

Operating Risk, Information Risk, and Cost of Capital

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First Draft: January 2005
This Version: September 2006

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This paper re-examines prior empirical evidence documenting a positive association between residual accruals volatility (a proxy for information risk) and a firm's cost of capital. We show that previous empirical findings are not robust and are likely driven by operating risk rather than information risk. Our empirical results show that, after controlling for cash flow volatility and stock return volatility, residual accruals volatility is not associated with a firm's equity beta, earnings-to-price ratio, or its cost of debt. In addition, we show that over 96% of the variation in the residual accruals volatility "asset-pricing factor" is explained by volatility factors based on firms' cash flows and stock returns. These findings suggest that residual accruals volatility is not related to cost of capital in the ways previously described in the literature.

* We wish to thank Christian Leuz, George Papadakis, and seminar participants at the 2005 European Accounting Congress for helpful discussions and comments. This paper was previously circulated under the title "Cost of Capital and Accounting Leverage".

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1. Introduction

Prior research suggests that residual accruals volatility is a measure of a firm's accruals quality, earnings quality, or overall information quality.¹ We re-assess recent studies that suggest that residual accruals volatility captures information risk and is related to a firm's cost of capital. For example, Francis, LaFond, Olsson and Schipper (2005) test the *joint hypothesis* that residual accruals volatility captures information risk and that information risk affects a firm's cost of capital. Their empirical evidence suggests that residual accruals volatility is positively associated with cost of capital proxies including: (i) market beta, (ii) earnings-to-price ratio (a proxy for a firm's implied equity cost of capital), (iii) historical cost of debt, and (iv) a priced "accruals quality" risk factor that explains expected stock returns. Based on these empirical associations, Francis, et al (2005) conclude that "*accruals quality proxies for information risk...*" and that accruals quality affects a firm's cost of capital. Related results and conclusions are also presented in Francis, LaFond, Olsson and Schipper (2004) and Ecker, Francis, Kim, Olsson and Schipper (2006).

Our paper re-examines prior empirical tests of and conclusions about the *joint hypothesis* that residual accruals volatility captures information risk and is related to a firm's cost of capital. We propose and test a simple, yet compelling, alternative explanation for the previous empirical findings; namely, residual accruals volatility is correlated with a firm's operating risk, and this

¹ *Residual accruals volatility* is the firm-specific volatility of regression residuals from a model of working capital accruals proposed by Dechow and Dichev (2002) and modified by McNichols (2002). Dechow and Dichev (2002) and Francis, LaFond, Olsson, and Schipper (2004, 2005) use the term "accruals quality" to describe residual accruals volatility. These papers argue that *lower* volatility of residual accruals indicates *higher* accruals quality.

operating risk is the true underlying factor associated with a firm's cost of capital.² First, we document that a firm's residual accruals volatility is explained primarily by operating risk characteristics captured by a firm's cash flow volatility and its stock return volatility. Second, we illustrate *how* and *why* the association between residual accruals volatility and cost of capital, as documented in Francis et al (2005), is not robust. After properly controlling for cash flow volatility and stock return volatility, we show that residual accruals volatility is *not* associated with cost of capital proxies including market beta, earnings-to-price ratio, or historical cost of debt. Furthermore, we question the fundamental construction and interpretation of the residual accruals volatility "risk factor" used by Francis et al (2005) and Ecker et al (2006). We show that over 96% of the variation in this "information risk factor" is explained by operating "factors" based on cash flow volatility and return volatility factors.

Our study addresses the important question of whether there is a robust empirical relation between a firm's residual accruals volatility and a range of cost of capital measures. Our evidence suggests that such a relation does *not* exist and that prior affirmative findings disappear after controlling for a firm's other operating risk characteristics. However, our study leaves open other important questions, including whether, how, and under what circumstances a *valid* measure of information risk will be associated with a firm's cost of capital (see, for example, Easley, Hvidkjaer, and O'Hara, 2002; Hughes, Liu, and Liu, 2005; Lambert, Leuz, and Verrecchia, 2006; and Yee, 2006).³

We contribute to a growing body of evidence that suggests that residual accruals volatility has: (1) dubious analytical and empirical validity as a measure of accruals or earnings

² We define operating risk as the ex post variability of a firm's future cash flows that cannot be predicted using current public and private information. For example, the operating risk of equityholders' cash flows can arise from the combination of a firm's fundamental asset risk and its financial leverage.

