unconstrained firms. As a result, the effect of private information in prices contributes to explain saving behaviors systematically.

From a different perspective, I also evaluate the impact of different sources of information on the results. Indeed, one may argue that a positive relation between private information in prices and the sensitivity of savings to price reflects managerial learning only to the extent that the information gleaned from stock prices is new and valuable to managers. To address this point, I combine various sources of information and consider their joint effect on the estimated saving-to-price sensitivity. Specifically, I use the number of analysts following the firm to proxy for the prevalence of public information. Alternatively, I capture the private information that managers possess already by using the transactions by corporate insiders as well as earnings surprises. As expected, these additional information channels explain some of the observed variation in the savings-to-price sensitivity.

Nevertheless, we continue to observe that savings are more sensitive to price s when prices convey more private information that is really new to managers.

Lastly, to reinforce the interpretation of the results, I examine the combined effect of price informativeness and savings on future operating performance. Using different specifications, I show that precautionary savings enhance future return on assets. Furthermore, this valuable effect turns out to be exacerbated when firms' stock price includes a larger content of private information. This finding supports the view that private information revealed in stock prices enables managers to make more efficient savings decisions.

Overall, the mosaic of evidence suggests that managers use part of the private information embedded in stock prices when they decide on corporate savings. As such, this paper contributes in two distinct areas. First, the study adds to the literature on cash holdings, and more particularly to that focusing on corporate savings. Prior research looks at savings decisions mostly through the lens of their key role in counteracting costly or limited access to external financing. By documenting that savings are sensitive to stock price, the results in this paper confirm that precautionary savings are explained by the market anticipations about the firm's future investment prospects *and* financing costs. Importantly, the findings further stress that managers infer information from observing market expectations and incorporate part of it into their saving choices. Moreover, such a learning mechanism appears to be value-enhancing. From a different perspective, the analysis illustrates that both financially constrained and unconstrained firms increase systematically their savings when their stock price picks up more information about favorable future prospects. As such, my results substantiate the recent findings of Dasgupta, Noe and Wang (2008) who document that *all* firms optimally stage their response to positive shocks by delaying investment and building up cash savings. My analysis suggests that this inter-temporal mechanism depends on the amount and quality of information that managers have about their firm's future prospects and future financing costs.

Second, my findings offer new evidence on the role of price informativeness on corporate actions. The bulk of the empirical research in this area has revolved around analyzing the effect of stock

prices on investment decisions. Certainly, by establishing a link between the informational content of prices and corporate savings, my results point to an additional dimension of firms' decision process that is affected by stock prices. In that respect, the results confirm the intuition that prices contain a variety of information that can help managers in their decisions making. Alternatively, the results provide additional support for the idea that financial markets are not a side-show, and affect materially the real economy. In my analysis, this channel operates through the effect of prices on optimal savings' decisions.

Finally, the interpretation of my findings depends crucially on the measures of the amount of private information in prices. Clearly, it is possible that the estimates may be driven by unobservables that affect both the firm-specific return variation and render simultaneously corporate savings more sensitive to stock price. Nevertheless I believe that my use of alternative measures of price informativeness, together with extensive robustness tests mitigate substantially this concern.

In the next section, I review the related literature, discuss the theoretical background, and outline the main hypothesis. In section 3, I present the empirical methodology and describe the data. Section 4 reports the results. I draw the conclusions in section 5 and discuss some implications for future research.

2. Related literature and hypothesis development

The recent period has witnessed a growing number of studies dedicated to understand firms' cash policy. Importantly, this large research effort has considerably broadened our knowledge of why firms hold cash.[4] Yet, the existing literature has devoted little attention to the economic mechanisms whereby firms build up cash reserves, that is, why they save.

There are, however, few notable exceptions. In particular, Almeida, Campello and Weisbach (2004) formalize the idea of *precautionary* savings. Specifically, they show that when future projects are valuable and when future external financing is uncertain, corporate saving becomes a key element

[4] See Bates, Kahle and Stulz (2006) for an overview of the recent literature on corporate cash holdings.

of a firm's financial choices. This is consistent with the general view that enhanced financial flexibility, in other words, ensuring a firm's ability to finance present and future investment undertakings is the main goal of managers' financial decisions. On the empirical level, Almeida, Campello and Weisbach (2004) support their theory by documenting that firms save more intensively when they anticipate valuable future growth opportunities - when their market-to-book ratio is high – and when their access to external financing is limited. Khurana, Pereira and Martin (2006) obtain analogous results in an international context.

In a similar vein, Dasgupta, Noe and Wang (2008) provide further evidence in favor of an effective inter-temporal tradeoff between current savings and future capital investment. As a matter of fact, they show that all firms display a systematic propensity to save. In particular, they report that both financially constrained and unconstrained firms allocate a fraction of their cash flows into cash savings. Subsequently, firms draw down part of the accumulated cash reserves and increase simultaneously capital spending. They further document that this phenomenon is magnified for financially constrained firms. Notably, firms appear to save in a systematic way, and then deplete the cash to secure the financing of *future* valuable investment opportunities.[5]

Other papers provide ancillary support for such a dynamic tradeoff. Acharya, Almeida and Campello (2007) document that firms' propensity to save is magnified when they anticipate that valuable growth options are likely to appear in periods where operating cash flows are expected to be low. Alternatively, Gamba and Triantis (2007) and Riddick and Whited (2008) further indicate that income uncertainty and productivity shocks play key roles in generating the observed saving's patterns. Specifically, they show that firms save more aggressively when there is more uncertainty about the value of their future cash inflows.

Overall, the above studies provide supporting evidence that firms' savings decisions are driven by managers' expectations about the value of future investment opportunities as well as expected future

[5] Note that these authors remain silent on the transmission mechanisms between cash savings in one period and investment in the next period. It could be that firms use directly the saved cash to finance investment. Alternatively, the cash can be used to increase external financing to finance investment.

financing costs, as reflected in their stock price (market-to-book ratio). In this paper, I build on this regularity and study more closely the relation between stock prices and savings. To the extent that prices contain valuable information about a firm's fundamentals, it is legitimate to ask what type of information matters for savings and how managers process and incorporate market information in their optimal saving choices. In this spirit, I argue that stock prices may contain specific information that is new and valuable to managers. This information can take different forms. It can be about future investment opportunities, but also about the future demand for the firm's products, the strategic competition with other firms, the intrinsic uncertainty faced by the firm or its future financing costs. On this ground, I conjecture that managers' decision to save is partly guided by some private information they learn from stock prices.

This hypothesis is based on the view that managers can improve their decisions by observing stock price. As advocated by Dow and Gorton (1997), Subrahmanyam and Titman (1999) or Dye and Sridhar (2002), stock prices cumulate information from different market participants who cannot communicate with the firm other than via the trading process.[6] In this context, stock prices may enclose some information that the managers do not have. This fresh information, in turn, can lead them to allocate corporate resources more efficiently and hence contributes to enhance firm value.[7]

Several studies have taken this prediction to the data. In particular, Durnev, Morck and Yeung (2004) show that firms invest more efficiently when their stock price incorporate more private information.[8] Chen, Goldstein and Jiang (2007) report that investment is more sensitive to stock price when prices are more informative. They interpret their results as evidence that managers extract information from stock prices when they make investment decisions. Bakke and Whited (2008) reach a similar conclusion. Using a different approach, Luo (2005) finds that merger announcement returns

[6] Put some additional reference of this literature (feedback effect).
[7] Stock prices can also affect corporate decisions through its effect on firms' access to capital. This mechanism is supported empirically by Baker, Stein and Wurgler (2003) and Campello and Graham (2007) who show that positive shocks to prices relax firm's financing constraints.
[8] They gauge the efficiency of corporate investment directly by estimating the deviation of Tobin's marginal q from its optimal level.

predict deal completions, even after controlling for deal quality, thereby concluding that merging firms extract information from stock prices. From a different angle, Ferreira, Ferreira and Raposo (2008) provide evidence that private information in prices impinge on the structure of corporate boards.