³ Other theory papers such as Barry and Brown (1984 and 1985), and Clarkson, Guedes, and Thompson (1996) also make a connection between "estimation risk" and expected stock returns.

“quality” (e.g., Wysocki, 2005), and (2) little empirical support as a systematically-priced equity “risk factor” (e.g., Core, Guay and Verdi, 2006, and Nichols, 2006). We note that previous studies (Dechow and Dichev, 2002; Francis et al, 2005) attempt to validate residual accruals volatility by examining the correlation between residual accruals volatility and a chosen set of “volatility” variables. Whereas the previous studies observe a significant correlation and draw the conclusions that residual accruals volatility is a *valid* proxy for accruals and earnings quality (Dechow and Dichev, 2002) or that residual accruals volatility is a *valid* proxy for information risk (Francis et al, 2005), we argue that the significant correlation is more consistent with residual accruals volatility capturing a firm’s operating risk. More importantly, we document the empirical properties of residual accruals volatility, which provide further evidence that residual accruals volatility more likely captures a firm’s operating volatility rather than the firm’s accounting quality or the firm’s information risk.

Our research also complements the recent work of Nichols (2006) and Core, Guay and Verdi (2006) that focuses on the validity of asset-pricing tests using the residual accruals volatility “risk factor” proposed in Francis et al (2005). These studies show that, in the presence of market, size, and distress risk factors, the residual accruals volatility “risk factor” has limited ability to explain the cross-section of stock returns. Core et al (2006) state that their findings are consistent with the predictions of Hughes, Liu and Liu (2005) and Lambert, Leuz and Verrecchia (2006), i.e., that a firm’s information risk should be impounded in its market beta, and therefore, residual accruals volatility should not exhibit additional explanatory power for stock returns. This interpretation appears to leave open the possibility that residual accruals volatility can still affect a firm’s equity cost of capital *through* its market beta. However, our empirical results indicate that, after controlling for other operating risk characteristics, there is no association

between a firm's estimated market beta and its residual accruals volatility. In addition, our findings on operating risk characteristics reinforce the asset-pricing results in Nichols (2006) which suggest that the residual accruals volatility "risk factor" does not behave like a traditional risk factor but instead picks up information already captured by macroeconomic variation in corporate cash flows.

Our empirical findings are closely connected to prior studies of the relation between operating volatility and risk, which have largely been overlooked by the "accruals quality" literature. The early work of Beaver, Kettler and Scholes (1970) suggests a direct link between systematic income volatility and beta risk. More recent work by Minton and Schrand (1999), Minton, Schrand, and Walther (2002), Baginski and Whalen (2003), Barnes (2003), and Allayannis, Rountree, and Weston (2005) highlight the fundamental connection between cash flow volatility, operating risk, and cost of capital. Our tests and results also contribute to the growing literature on the relation between the idiosyncratic return volatility and future stock returns (see, for example, Merton, 1987; French, Schwert and Stambaugh, 1987; Malkiel and Xu, 2002; and Fu, 2005). Our results suggest that the idiosyncratic return volatility is also associated with other cost of capital measures.

The remainder of the paper is organized as follows. Section 2 explores the links between operating risk, information risk and cost of capital. Section 3 provides a description of the sample used in the empirical tests. Section 4 documents the association between residual accruals volatility and operating risk and tests of the association between residual accruals volatility and market beta. Sections 5 re-examines the Francis et al (2005) tests of the apparent association between residual accruals volatility and a firm's earnings-to-price ratio and its historical cost of debt. Section 6 explores the association between the Francis et al (2005) accruals quality "risk

factor” and other “factors” based on cash flow volatility and idiosyncratic return volatility. Section 7 concludes.

2. The relations among information risk, operating risk and cost of capital

Francis, et al (2004, 2005) document an empirical association between residual accruals volatility (i.e., “accruals quality”) and a firm’s cost of capital. Based on this observed empirical association, Francis, et al (2005) draw the conclusion that “the capital market consequences of differences in accruals quality arise *because accruals quality proxies for information risk...*”⁴

The Francis, et al (2004, 2005) evidence seems to support the claim that information risk affects a firm’s cost of capital. However, we highlight that these studies implicitly test a *joint* hypothesis comprised of at least two parts⁵: (1) residual accruals volatility is a valid proxy for information risk, and (2) information risk affects a firm’s cost of capital. The limitation of the Francis, et al (2005) joint hypothesis is that if either of the two parts fails to hold, then it is difficult to draw any conclusions about the association between information risk and a firm’s cost of capital.

In this section, we closely examine the limitations of the Francis et al (2005) joint hypothesis. First, we question whether residual accruals volatility is a *valid* proxy for information risk, i.e., the first part of the joint hypothesis. We review prior studies and present supporting arguments that suggest that residual accruals volatility captures a firm’s operating risk and volatility characteristics *rather than* information risk. Second, we review the possible

⁴ Francis, LaFond, Olsson, and Schipper (2005) page 324, paragraph 2.

⁵ An additional part of the joint hypothesis is that the cost-of-capital proxies are appropriate for the tested hypothesis. For example, Francis et al (2005) use interest expense and book value of debt from a firm’s current financial statements to create a proxy for cost of debt capital. The limitation of this proxy is that it reflects a firm’s historical borrowing costs that can significantly predate the firm’s observed accruals properties.

theoretical links between information risk and cost of capital, i.e., the second part of the joint hypothesis. The limitations of the Francis et al (2005) joint hypothesis motivate our subsequent empirical analyses of whether residual accruals volatility captures information risk or operating risk.

2.1. Is residual accruals volatility a valid proxy for information risk?

The first part of the Francis et al (2005) “residual accruals volatility/cost of capital” joint hypothesis is that residual accruals volatility captures information risk. To investigate this assumption, we first review the background, properties, and empirical use of the residual accruals volatility variable. Dechow and Dichev (2002) originally proposed the idea that residual accruals volatility captures “accounting quality”. Residual accruals volatility is an output from the Dechow and Dichev (2002) model of working capital accruals. Their empirical model of working capital accruals attempts to map working capital accruals into, past, present and future cash flow from operations. By construction, the residuals accruals from this model do not map into near-term operating cash flow realizations and, therefore, are deemed to be “low quality”.

Dechow and Dichev (2002) suggest that empiricists use the *volatility* of residuals from their working capital accruals model as a measure of accruals and earnings quality. In an attempt to validate the properties of their working capital accruals model, Dechow and Dichev (2002) examine the correlations between residual accruals volatility and firm characteristics such as volatility of sales, volatility of cash flow, volatility of changes in working capital, and volatility of earnings. Dechow and Dichev (2002) observe a significant correlation between residual accruals volatility and these “volatility” variables and draw the conclusion that residual accruals volatility is a valid proxy for accruals and earnings quality. However, since these volatility

variables are also highly associated with a firm's operating risk, the observed significant correlations suggests an alternative interpretation -- that residual accruals volatility captures a firm's operating risk.