By and large, all these pieces of evidence support the existence of a feedback from the informational content of stock prices to corporate decisions. However, it is fair to say that the vast majority of the research in this area concentrates on investigating the impact of price information on corporate investment. This unilateral focus appears surprising. As a matter of fact, both theory and economic intuition suggest the information revealed by prices may contain different components. Consequently, and to the extent that the information is new to managers, one may expect that the informational content of prices also guide managers in their savings strategy. On this ground, I hypothesize that corporate savings will be more sensitive to stock price when price embeds more private information. Below, I provide evidence that substantiate this claim.

3. Methodology and data

This section describes the econometric methodology, details how I construct proxies for the amount of private information embedded in stock prices and presents summary statistics.

3.1. Measuring the sensitivity of savings to prices: econometric specification

To gauge whether managers incorporate the private information embedded in stock prices into their saving's decisions, I examine the relation between the amount of private information in stock prices and the sensitivity of savings to price. To do so, I follow and adapt the approach of Chen, Goldstein and Jiang (2007) who investigate whether price informativeness affects the sensitivity of corporate investment to stock price. Based on their argument, stock prices aggregate all public and private information about firms' fundamental value. Hence, when deciding upon the optimal level of savings, a value maximizing manager will consider all relevant and available information. This set includes both private information that managers possess, and that is not yet integrated into the stock

price, as well as the overall information embedded into the stock price.[9] If managers learn from prices and use this information into their savings decisions, we expect corporate savings to be more sensitive to stock price when the prices convey more private information that is new to managers.

To test this hypothesis, I draw from Almeida, Campello and Weisbach (2004) and specify the following model of corporate savings:

$$Savings_{i,t} = \alpha_i + \eta_t + \beta_1 Q_{i,t-1} + \beta_2 (Q_{i,t-1} \times \psi_{i,t-1}) + \varphi_1 Size_{i,t} + \varphi_2 CF_{i,t} + \varphi_3 \psi_{i,t-1} + \varphi_4 Cash_{i,t-1} + \varepsilon_{i,t}$$

where the subscripts i and t represent respectively the firm and the year. The dependent variable $Savings_{i,t}$ is the annual change in the holdings of cash and other liquid assets divided by lagged assets.[10] $Q_{i,t-1}$ is the normalized stock price, and is computed as the market value divided by the book value of assets. The variable of interest $\psi_{i,t-1}$ represents the firm-specific stock price and is used as a proxy for private investors' information. First proposed by Roll (1988), this measure relies on the correlation between a firm's stock return and the return of its corresponding industry and of the market. As explained and demonstrated by Durnev, Morck and Yeung (2004), in the absence of firm-specific information, a firm's stock return varies only because of exogenous s in industry and markets returns. In contrast, the presence of firm-specific information magnifies stock price, rendering the returns less correlated with market and industry returns. Hence, stock prices informativeness increases when the return on a stock becomes less correlated with the market and industry returns. A large amount of evidence supports the informational content captured by this measure, and particularly, the amount of

[9] As noted in Chen, Goldstein and Jiang (2007), information that managers already had will move the price but not affect the savings decisions (as it already affected past savings) and thus will decrease the sensitivity of savings to price.

[10] The definition of all the variables is outlined in the Appendix A.

private information about firms.[11] To compute this measure, I follow Durnev, Morck and Yeung (2004) and define firm-specific return variation for each year as $\psi_{i,t} = \ln((1 - R_{i,t}^2) / R_{i,t}^2)$, where $R_{i,t}^2$ represents the R^2 from the regression of firm 's weekly returns on the value-weighted market and value weighted industry indices in year *t*. The market index and industry indices are value weighted and exclude the firm in question. This exclusion prevents spurious correlation between firm and industry returns in industries that contain few firms**.** Similarly to Durnev, Morck and Yeung (2004), I define industry at the three-digit SIC-code level. Note that I use weekly returns because CRSP daily returns data reports zero return when a stock is not traded in a given day.[12] The presence of zero (non-traded) returns could artificially decrease the explanatory power in the return regressions and therefore inflate mechanically the proxy for private information in prices. Although small stocks may not trade for a day or more, they generally trade at least once every few weeks. Weekly returns are thus less likely to suffer from "thin trading" problems.

To reliably estimate the combined effect of price and private information on corporate savings, I include control variables designed to capture a number of factors affecting savings decisions that may also correlate directly with stock price and its informativeness. First, I include $\psi_{i,t-1}$ separately to capture the possible effect of private information on corporate savings. I also include the natural logarithm of assets (*Size*) to neutralize the impact of size on the genuine need to save funds, as well as the potential effect of economies of scale in cash management. To accommodate the documented precautionary allocation of cash inflows into cash savings, I include cash flow (*CF*) as a control variable; see Almeida, Campello and Weisbach (2004) and Riddick and Whited (2008). Also, since a firm's decision to change its cash position depends likely on its available stock of cash, I include the beginning of period cash holdings (*Cash*). I account for time-invariant firm heterogeneity and a time trend by including firm fixed effects as well as time dummies (α_i and η_t). Finally, I allow the error term

[11] See for instance Wurgler (2000), Durnev, Morck, Yeung and Zarowin (2003), Jin and Myers (2006). Chen, Goldstein and Jiang (2007) provide a detailed survey of the literature supporting the idea that high firm-specific return variation is a valid proxy for firm-specific information.

[12] My sample contains 4.5% of daily observations that are not traded (reporting zero return and zero volume).

in (1) to be serially correlated for the same firm. Hence, in all estimations, the standard errors are adjusted for heteroskedasticity and within firm-period clustering as defined in Petersen (2008). In estimating equation (1), my primary interest is on β_2. Indeed, this coefficient measures how the association between saving and price is affected by the amount of private information contained in prices. If corporate savings decisions are guided by private information embedded in the stock price, one expects this coefficient to be significantly positive.

In an augmented version of (1), I further isolate the effect of stock prices on savings by including a number of sources and competing uses of funds. Indeed, because savings decisions are likely to be determined jointly with other financial choices, the estimates may be biased by the presence of omitted important variables. To address this concern, I follow Almeida, Campello and Weisbach (2004) and control for discretionary spending by including capital expenditure (*Capex*) and acquisitions (*Acquisitions*) because firms can draw down their cash reserves in order to pay for valuable growth opportunities. I add change in net working capital (ΔNWC) since working capital can be a substitute for cash (Opler, Pinkowitz, Stulz and Williamson (1999)) or it may compete for the available pool of resources. I include changes in short-term debt ($\Delta ShortDebt$) due to the substitutability between cash and debt, and because firms can use short-term debt financing to build up cash reserves. When I add these variables, I explicitly recognize the endogeneity of financing and spending decisions and use instrumental variables estimations. As recognized by Almeida, Campello and Weisbach (2004), finding appropriate instruments is not an obvious task. My approach strictly follows their and includes two lags of the level of fixed capital (property, plant and equipment over assets), lagged acquisitions, lagged net working capital, lagged short-term debt as well as industry dummies (two-digit SIC codes).

3.2. Sample and summary statistics

I obtain cash holdings and financial data from the annual Compustat industrial files. This data constitutes an unbalanced panel that covers the period 1970-2006. I exclude firm-year observations

with missing data. Next, I delete observations for which total assets, cash holdings, or sales are negative. I omit all firms in the financial (SIC code 6000-6999) and utility industries (SIC code 4900-4999). Stock price and return information are from CRSP. After merging the CRSP with the Compustat data and after deleting the top and bottom 1% of my regression variables, the sample comprises 88'501 firm-years observations with 11'937 firms. In robustness tests, I use additional data on analysts' coverage and insiders' transactions. Data on analysts' earnings forecasts are from I/B/E/S summary files and data on insiders' trading is from Trade and Quote (TAQ) database.[13] Appendix A defines the variables used in this study and describes their source.

Table 1 presents descriptive statistics. Noticeably, the average savings is 0.012 indicating that firms' saving rate is slightly more than 1% of total asset over the sample period. In dollar terms, this represents slightly more than $10 million per year. To put this number in perspective, I note that the average cash flow represents 5.4% of firm's assets. Hence, broadly speaking, firms save an amount that is equal to one fifth of their annual operating revenues. Noteworthy, the mean of ψ is 1.92, corresponding to an average firm return-specific variation of 79% (1-R^2 in yearly firm-level return regressions). This number is in line with that displayed in Roll (1988), who first argued that a considerable part of stock price is driven by firm-specific information.

[Insert Table 1 about here]

The average firm in my sample has a size (total assets) of $835 million and cash-to-asset ratio of 11%. Its investment rate (capital expenditure over assets) is 6.8 % and its acquisition rate is (acquisitions over assets) is 1.4%. The mean net working capital represents 12.8% of firm's assets while the mean short-term debt accounts for 6%. Overall, these numbers are comparable to those found in closely related studies, such as Almeida, Campello and Weisbach (2004), Riddick and Whited (2008) and Chen, Goldstein and Jiang (2007).

[13] We thank Wei Jiang for providing us with the insider trading data.

4. Main results

4.1. The effect of price informativeness on the savings-to-price sensitivity

Before formally testing the hypothesis that I delineate in section 2, I start by documenting that corporate savings are sensitive to stock price . Specifically, column 1 of table 2 presents the results of a univariate regression of corporate savings on the stock price (*Q*). Notably, I observe a positive and significant association between *Savings* and *Q*, with a coefficient for *Q* estimated at 0.013, significant at less than the 1% level. The magnitude of this estimate is in line with Almeida, Campello and Weisbach (2004) and Riddick and Whited (2008) and confirms that savings are positively correlated with prices.[14] Firms appear to save more when they have higher valuation. This finding confirms the idea that, on average, firms allocate more resources to their cash savings when the market, i.e the marginal investor, foresees more valuable future prospects.

[Insert Table 2 about here]

Column 2 displays the central finding of this paper. Indeed, I observe that the coefficient for $\psi \times Q$ is positive and statistically significant (0.002 with a t-stat of 4.48). Accordingly, corporate savings are more sensitive to stock price when prices contain a larger amount of private information. In other words, managers save more following a positive signal given by the market price when the signal contains a larger amount of private investors' information. To wit, this result corroborates the view that managers learn some information from their stock price and subsequently adjust their saving choices. This effect is also economically significant since the saving-to-price sensitivity increases by 60% when one moves from the 25th to the 75th percentile value of price informativeness (ψ).

[14] Almeida, Campello and Weisbach (2004) do not report an estimate of the sensitivity of savings to price for their whole sample. Splitting their sample by the severity of financing constraints, they report estimates ranging between 0.0001 and 0.0029. Similarly, Riddick and Whited (2008) presents estimates between 0.006 and 0.045.

Controlling for other firm characteristics does not alter my central result. In column 3, I present estimates for a specification that includes the control variables described in equation (1). Importantly, the positive coefficient for $\psi \times Q$ remains highly significant (0.002 with a t-stat of 4.14). Note that the other estimates have the expected signs. In particular and consistent with Almeida, Campello and Weisbach (2004), cash flow contributes significantly to explain cash savings. In essence, this result confirms that the average firm has a positive propensity to save cash out of cash inflows. Also, *Size* displays a positive sign, indicating that larger firms tend to save more (or use less) cash.[15] As expected, a firm's stock of cash is negatively related to cash accumulation. A similar result is shown in Campello and Graham (2007). Finally, I observe that the coefficient on $\psi_{i,t-1}$ is not significant, thereby suggesting that price informativeness has no direct effect on corporate savings.

Column 4 reports the results I obtain by estimating the augmented specification using instrumental variables. Although slightly smaller, the coefficient for $\psi \times Q$ continues to be significantly positive. The decrease in estimated sensitivity is expected given that this specification controls for additional sources and use of funds. Again, most of the coefficients for the other regressors attract the expected signs.

Taken together, this first set of results supports the view that managers use part of the private information embedded in stock prices, as measured by firm-specific return variation, when they decide upon corporate savings.

4.2. Sensitivity Analysis

To give additional support for my findings, I extend the analysis in two dimensions. First, I use alternative definitions and measures of private information in prices. Second, I address the possibility that my inference is misstated by changing the model specification and the estimation procedure. I start by performing robustness checks with respect to the computation of firm-specific return variation (ψ).

[15] Maybe small firms actively use the cash to grow while large mature firms accumulate cash (due to lack of valuable investment opportunities).

First, I use three complementary methods to compute firm-specific return variation using daily returns data instead of weekly data. Despite the advocated potential problem of "thin trading", column 1 of Table 3 reports the results of using daily returns to compute ψ. In column 2, I account for infrequent trading of daily frequency returns by cumulating the returns in days where no trading took place. This strategy mitigates the potential bias created by the zeros in returns series. In column 3, I add (one day) lagged market and industry returns to the regression estimating R^2 to control for some market and industry information that might find their way into prices with some delay. Although the magnitude of the estimates changes slightly across the three first columns of table 3, the effect of price informativeness on the sensitivity of savings to price is still positive and highly significant. Then, in column 4, I estimate firm-specific return variation by regressing weekly stock returns on the three factors from Fama and French.[16] Indeed, we might argue that those factors are part of the systematic variation in individual returns. Notably, the results remain unchanged.

Next, I replace firm-specific return variation by two alternative variables capturing price informativeness. In particular, I use the probability of information-based trading (*PIN*) developed by Easley, Kiefer and O'Hara (1996).[17] This measure is based on the estimation of a structural microstructure model, where trades may come from "noise traders" or "informed traders". Previous empirical work generally supports the use of *PIN* as a valid measure of price informativeness.[18] Despite a sharp reduction in the sample size (due to the use of intraday data from TAQ to compute *PIN*), column 5 shows the results for the regression using *PIN* instead of ψ, I find that the estimated coefficient on $PIN \times Q$ is significantly positive (at 5.3% level).

[16] The daily Fama and French returns for small-minus-big (SMB) and high-minus-low (HML) factors are obtained from French's website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

[17] The data on PIN are available on Soeren Hvidkjaer's webpage for the period 1983-2001 (NYSE and AMEX).

[18] Vega (2006) reports that stock with high *PIN* have smaller reactions following an earnings announcement, which is in line with the idea that these stocks incorporate more private information. Chen, Goldstein and Jiang (2007) and Bakke and Whited (2008) document a positive association between PIN and the sensitivity of investment to stock prices, consistent with the idea that managers learn from the private information embedded into stock prices. Ferreira and Laux (2007) and Ferreira, Ferreira and Raposo (2008) report a positive relation between governance quality and PIN. However, Duarte and Young (2007) recently questions some interpretation of *PIN* as a measure of information.