Francis et al (2004 and 2005) embrace residual accruals volatility as a proxy for overall accounting quality, and they further extend the use of residual accruals volatility as a proxy for "information risk". Francis et al (2004 and 2005) use a modified version of the Dechow and Dichev model (see, McNichols, 2002) to test the *joint* hypothesis that residual accruals volatility captures information risk and information risk affects cost of capital. Francis et al (2005) attempt to validate residual accruals volatility using the same methods in Dechow and Dichev (2002). Francis et al (2005) also correlate residual accruals volatility with various "innate" characteristics and conclude that their accruals measure captures information risk. However, these studies do not directly address competing interpretations of residual accruals volatility

Subsequent studies have since provided evidence suggesting that residual accruals volatility is not a valid measure of either accounting quality or of information risk. Wysocki (2005) re-assesses the legitimacy of the original Dechow and Dichev (2002) working capital accruals model and the validation tests presented in previous research studies. Wysocki (2005) presents analytical and empirical tests that suggest that the Dechow and Dichev (2002) accruals model has limited ability to distinguish between discretionary and non-discretionary accruals. In addition, the Dechow and Dichev (2002) model displays empirical properties indistinguishable from a random decomposition of working capital accruals. Finally, Wysocki (2005) shows that prior empirical validations of the model, based on correlations with "innate" characteristics and correlations with earnings persistence, are flawed. In particular, the empirical associations with a

firm's "innate" characteristics suggest that residual accruals volatility captures operating volatility and operating risk rather than information risk as previously suggested.

In related research, Liu (2006) shows that a one-size-fits-all model of working capital accruals would likely misclassify firms' "normal" operating accruals. In particular, Liu (2006) shows the association between "normal" operating accruals and cash flows varies significantly over a firm's life cycle and, as a result, a one-size-fits-all accruals model can lead to incorrect classifications of and inferences about a firm's "accounting quality". Additionally, Nichols (2006) questions prior studies' interpretation of the residual accruals volatility "factor" as an information risk factor.

2.2. Does residual accruals volatility merely capture operating volatility?

Recent studies question the ability of residual accruals volatility to capture accounting quality and information risk. Therefore, if residual accruals volatility does not capture accounting quality nor does it capture information risk, what *does* this variable capture? In this section, we argue that residual accruals volatility is correlated with operating volatility and risk. We define operating risk in a way that is common in the economics and finance literatures: it is the ex post variability in a firm's future cash flows that cannot be predicted using current public and private information. For example, the operating risk of cash flows to equityholders can arise from the combination of the firm's fundamental asset risk and its financial leverage. We further argue that the apparent empirical association between residual accruals volatility and cost of capital simply reflects the true underlying relation between operating risk and cost of capital.

Previous studies argue that residual accruals volatility proxies for accounting quality (Dechow and Dichev, 2002) and information risk (Francis et al, 2005) *because* residual accruals

volatility is correlated with a firm's "innate" characteristics such as volatility of sales, volatility of cash flow, volatility of changes in working capital, and volatility of earnings. However, a simple yet compelling alternative interpretation is that residual accruals volatility directly reflects a firm's *operating* volatility and risk. For example, firms with risky underlying assets, high leverage, or high expected growth are expected to have high *operating* volatility --- i.e., volatile sales, volatile operating cash flows, volatile changes in working capital, and volatile earnings. These factors reflect systematic and idiosyncratic volatility of past and future expected cash flows for investors and, ultimately, higher operating risk.

This operating volatility and risk will lead to volatility in accruals --- not for information risk reasons, but for simple operating reasons. For example, a firm in the growth stage of its life cycle will exhibit a high degree of operating volatility. Such a firm will make large investments in working capital and property plant and equipment and will also raise debt and equity capital. The firm's early investments in working capital will result in large magnitude accruals that may not map into near-term cash flow or changes in revenues but are expected to generate benefits over subsequent periods in the future. Although these types of transactions support a firm's high growth trajectory (albeit at high risk), a model of working capital accruals in the spirit of Dechow and Dichev (2002) will most likely identify this firm as recording large positive "unexplained" or residual accruals (see, for example, Liu, 2006). Since these accruals typically reverse, growth firms will also exhibit a *high* volatility of residual accruals.

Overall, we argue that residual accruals volatility is correlated with operating volatility and operating risk. We also argue that Francis et al (2005) find an apparent relation between residual accruals volatility and cost of capital *because* operating risk is a correlated omitted variable which is the underlying factor associated with a firm's cost of capital. We view cash

flow volatility and stock return volatility as underlying primitive variables that capture a firm's operating risk, and both variables will be associated a firm's accruals volatility (and a firm's residual accruals volatility). In the following sections, we conduct empirical tests to determine whether cash flow volatility and stock return volatility explain the apparent association between residual accruals volatility and various cost of capital measures.

Our insight about the link between operating volatility and cost of capital is not entirely new. There are numerous prior studies that posit a relation between operating volatility and cost of capital. These studies have largely been overlooked by the "accounting quality" literature. For example, Beaver, Kettler and Scholes (1970) suggest a direct link between systematic income volatility and beta risk. More recent work by Minton and Schrand (1999), Minton, Schrand, and Walther (2002), Baginski and Whalen (2003), Barnes (2003), and Allayannis, Rountree, and Weston (2005) highlight the fundamental connection between cash flow volatility, operating risk, and cost of capital.

Prior research suggests that cash flow volatility can capture certain aspects of a firm's operating risk. In addition, stock return volatility can also capture a firm's systematic and idiosyncratic operating risks. In a CAPM world, only systematic market risk should determine expected returns and therefore influence a firm's equity cost of capital. However, the finance literature has presented a number theoretical and empirical explanations for an observed association between a firm's idiosyncratic stock return volatility, future stock returns, and its cost of capital. For example, if multiple systematic (operating) risk factors exist, and one uses an incomplete empirical asset-pricing model, then one can observe an association between *idiosyncratic* return volatility and expected stock returns. This outcome can occur because idiosyncratic returns will be correlated with systematic operating risk factors that are omitted

from the empirical model. This can be easily seen in the case of the Fama-French 3-factor model where market, size and distress factors describe the “true” cross-section of stock returns. Given that idiosyncratic return volatility is positively associated with financial distress and negatively associated with firm size, then idiosyncratic return volatility will explain stock returns if one uses an “incomplete” empirical asset-pricing model with only the market factor. This occurs because the size and distress factors are correlated omitted asset-pricing factors. The same argument can be extended to other incompletely-specified multi-factor empirical models of firms’ expected stock returns.

Other finance studies suggest that greater idiosyncratic return volatility can be indicative of a firm that has *either* high or low information quality, and this can affect expected stock returns. For example, Merton (1987) presents a model where idiosyncratic risk is positively related to returns. Roll (1988) also argues that idiosyncratic stock returns should be interpreted as “noise” and that greater volatility in idiosyncratic returns would arguably be associated with less information about a stock. On the other hand, more recent research has argued that greater idiosyncratic return volatility suggests that *better* firm-specific information exists about a stock (see, for example, Morck, Yeung, and Yu, 2000, and Berger, Chen and Li, 2006).

Overall, empirical studies generally find a positive association between idiosyncratic return volatility and future stock returns (see, for example, French, Schwert and Stambaugh, 1987; Malkiel and Xu, 2002; and Fu, 2005). Given that accruals volatility and stock return volatility are correlated, there is a concern that the findings and conclusions of previous studies on accruals volatility may be incorrect because idiosyncratic return volatility is an important correlated omitted variable.

2.3. Information risk and cost of capital

The second part of the Francis et al (2005) “residual accruals volatility/cost of capital” joint hypothesis is that information risk affects a firm’s cost of capital. Prior research often uses the terms information quality and information risk interchangeably, although we note that the two terms are not necessarily synonymous. We briefly review the possible theoretical links between generic information quality and a firm’s cost of capital, but a more exhaustive survey of these potential links is provided by Leuz and Wysocki (2006).

Theoretical studies typically argue that higher information quality lowers a firm’s cost of capital through any one of the following four mechanisms: (i) higher information quality lowers information asymmetries between investors, which decreases the bid-ask spread and increases liquidity of trade in the firm’s securities, (ii) higher information quality lowers the estimation risk in pricing the firm’s securities, (iii), higher information quality leads to more efficient monitoring of management by investors, and (iv) higher information quality can allow a firm to increase its visibility to a broader set of investors and therefore lead to more efficient risk-sharing among these investors. We briefly describe each of these below.