[Insert Table 3 about here]

Alternatively, I replace firm-specific return variation by the illiquidity ratio (*ILLIQ*) of Amihud (2002). This measure is computed as the annual average of the daily ratio between a stock's absolute return and its dollar volume (multiplied by 10^6). *ILLIQ* measures the absolute percentage price change per dollar of daily trading volume and is a proxy for the price impact of trades. As in Kyle (1985) and Ferreira, Ferreira and Raposo (2008), I conjecture that the magnitude of the price impact should be a positive function of the perceived amount of informed trading on a stock, and thus a proxy for the amount of private information embodied into prices.[19] Column 6 presents the estimates. $ILLIQ \times Q$ is positive and insignificant at any reasonable level of confidence!. This supports the hypothesis that the savings-to-price sensitivity increases when there is more private information-based trading.

To further verify the validity of the inference, I reassess my base specification (1) following alternative estimation procedures. An important concern is that my results are driven by extreme observations in the information proxy. To reduce the potential impact of outliers, I first re-estimate specification (1) without firm-years observations for which ψ is above the 90th percentile and below the 10th percentile. Column 7 shows that this winsorizing does not alter my main findings. In column 8, I perform a similar test but trimming firm-years observations with ψ above (below) the 75th (25th) percentile and continue to observe a positive effect of price informativeness on the savings-to-price sensitivity.

Another possible issue is the presence of time and cross-sectional dependence in the sample. Despite the use of time and firm fixed effects and firm-clustered standard errors, it might be that my results stem from the misspecification of dependencies. To validate the inference, I use the Fama and MacBeth (1973) methodology. Specifically, I estimate specification (1) separately for each year and

[19] Note however that this measure will also reflect the inventory costs associated with trading a given order size. Thus, it is a "noisy" measure for the private information content of prices.

report the average of yearly estimated coefficients. Column 9 displays the Fama-MacBeth results. The estimates are qualitatively similar to those reported in Table 2. The coefficient for $\psi \times Q$ is 0.001 with a t-statistic of 2.84. The coefficients of the other firm characteristics are also consistent with the previous OLS regression estimates.

Overall, the conclusion remains robust to different definitions of price informativeness and different estimation techniques. Corporate savings are more responsive to stock price when market prices contain a larger fraction of private information.

4.3. Market mispricing

In this section, I examine the potential effect of mispricing on my findings. As argued by Baker and Wurgler (2002) and Baker, Stein and Wurgler (2003), overvalued firms may take advantage of irrationally low discount rates to issue securities at a cheaper price.[20] In this spirit, some recent papers provide evidence in favor of a "market mispricing" explanation for cash accumulation. In particular, Campello and Graham (2007) document that during the technology bubble (1995-1999), financially constrained non-technology firms issued equity in response to unjustified high stock prices, and subsequently saved a significant part of those funds. In an international context, Kim and Weisbach (2007) report that highly valued firms that issue equity via SEO tend to save a high fraction of the cash they raise.[21] On this ground, there is a possibility that the documented sensitivity of savings to prices reflects the fact managers act on mispricing by issuing overvalued stocks and channeling the proceeds into their cash savings, and not by optimally responding to changes in future prospects.

I address this possibility in different ways. First, I look at how issuance patterns affect the estimated saving-to-price sensitivity. Indeed, if stock prices influence corporate savings only through the hoarding of issuance proceeds, the positive saving-to-price sensitivity should vanish when I control

[20] Bakke and Whited (2008) provide a comprehensive survey of this literature.
[21] In contrast, D'Angelo, D'Angelo and Stulz (2007) show that a large part of equity issuance cannot be explained by the timing of overvalued stock prices.

for issuance activity. To test this claim, I define *Issuance* as the yearly change in equity[22] and introduce this additional variable into specification (1). Column 1 of table 4 displays the results. As expected, we observe that the coefficient on *Issuance* is significantly positive. Hence, firms that issue equities set aside part of the proceeds into their cash balances. Also, I note that the effect of prices on savings is reduced slightly when I control for issuance activity. These results corroborates Kim and Weisbach (2007) and Campello and Graham (2007) and indicate that part of the effect of prices on corporate savings materializes through "market timing". However, the estimated coefficient for $\psi \times Q$ remains largely significant, thereby supporting that the positive effect of private information in prices on the savings-to-price sensitivity is not an artifact of managers timing the market.

Alternatively, I use future abnormal returns ($EXRET_{t+3}$) to proxy directly for market mispricing. This approach follows Baker and Wurgler (2002) and Baker, Stein and Wurgler (2003) who use returns subsequent to the measurement of Q as a measure of mispricing. They argue that as mispricing is a transient phenomenon, firms with overvalued stocks ought to experience negative returns as the mispricing gets corrected. Hence, observing negative returns following the measurement of Q is suggestive that the stock was mispriced. I compute $EXRET_{t+3}$ as the value-weighted market adjusted three-year cumulative return, starting from the end of the saving year.[23] Consistent with a market mispricing argument, column 2 reveals that the estimate for $EXRET_{t+3}$ is negative and significant, indicating that firms save more intensively when their stock is *a priori* overvalued. Yet, the effect of price informativeness is not altered by the inclusion of future excess returns.

[Insert Table 4 about here]

[22] More precisely, Issuance is computed as yearly change in equity plus the change in deferred taxes minus change in retained earnings divided by the beginning-of-year equity stock.
[23] As in Chen, Goldstein and Jiang (2007), for observations in the last two years of my sample period, two-year or one-year future returns are used.

Finally, I control for firms' age. As documented in Bates, Kahle and Stulz (2008), firms that have recently gone public tend to accumulate more cash. This intensified saving behavior may originate in the hoarding of the IPO proceeds and/or because IPO firms often issue equity within a few years following their IPO. Alternatively, it could also be argued that young firms are genuinely more exposed to pricing errors because their valuation is more complex. For those reasons, in columns 4, 5 and 6, I report estimates of specification (1) when I eliminate firms that had their IPO within one, two and three years respectively. Although the effect of information in prices on the saving-to-price sensitivity decreases a little, it is still positive and largely significant.

4.4. Financing constraints

In this section, I investigate whether the effect of price informativeness on the saving-to-price sensitivity is affected by a firm's financing conditions. In so doing, I address two related questions. First, are corporate savings more sensitive to change in prices when firms anticipate constraints in accessing external capital? Second, is there a difference in the effect of price informativeness on the estimated saving-to-price sensitivity between financially constrained and unconstrained firms?

To answer these questions, I partition the sample to obtain cross-sectional contrasts related to firms' access to external financing. Specifically, I split the sample according to five widely used measures of financing constraints. This strategy mirrors that of Almeida, Campello and Weisbach (2004) and Campello and Graham (2007). In particular, I use firm's size, the Kaplan and Zingales (1997) Index (KZ), the Whited and Wu (2006) index (WW), the payout ratio, and the existence of a bond rating to proxy for financing constraints.[24] I assign a firm in the "constrained" group if the book value of its assets lies below the 33rd percentile and in the "unconstrained" group otherwise. Concerning the KZ and WW indices as well as the payout ratio, I classify a firm in the constrained (unconstrained) group if it lies in the highest (lowest) tercile of each variable. Finally, I categorize a firm as constrained if it never had its public debt rated during the sample period. I then estimate specification (1)

[24] These variables are defined in the appendix.

independently for each partition of constrained and unconstrained firms and present the results in table 5.

[Insert Table 5 about here]

First, notice that the coefficients for Q are positive and significant across all specifications. These estimates confirm that stock price is a strong driver of corporate savings behavior for both financially constrained and unconstrained firms. All firms tend to accumulate more cash savings when their price reflects more valuable future prospects. These results mirrors those in Riddick and Whited (2008) and Dasgupta, Noe and Wang (2008) who find as well that both constrained and unconstrained firms have positive and significant saving-to-price sensitivities. Notably, in the financially constrained groups, savings are on average two times more sensitive to stock price than in the financially unconstrained groups. These systematic differences suggest that firms that anticipate difficulties in accessing capital in the future tend to increase their saving rate more intensively when their stock price points to more valuable future growth options.