The first way in which information quality can affect cost of capital is through the mechanism of adverse selection. The existence of information asymmetries among the firm’s investors introduces adverse selection problems into capital markets. When information asymmetries exist among investors, the less-informed investors will be concerned that they will systematically lose money when they trade with more-informed investors (Glosten and Milgrom, 1985). As a result, the less-informed investors will decrease (increase) the price at which they are willing to buy (sell) the firm’s securities in order to protect themselves against the anticipated losses from trading with more-informed investors. This practice of “price protection” by less-

informed investors affects the trading of the firm's securities by increasing bid-ask spreads and lowering liquidity in secondary securities markets. In the extreme, bid-ask spreads can become so large that no trades occur (Akerlof, 1971). Lower liquidity and higher bid-ask spreads can affect a firm's market value and its cost of capital by imposing transaction costs on investors for which they must be compensated in equilibrium. Constantinides (1986) and Amihud and Mendelson (1986) argue that the required rate of return of a security increases by its per-period transaction costs.

High quality financial information can mitigate the adverse selection problem by reducing information asymmetries between the less-informed and more-informed investors. By releasing high quality financial information to all investors, the firm reduces uncertainty about firm value and decreases the gains to acquiring private information, thereby decreasing the potential information advantage of the more-informed investors (Verrecchia, 2001).

A second mechanism that links information quality to a firm's cost of capital is based on the concept of estimation risk (e.g., Brown, 1979; Barry and Brown, 1984 and 1985; Coles and Loewenstein, 1988). For example, investors face uncertainty when deriving estimates of value-relevant parameters (such as a firm's beta factor) that affect their investment allocations. Estimation risk is likely to be greater when information quality is low. Barry and Brown (1985) and Coles et al. (1995) examine how differences in firm-specific information, as captured by the length of the time-series of firms' historical stock returns, can induce estimation risk and potentially affect a firm's cost of capital.

Recent studies by Jorgenson and Kirschenheiter (2003), Hughes, Liu, and Liu (2005), Yee (2006), and Lambert, Leuz and Verrecchia (2006) also examine estimation risk and cost of capital. For example, Lambert, Leuz and Verrecchia (2006) show that the *assessed* covariances

between a firm's cash flows and the cash flows of other firms decrease as the quality of firm-specific information increases, which therefore reduces the firm's cost of capital. The investor cannot diversify this effect away, as it exists for all covariance terms with other firms; only the effect on the firm-specific variance is likely to be diversified in "large economies" where investors can form portfolios of many stocks. Lambert et al. (2006) argue that their approach is consistent with the CAPM and that the information effect should manifest itself in a firm's beta factor (rather than generating a separate risk factor).

The third way in which information quality may affect cost of capital is through the mechanism of increased monitoring of a firm's managers. A firm that releases high quality information is likely to increase firm transparency to outside investors. Previous studies in agency theory suggest that increased transparency and better corporate governance increases firm value by improving managers' decisions or by reducing the likelihood of and level of managerial wealth expropriation from outside investors (e.g., Lambert, 2001). The influence of information quality on managers' real decisions can have a direct effect on the firm's expected future cash flows, as well as a possible indirect effect on its cost of capital (e.g., Lombardo and Pagano, 2002; Lambert et al., 2006).

The last way in which information quality may affect cost of capital is through increased firm visibility and more efficient risk sharing among the firm's investors. Merton (1987) presents an asset-pricing model where risk sharing is inefficient because some investors have incomplete information and are unaware of all firms in the economy. A low-visibility firm may disclose information in order to make investors aware of its existence and therefore enlarge the firm's investor base. This will arguably improve risk sharing among the firm's investors and lower the firm's cost of capital.

While the theoretical literature provides a number ways in which generic “information quality” can affect cost of capital, we question whether one can draw any inferences about these theoretical predictions from the *joint hypothesis* empirically tested in Francis et al (2005). We specifically address the important competing explanation: that residual accruals volatility is spuriously correlated with a firm’s cost of capital because residual accruals volatility reflects operating risks that are directly captured by a firm’s volatility of cash flows and volatility of stock returns.

3. Sample Description

3.1. Sample Selection

We follow the procedures and variable definitions outlined in a previous study of accruals quality and risk (Francis, LaFond, Olsson, and Schipper, 2005). We summarize our sample selection procedures, which differ slightly for each of our tests, in Table 1 Panel A (for our general tests) and Table 1 Panel B (for our earnings-to-price (E/P) test and cost of debt test). We begin our study with all firm-year observations listed in the 2006 Compustat Industrial Annual database with non-missing values of total assets (Compustat data item #6). This full sample contains 307,263 firm-years, as shown in Panels A and B of Table 1.

We next apply the following accruals expectation model, from Francis, LaFond, Olsson, and Schipper (2005) equation 1, to our sample of 307,263 observations:

$$TCA_{j,t} = \Phi_{0,j} + \Phi_{1,j}CFO_{j,t-1} + \Phi_{2,j}CFO_{j,t} + \Phi_{3,j}CFO_{j,t+1} + \Phi_{4,j}\Delta Rev_{j,t} + \Phi_{5,j}PPE_{j,t} + v_{j,t} \quad (1)$$

This model relates a firm’s working capital accruals ($TCA_{j,t}$) to its cash flow from operations for the previous year, current year, and subsequent year ($CFO_{j,t-1}$, $CFO_{j,t}$, and

$CFO_{j,t+1}$), its changes in revenue for the current year ($\Delta Rev_{j,t}$), and its gross property, plant, and equipment ($PPE_{j,t}$).

We calculate the variables in equation (1) according to the methods outlined in Francis, LaFond, Olsson, and Schipper (2005). A firm's working capital accruals $TCA_{j,t}$ are calculated using the balance sheet variables $((\Delta data\#4 - \Delta data\#5 - \Delta data\#1 + \Delta data\#34) / data\#6)$. A firm's cash flow from operations $CFO_{j,t}$ is calculated as the difference between net income and working capital accruals $((data\#18 - (\Delta data\#4 - \Delta data\#5 - \Delta data\#1 + \Delta data\#34 - data\#14)) / data\#6)$. A firm's change in revenues ($\Delta Rev_{j,t}$) is $\Delta data\#12 / data\#6$, and its gross property, plant, and equipment ($PPE_{j,t}$) is $data\#7 / data\#6$.

Table 1 Panel A summarizes the sample selection procedures. We winsorize the 1st and 99th percentiles, within each year, of the variables $TCA_{j,t}$, $CFO_{j,t}$, $\Delta Rev_{j,t}$, and $PPE_{j,t}$, which will all be used in the accruals expectation model. After the winsorization, we obtain the lag and lead values of a firm's $CFO_{j,t}$ in order to define the variables $CFO_{j,t-1}$ and $CFO_{j,t+1}$.⁶ We next require that all observations have non-missing values of each of the variables that will be used in the accruals expectation model, and this requirement reduces the sample to 257,152 observations. We apply the accruals expectation model in equation (1), within each year and each Fama and French (1997) industry group, to the full sample and obtain 257,152 firm-year residuals. A firm-year must have a non-missing value of the residual for the current year and the residuals for the lag four year period in order to calculate the standard deviation of the residual

⁶ Since a firm's working capital accruals are expected to generate cash flow realizations within a one year period, Dechow and Dichev (2002) modify the model of working capital accruals to include a firm's previous year and subsequent year cash flow from operations ($CFO_{j,t-1}$ and $CFO_{j,t+1}$).

$Std(ResidualAccrual)$,⁷ which is used as a measure of a firm's accruals quality. Our sample has 176,464 firm-years with values of $Std(ResidualAccrual)$.