Strikingly, for each of the five classification schemes, we observe that the coefficients estimates for $\psi \times Q$ are positive and significant for both constrained and unconstrained firms, with estimates ranging from 0.001 in the payout ratio partition to 0.004 in the bond rating partition. This clear pattern reveals that the amount of private information embedded in prices turns out to be an important element of savings' decisions irrespective of firms' capital access. Interestingly, even managers of unconstrained firms seem to be sensitive to the informational content of their stock prices when deciding to allocate resources into cash savings. As such, these results substantiate the recent findings of Dasgupta, Noe and Wang (2008) who documents that *all* firms optimally stage their response to positive shocks by delaying investment and building up cash savings. The results of table 5 suggest that such an inter-temporal trade-off is magnified when stock prices are more informative about future prospects.

Table 5 also reveals that the effect of private information in prices on savings-to-price sensitivity is on average two times larger for firms that are less financially constrained. As pointed out by Chen, Goldstein and Jiang (2007), this result may translate the fact that firms can respond to market price signals more easily when they are less dependant on external funding.

In summary, the results in this section reveal that both private information in prices and financing constraints play a role in generating the positive sensitivity of savings to price. Importantly, my conclusion that managers learn from stock prices when they allocate funds into cash savings is not an artifact of unspecified financing constraints.

4.5. Other sources of information

So far, the results are consistent with the intuition that managers integrate some private information in prices into their savings' decisions. However, the documented association between private information in prices and the savings-to-price sensitivity would only be reflective of managerial learning to the extent that the private information in prices is new to managers. In this section, I reinforce this interpretation by assessing the effect of other competing sources of information on the results. To do so, I follow Chen, Goldstein and Jiang (2007) and consider one measure of public information and two measures of managerial private information. Then, I test whether the results are robust to the insertion of additional information in the baseline specification (1) and assess their effect on the estimated saving-to-price sensitivity.

To gauge the quantity of public information, I rely on the number of analysts covering a firm. I define *Coverage* as the number of analysts that have issued an earnings forecast for the firm during the previous year. To the extent that analysts transfer information from managers to investors, the content of the information analysts release is unlikely to be new to managers.[25] Hence, one would expect less

[25] See for instance Agrawal, Chadha and Chen (2006) for evidence that a considerable fraction of information produced by analysts is obtained from managers.

managerial learning, and consequently a lower savings-to-price sensitivity, when many analysts generate information about a firm's prospects.

[Insert Table 6 about here]

To assess the effect of the information produced by analysts, I add *Coverage* and its interaction with *Q* in the baseline specification (1). Column 1 of table 6 presents the results. Importantly, we note first that the inclusion of *Coverage* has no bearing on the estimated effect of price informativeness on the savings-to-price sensitivity. As a matter of fact, we continue to observe a positive and significant relation between the saving-to-price sensitivity and price informativeness. Next, I remark that analyst coverage has a negative and significant effect on the savings-to-price sensitivity. Similarly to Chen, Goldstein and Jiang (2007), this result is consistent with managers already knowing the information released by analysts.[26] We note also a negative and significant effect of analyst coverage on corporate savings, suggesting that largely covered firms have a lower tendency to save cash.

Next, I use insiders' trading activities to capture the amount of private information that managers possess. I define *Insiders* as the total number of inside stock transactions for a given year divided by that year's total transactions. The intuition behind this measure lies in the fact that managers are more likely to trade if they possess more private information. I use equivalently buys and sells to compute this measure.[27] Because the computation of *Insiders* requires data from Trades and Quotes (TAQ) database, the sample is limited to the period 1993-2001. Alternatively, I consider earnings' surprise (*ERC*) as a second proxy for managerial private information. This variable is defined as the average of the absolute market-adjusted stock returns over the four

[26] As pointed out by Chen, Goldstein and Jiang (2007), another possible effect that might explain the negative effect of analyst coverage on the savings-to-price sensitivity is offered in Easley, O'Hara and Paperman (1998). These authors argue that the presence of analysts may attract more noise trading to the stock. This reduces the content of private information in the stock price and thus further decreases the sensitivity of savings to price. In this spirit, we find a positive negative correlation between analyst coverage and stock price informativeness (ψ) is -0.26.

[27] We thank Wei Jiang for providing us with the insider trading data.

quarterly earnings announcements periods (day-1 to day 1). I conjecture that a positive absolute earnings' surprise reveals that some information in earnings was not fully anticipated by the market and hence not impounded entirely into prices. Because managers know allegedly the accounting numbers before they are released to investors, *ERC* appears to be a reasonable measure of managerial private information.

Columns 2 and 3 of table 6 present the results when I include these two measures as well as their interaction with Q in specification (1). The first thing to notice is that when *Insiders* and *ERC* are included, the coefficient on $\psi \times Q$ remain virtually unchanged. This again corroborates the idea that some information embedded in stock prices is really new to managers. Noteworthy, both coefficients on the interaction between Q and *Insiders* and *ERC* display the expected negative sign. Such a negative correlation is expected since managers that own superior private information are less likely to rely on information in stock prices for their savings decisions. These coefficients, however, are not statistically significant at conventional levels.

All in all, the results in this section lend additional support for my interpretation. Indeed, the results are not affected by the inclusion of measures of alternative sources of information. As such, they confirm that corporate savings are more sensitive to stock price when prices vehicle more private information new to managers.

4.6. Price informativeness, savings and future operating performance

Looking at the results I present so far, a natural question arises: Does the private information contained in prices really help managers to make *better* savings decisions? To shed some light on this question, I examine the relation between price informativeness, corporate savings and firms' future operating performance. I consider the one-year ahead return on asset (*ROA*), defined as operating income before depreciation divided by total assets as well as its industry adjusted value as measures of performance (*Excess ROA*).

Table 7 presents regressions results of future performance on firm-specific return variation (ψ). In the regressions, I control for size, the structure of the firm's assets using the ratio of property, plant and equipment to total assets (*PPE*) as well as past performance. Moreover, I include firm- and time-specific effect and adjust the estimates' standard errors for within-firm-period error clustering and heteroskedasticity. Columns 1 and 2 exhibit that future performance increases significantly in the amount of private information embedded in stock price (0.001 with a t-stat of 2.03 in the *ROA* estimation). These results largely mirrors those reported in Chen, Goldstein and Jiang (2007). All else being equal, firms with more informative stock price experience better future operating performance. Although this positive association is consistent with the view that private information in stock prices helps managers to allocate corporate resources more efficiently, the channels through which this enhancement operates remain unclear.

[Insert Table 7 about here]

I continue by analyzing whether this superior future performance originates in more efficient savings decisions. To this end, I estimate the joint impact of savings and price informativeness on future performance and display the results in columns 2 and 4. First, we remark (column 2) that corporate savings are positively related to future operating performance (a coefficient of 0.087/0.071 with a *t*-stat close to 10). Thus, on average, savings seem to enhance future operating performance. This is in line with the traditional argument that firms save for precautionary reasons. The results suggest that, else being equal, such a precautionary behavior turns out to be effective. Of most interest is the estimated coefficient on the interaction between *Savings* and ψ. In both specifications 3 and 4, I observe positive and significant estimates. For example, in column 3 the estimated coefficient on the interaction is 0.006 with a *t*-statistics of 2.42. Hence, corporate savings have a magnified effect on future performance when stock price contained a larger deal of private information. This result confirms the idea that private information in prices guide managers towards better savings decisions.

Overall, these findings are consistent with managers using part of the information contained in stock prices to efficiently allocate corporate resources into cash savings. From a different perspective, they also provide some validation in favor of ψ as a measure of price informativeness. Indeed, as noted by Chen, Goldstein and Jiang (2007), if this measure captures just noise or market mispricing, I should not expect it to be related to future operating performance.

5. Conclusions

This paper looks at the interplay between a firm's stock price and its decision to save cash. Remarkably, the analysis provides strong evidence that stock price, and more importantly the private information it contains plays a key role in explaining a firm's saving choices. Specifically, I start by documenting that corporate savings are highly sensitive to stock prices. This positive association suggests that firms tend to transfer more resources into their cash account when the market foresees valuable future prospects and concomitantly raise firms' valuation. Strikingly, the analysis reveals that such a precautionary mechanism turns out to be amplified when the market price encloses a larger content of private investors' information. Notably, extensive robustness checks indicate the significant effect of price informativeness on savings is not due to market mispricing or financing constraints. Moreover, the informational effect of prices remains markedly strong even when one controls for public and managerial private information.

In a nutshell, the analysis highlights that private information in prices matter for savings policy. As such, this paper provides at least two important insights. First, it confirms that corporate savings are driven by the nature and precision of managers' anticipations about their firm's future investment prospects and financing costs. Importantly, the findings stress that managers infer information from observing market expectations and incorporate part of it into their savings choices. Second, by documenting a link between the informational content of prices and saving policy, the paper points to an additional of corporate decisions that is affected by stock prices. In

that respect, the results corroborates the intuition that prices contain a variety of new information that can guide managers in their financial and operating decisions.

The findings in this paper ultimately raise more questions than they answer. In particular, what is the exact origin of the saved cash? Why a priori financially unconstrained firms tend to save cash? What is the inter-temporal link between savings and investment? Do firms save incrementally over many periods to finance large investment projects? I leave these issues for further research.

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Appendix : Definition of the main variables used in the analysis

Cash	Cash and short-term investment (Compustat item 1) scaled by *Total Assets*
Total Assets	Total assets (item 6) (in million USD)
Savings	Cash and short-term investment (item 1) minus one-year lagged Cash and short-term investment divided by one-year lagged *Total Assets*
Q	Market value of equity (item 24 multiplied by item 25) plus book value of assets minus book value of equity minus deferred taxes (item 6 – item 60 – item 74), scaled by *Total Assets*
ψ_t	Firm specific return variation computed as $\psi_{i,t} = \ln((1-R^2_{i,t})/R^2_{i,t})$, where $R^2_{i,t}$ represents the R^2 from the regression of firm *i* weekly returns on value-weighted market and value weighted industry indices in year *t*.
Size	Logarithm of *Total Assets* (item 6)
CF	Sum of net income before extraordinary items (item 18) and depreciation and amortization (item 14) scaled by *Total Assets*
Capex	Capital expenditures computed as capital expenditures (item 30) minus sales of property, plant, and equipment (item 107) divided by *Total Assets*
Acquisitions	Amount spent in acquisitions (cash) (item 129) scaled by *Total Assets*
NWC	Net working capital computed as current non-cash assets (item 4 minus item 1) minus current liability (item 5) divided by *Total Assets*
ΔNWC	Change in net working capital computed as NWC_t- NWC_{t-1}
ShortDebt	Short-term debt computed as short-term debt (item 34) divided by *Total Assets*
ΔShortDebt	Change in short-term debt computed as $ShortDebt_t$- $ShortDebt_{t-1}$
Capital stock	Gross property, plant, and equipment (item 7)
PIN	Probability of informed-based trading measure from Easley, Kiefer and O'Hara (available at http://www.smith.umd.edu/faculty/hvidkjaer/data.htm
ILLIQ	Average daily ratio of a stock's absolute return by the dollar volume (Amihud (2002)) $Illiq_{i,t} = \frac{1}{T}\sum_{\tau=t-T}^{t-1}\sqrt{\frac{\lvert Ret_{i,\tau}\rvert}{Vol_{i,\tau}}}$
Issuance	Yearly change in equity (item 60) plus the change in deferred taxes (item 74) minus change in retained earnings (item 36) divided by the beginning-of-year equity stock (item 60)

$EXRET_{t+3}$	Value-weighted market adjusted returns cumulated over three years
Payout	Sum of preferred (item 19) and common (item 21) dividends scaled by *Total Assets*
KZ index	Kaplan and Zingales (1997) index is computed as follows (excluding *Cash*): *KZ*=-1.002**CF*-39.362**Payout* + 3.138**Leverage* , where *Leverage* is long-term debt (item 9) scaled by *Total Assets*
WW index	Whited and Wu (2006) index is computed as follows: *WW*=-0.91**CF*-0.062**Dividend*+0.021**Leverage*-0.044**Size*-0.035**Sales Growth*, where *Dividend* is a dummy that equals one if *Payout*is positive and zero otherwise and *Sales Growth* is the yearly change in sales (item 12)
Bond Rating	A dummy variable that equals one if the firm has a public bond rated (item spdrc is non-zero and non-missing) and zero otherwise
Coverage	The number of analysts that have issued earnings forecast during a year. Earnings forecasts data are from the I/B/E/S summary files
Insiders	Number of transaction by insiders scaled by the total number of transactions during a year. Transactions data are from the Trades and Quotes (TAQ) database
ERC	Average of the absolute market-adjusted stock returns over the four quarterly earnings announcements periods (day-1 to day 1)
ROA	Ratio of operating income before depreciation and amortization expenses (item 13) to *Total Assets*

Table 1. Descriptive statistics

This table reports the mean, median, standard deviation, number of observations as well as the 10^{th}, 25^{th}, 75^{th} and 90^{th} percentiles for the main variables used in the analysis. The variables are defined in the Appendix. The sample covers the period 1970 to 2006 and exclude firms from the financial (SIC 6000-6999) and the utility (4900-4999) industries.

Variables	Mean	Median	St.Dev	#Obs	10^{th}	25^{th}	75^{th}	90^{th}
Q	1.515	1.176	1.066	87145	0.779	0.924	1.684	2.58
Savings	0.012	0.001	0.113	88501	-0.075	-0.02	0.03	0.097
ψ	1.922	1.902	1.825	87612	0.082	0.886	2.982	4.092
R^2	0.212	0.131	0.227	88002	0.016	0.048	0.297	0.535
Assets	835.483	99.47	2445.221	88501	10.374	27.912	438.683	1927.249
Cash	0.114	0.059	0.142	87947	0.009	0.023	0.148	0.297
Cash Flow	0.054	0.083	0.142	88501	-0.07	0.038	0.122	0.161
Capex	0.068	0.05	0.065	88501	0.011	0.025	0.09	0.15
Acquisitions	0.015	0	0.041	88501	0	0	0.002	0.045
ΔNWC	0.063	0.048	1.607	88501	-0.866	-0.244	0.335	0.975
$\Delta ShortDebt$	0.781	-0.045	3.867	88501	-0.841	-0.433	0.447	2.007

Table 2. Price informativeness and the saving-to-price sensitivity: Baseline results

This table presents coefficient estimates of corporate savings on stock price and the amount of private information contained in price (specification (1)). The dependent variable is *Savings*, the annual change in cash holdings divided by lagged assets. Q is the normalized price, computed as the market value divided by the book value of assets. ψ is a proxy for the amount of private information in price and refers to firm-specific stock price . The set of control variables include *Cash flow*, *Size* and lagged *Cash*. In addition, in column (4), we also include *Capex*, *Acquisitions*, ΔNWC and $\Delta Shortdebt$ as additional control variables. All the variables are defined in the Appendix. The sample period is 1973 through 2006. IV estimations display diagnostic statistics for instrument overindentification restrictions (p-values for *J*-statistics reported). The estimations correct the error structure for heteroskedasticity and within-firm error clustering. *t*-statistics in brackets. ** and * denote statistical significance at the 1% and 5% level, respectively.

Variables	(1) OLS	(2) OLS	(3) OLS	(4) IV
Q_{t-1}	0.013**	0.010**	0.016**	0.017**
	[13.72]	[9.65]	[14.32]	[6.39]
$Q_{t-1} \times \psi_{t-1}$		0.002**	0.002**	0.001*
		[4.49]	[4.14]	[2.17]
ψ_{t-1}		0.000	0.000	-0.002
		[0.05]	[0.44]	[1.00]
$Cash\ Flow_t$			0.176**	0.206**
			[27.51]	[11.29]
$Size_t$			0.002	-0.020**
			[1.60]	[3.16]
$Cash_{t-1}$			-0.442**	-0.526**
			[51.58]	[17.34]
$Capex_t$				-0.809**
				[2.77]
$Acquisitions_t$				-0.697**
				[3.97]
ΔNWC_t				0.009
				[0.54]
$\Delta ShortDebt_t$				-0.003*
				[2.57]
Firm fixed effects	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes
#Obs.	88376	88376	88376	73213
R^2	0.23	0.24	0.34	0.22

Table 3. Price informativeness and the saving-to-price sensitivity: Sensitivity analysis

This table presents coefficient estimates of corporate savings on stock price and the amount of private information contained in price (specification (1)). The dependent variable is *Savings*, the annual change in cash holdings divided by lagged assets. Q is the normalized price, computed as the market value divided by the book value of assets. ψ is a proxy for the amount of private information in price and refers to firm-specific stock price . The set of control variables include *Cash flow*, *Size* and lagged *Cash*. Columns (1) to (3) use daily returns to compute ψ. In column (2) ψ is computed using daily returns that are cumulated in no-trading days. In column (3), ψ is computed by including lagged market and industry returns in the returns regressions. In column (4) ψ is computed by including the Fama and French factors in the returns regressions.

In column (5), *PIN* refers to the probability of informed trading from Easley, Kiefer and O'Hara (1996). In column (6), *ILLIQ* refers to the Amihud (2002) liquidity ratio. In column (7) and (8), firm-years observations for which ψ is above (below) 90^{th} (10^{th}) percentile, respectively above (below) 75^{th} (25^{th}) percentile are not included. In column (9) specification (1) is estimated using the Fama and MacBeth (1973) approach. All the variables are defined in the Appendix. The sample period is 1973 through 2006. The estimations correct the error structure for heteroskedasticity and within-firm error clustering. *t*-statistics in brackets. ** and * denote statistical significance at the 1% and 5% level, respectively.

Variables	(1) Daily	(2) Cumul	(3) Delay	(4) FF	(5) PIN	(6) ILLIQ	(7) 10^{th}-90^{th}	(8) 25^{th}-75^{th}	(9) FM
Q_{t-1}	0.015**	0.014**	0.012**	0.012**	0.003	0.019**	0.016**	0.014**	0.017**
	[12.29]	[13.08]	[7.52]	[6.79]	[0.81]	[19.13]	[12.15]	[8.54]	[14.04]
$Q_{t-1}\times\psi_{t-1}$	0.002**	0.002**	0.003**	0.003**			0.002**	0.003**	0.001**
	[5.82]	[5.81]	[5.65]	[5.50]			[4.50]	[4.61]	[2.84]
ψ_{t-1}	0.000	-0.000	-0.003	0.00			-0.001	-0.002	0.001*
	[0.54]	[0.94]	[1.43]	[0.09]			[0.84]	[1.92]	[2.34]
$Q_{t-1}\times PIN_{t-1}$					0.039				
					[1.94]				
PIN_{t-1}					-0.027				
					[0.97]				
$Q_{t-1}\times ILLIQ_{t-1}$						0.013			
						[1.52]			
$ILLIQ_{t-1}$						0.01			
						[0.97]			
$Cash\ Flow_t$	0.175**	0.175**	0.176**	0.175**	0.108**	0.174**	0.187**	0.201**	0.137**
	[27.36]	[27.46]	[27.34]	[27.62]	[8.35]	[27.28]	[24.85]	[20.67]	[16.65]
$Size_t$	0.003**	0.002	0.001	0.003**	0.000	0.001	0.001	0.001	0.001*
	[2.60]	[1.82]	[1.05]	[2.60]	[0.02]	[1.12]	[1.09]	[0.55]	[1.99]
$Cash_{t-1}$	-0.443**	0.443**	0.443**	0.440**	0.470**	0.444**	0.441**	0.442**	0.122**
	[51.41]	[51.40]	[51.42]	[51.37]	[22.70]	[51.71]	[45.69]	[35.09]	[14.65]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

#Obs.	88010	87878	87299	88371	17885	88376	70292	44335	88376
R^2	0.34	0.34	0.34	0.34	0.32	0.34	0.37	0.44	0.08

Table 4. Price informativeness and the saving-to-price sensitivity: The effect of market mispricings

This table presents coefficient estimates of corporate savings on stock price and the amount of private information contained in price (specification (1)). The dependent variable is *Savings*, the annual change in cash holdings divided by lagged assets. *Q* is the normalized price, computed as the market value divided by the book value of assets. ψ is a proxy for the amount of private information in price and refers to firm-specific stock price . The set of control variables include *Cash flow*, *Size* and lagged *Cash*. *Issuance* is the Yearly change in equity plus the change in deferred taxes minus change in retained earnings divided by the beginning-of-year equity stock. $ABRET_{t+3}$ is the value-weighted market adjusted returns cumulated over three years. Columns (4) to (6) exclude firms-years that had their IPO less than one, two and respectively three years ago. All the variables are defined in the Appendix. The sample period is 1973 through 2006. The estimations correct the error structure for heteroskedasticity and within-firm error clustering. *t*-statistics in brackets. ** and * denote statistical significance at the 1% and 5% level, respectively.

Variables	(1)	(2)	(3)	(4) IPO<1yr	(5) IPO<2yrs	(6) IPO<3yrs
Q_{t-1}	0.011**	0.014**	0.009**	0.016**	0.016**	0.016**
	[10.84]	[10.76]	[8.00]	[14.35]	[12.95]	[12.03]
$Q_{t-1} \times \psi_{t-1}$	0.001**	0.002**	0.001*	0.002**	0.002**	0.001**
	[2.65]	[3.82]	[2.37]	[4.16]	[3.98]	[2.91]
ψ_{t-1}	0.00	0.00	0.00	0.00	0.00	0.00
	[0.12]	[0.61]	[0.10]	[0.51]	[0.75]	[0.14]
$Cash\ Flow_t$	0.199**	0.201**	0.226**	0.176**	0.171**	0.169**
	[32.97]	[23.25]	[27.10]	[27.60]	[26.28]	[24.32]
$Size_t$	0.001	0.001	0.001	0.002	0.002*	0.003**
	[1.28]	[0.49]	[0.68]	[1.40]	[2.09]	[2.58]
$Cash_{t-1}$	-0.408**	-0.445**	-0.404**	-0.442**	-0.432**	-0.433**
	[50.57]	[43.21]	[41.88]	[51.41]	[47.58]	[46.38]
$Issuance_t$	0.078**		0.089**			
	[29.55]		[26.10]			
$EXRET_{t+3}$		-0.006**	-0.003**			
		[7.53]	[3.85]			
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
#Obs.	86275	66965	65571	88096	82777	76101
R^2	0.41	0.34	0.4	0.34	0.33	0.32

Table 5. Price informativeness and the saving-to-price sensitivity: The effect of financing constraints

This table presents coefficient estimates of corporate savings on stock price and the amount of private information contained in price (specification (1)). The dependent variable is *Savings*, the annual change in cash holdings divided by lagged assets. Q is the normalized price, computed as the market value divided by the book value of assets. ψ is a proxy for the amount of private information in price and refers to firm-specific stock price . The set of control variables include *Cash flow*, *Size* and lagged *Cash*. Firms-years are classified as financially constrained (C) and unconstrained (U). I use firm's size, the Kaplan and Zingales (1997) Index (KZ), the Whited and Wu (2006) index (WW), payout ratio, and the existence of a bond rating to proxy for financing constraints. I assign a firm in the "constrained" group if the book value of its assets lies below the 33rd percentile and in the "unconstrained" group if the book value of its asset lies above the 67th percentile. Concerning the KZ and WW indices as well as the payout ratio, I classify a firm in the constrained (unconstrained) group if it lies above (below) the 67th (33rd) percentile of each variable. Finally, I categorize a firm as constrained if it never had its public debt rated during the sample period. All the variables are defined in the Appendix. The sample period is 1973 through 2006. The estimations correct the error structure for heteroskedasticity and within-firm error clustering. *t*-statistics in brackets. ** and * denote statistical significance at the 1% and 5% level, respectively.

	Firm Size		**KZ Index**		**WW Index**		**Payout policy**		**Bond Rating**	
	C	U	C	U	C	U	C	U	C	U
Q_{t-1}	0.009**	0.008**	0.017**	0.010**	0.011**	0.007**	0.016**	0.006**	0.014**	0.005*
	[5.13]	[3.19]	[6.18]	[5.18]	[4.32]	[3.88]	[6.40]	[3.65]	[8.09]	[2.29]
$Q_{t-1}\times\psi_{t-1}$	0.002**	0.003**	0.001**	0.003**	0.002*	0.002**	0.001*	0.001*	0.002**	0.004*
	[3.44]	[4.08]	[2.71]	[4.81]	[2.66]	[3.12]	[1.97]	[2.41]	[4.13]	[2.67]
ψ_{t-1}	-0.003**	-0.002	0.000	-0.001	-0.002	-0.001	0.000	-0.001	-0.002*	-0.005*
	[2.72]	[1.57]	[0.02]	[1.09]	[1.47]	[1.16]	[0.28]	[0.66]	[2.39]	[2.43]
Cash Flow$_t$	0.186**	0.182**	0.123**	0.272**	0.195**	0.168**	0.197**	0.187**	0.177**	0.133**
	[21.61]	[12.57]	[12.16]	[22.60]	[22.31]	[10.73]	[21.72]	[11.85]	[26.79]	[6.28]
Size$_t$	0.007**	-0.004**	-0.003*	0.002	0.008**	-0.003*	0.002	-0.003	0.003*	-0.003
	[3.57]	[2.72]	[2.00]	[1.28]	[3.89]	[2.64]	[0.99]	[1.90]	[2.34]	[1.73]
Cash$_{t-1}$	-0.443**	-0.314**	-0.411**	-0.351**	-0.438**	-0.287**	-0.417**	-0.316**	-0.458**	-0.322**
	[38.13]	[23.74]	[28.17]	[32.06]	[36.53]	[20.97]	[33.39]	[25.95]	[49.85]	[14.22]
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

#Obs.	33319	37890	35359	35953	29717	33938	30913	35225	72913	15588
R^2	0.40	0.32	0.45	0.42	0.39	0.34	0.43	0.39	0.35	0.21

Table 6. Price informativeness and the saving-to-price sensitivity: Other sources of information
This table presents coefficient estimates of corporate savings on stock price and the amount of private information contained in price (specification (1)). The dependent variable is *Savings*, the annual change in cash holdings divided by lagged assets. *Q* is the normalized price, computed as the market value divided by the book value of assets. ψ is a proxy for the amount of private information in price and refers to firm-specific stock price . The set of control variables include *Cash flow*, *Size* and lagged *Cash*. Coverage is the number of analysts that have issued earnings forecast during a year. *Insiders* is the number of transaction by insiders scaled by the total number of transactions during a year. *ERC* is the average of the absolute market-adjusted stock returns over the four quarterly earnings announcements periods (day-1 to day 1). All the variables are defined in the Appendix. The sample period is 1973 through 2006. The estimations correct the error structure for heteroskedasticity and within-firm error clustering. *t*-statistics in brackets. ** and * denote statistical significance at the 1% and 5% level, respectively.

	(1)	(2)	(3)
Q_{t-1}	0.018**	0.016**	0.016**
	[13.85]	[5.48]	[7.32]
$Q_{t-1} \times \psi_{t-1}$	0.001**	0.002**	0.002**
	[3.21]	[2.88]	[3.20]
ψ_{t-1}	0.000	0.000	0.000
	[0.07]	[0.14]	[0.11]
$Cash\ Flow_t$	0.175**	0.210**	0.194**
	[27.41]	[8.90]	[20.86]
$Size_t$	0.006**	0.022**	0.005*
	[5.21]	[3.90]	[2.42]
	-	-	-
$Cash_{t-1}$	0.443**	0.677**	0.464**
	[51.82]	[25.80]	[38.48]
	-		
$Q_{t-1} \times Coverage_{t-1}$	0.000**		
	[4.09]		
	-		
$Coverage_{t-1}$	0.001**		
	[5.99]		
$Q_{t-1} \times Insiders_{t-1}$		-0.001	
		[1.40]	
$Insiders_{t-1}$		0.000	
		[1.34]	
$Q_{t-1} \times ERC_{t-1}$			-0.015
			[1.35]
ERC_{t-1}			0.172**
			[2.72]
Firm fixed effects	Yes	Yes	Yes
Time effect	Yes	Yes	Yes
#Obs.	88376	13879	41514
R^2	0.35	0.51	0.38

Table 7. The impact of savings and price informativeness on future operating performance
This table presents results of regressions examining the effect savings and price informativeness on future operating performance. In columns (1) and (2), the dependent variable is return on assets (*ROA*). In columns (3) and (4), the dependent variable is the industry-adjusted return on assets (*Excess ROA*). The dependent variable is *Savings*, the annual change in cash holdings divided by lagged assets. *Q* is the normalized price, computed as the market value divided by the book value of assets. ψ is a proxy for the amount of private information in price and refers to firm-specific stock price . The set of control variables include *Size, PPE* and lagged *ROA* (respectively *Excess ROA*). All the variables are defined in the Appendix. The sample period is 1973 through 2006. The estimations correct the error structure for heteroskedasticity and within-firm error clustering. *t*-statistics in brackets. ** and * denote statistical significance at the 1% and 5% level, respectively.

	(1)	(2)	(3)	(4)
Variables	ROA_t	ROA_t	Excess ROA	Excess ROA
ψ_{t-1}	0.001*	0.000	0.001*	0.000
	[2.03]	[1.27]	[1.97]	[0.24]
$Savings_{t-1}$		0.087**		0.071**
		[10.95]		[9.25]
$\psi_{t-1} \times Savings_{t-1}$		0.006*		0.006**
		[2.42]		[2.59]
$Size_t$	0.014**	0.013**	0.014**	0.013**
	[13.36]	[12.61]	[13.96]	[13.28]
PPE_t	-0.108**	-0.083**	-0.093**	-0.071**
	[15.86]	[12.31]	[14.52]	[11.20]
ROA_{t-1}	0.169**	0.171**	0.156**	0.158**
	[19.53]	[19.99]	[18.93]	[19.36]
Firm fixed effects	Yes	Yes	Yes	Yes
Time effect	Yes	Yes	Yes	Yes
#Obs.	86175	86175	86175	86175
R2	0.49	0.5	0.41	0.42