To ensure comparability of our results to that of other studies, we limit our sample to the post-1970 period, which leaves 159,055 observations in the sample, as shown in Table 1 Panel A. We also require that each firm-year observation have CRSP information in order to calculate returns-related variables. This step reduces the sample to 126,154 firm-year observations. We then use the required CRSP information to calculate several variables designed to capture a firm's underlying operating risk. We calculate the standard deviation of cash flows from operations ($Std(CFO)$) for each firm-year observation.⁸ We also estimate the following market model regression for every firm-year observation:

$$R_i - R_f = a + Beta*(R_{mkt} - R_f) + i \quad (2)$$

This regression allows us to estimate a firm-year $Beta$ and a firm-year standard deviation of idiosyncratic returns i or $Std(IdioReturn)$.⁹ The requirement that each firm-year have non-missing values of $Beta$ and $Std(IdioReturn)$ reduces the sample size to 90,013, as shown in Table 1 Panel A. We use the sample of 90,013 as the starting point for each of our two additional tests that involve the earnings-to-price (E/P) ratio and the cost of debt.

Our sample selection procedures for the earnings-to-price (E/P) tests are outlined in Panel B of Table 1. We begin with the 90,013 firm-year observations (from Table 1 Panel A). We

⁷ The standard deviation of the residual is calculated as the standard deviation of a firm's residuals $v_{j,t}$, $v_{j,t-1}$, $v_{j,t-2}$, $v_{j,t-3}$, and $v_{j,t-4}$.

⁸ A firm-year must have a non-missing value of the operating cash flow (CFO) for the current year and valid observations of CFO for each of the preceding four years in order to calculate the $Std(CFO)$.

⁹ We conduct firm-year CAPM regressions over a CRSP pre-formation window. A firm in year t must have at least 18 monthly returns in the CRSP pre-formation window (i.e., the 36-month return period ending June $t+1$) in order to conduct the firm-year CAPM regression $R_i - R_f = a + Beta*(R_{mkt} - R_f) + i$. The coefficient $Beta$ is the firm-year Beta, and the standard deviation of the idiosyncratic returns i is the firm-year $Std(IdioReturn)$.

calculate the variables in the following E/P regression from Francis, LaFond, Olsson, and Schipper (2005) equation 3:

$$IndEP_{j,t} = \delta_{0,j} + \delta_1 Growth_{j,t} + \delta_2 Leverage_{j,t} + \delta_3 Beta_{j,t} + \delta_4 Size_{j,t} + \delta_5 AQ_{j,t} + \zeta_{j,t} \quad (3)$$

The following variable definitions are based on the methods in Francis, LaFond, Olsson, and Schipper (2005). We first calculate a firm's earnings-to-price (E/P) ratio as data#58/data#199, based on the reference in Francis, LaFond, Olsson, and Schipper (2005) and on the definitions in the appendix of Liu, Nissim, and Thomas (2002). We follow the methods in these previous studies and only calculate E/P for firms with positive earnings. To control for the effect of outliers and to make our E/P ratios comparable to those in other studies, we also require that the E/P ratio be bounded between 0 and 1. We follow Francis, LaFond, Olsson, and Schipper (2005) by calculating the median E/P ratio for the remaining firm-years for every year and every Fama and French (1997) industry group. We define each firm-year's industry-adjusted E/P ratio $IndEP_{j,t}$ as $(E/P - \text{median } E/P)$; of the starting sample of 90,013 firm-years, there are 68,797 firm-year observations have non-missing values of $IndEP_{j,t}$.

We require that firms have non-missing values for the *Growth* in book value of equity over the five year period, defined as $\log(1 + ((\text{data}\#60_t / \text{data}\#60_{t-4}) - 1))$, which reduces the previous sample of 68,797 firm-years down to 67,425 firm-year observations. We define *Leverage* as $(\text{data}\#9 + \text{data}\#34) / \text{data}\#6$ and require that values of data#9 and data#34 be positive and non-missing in order to remain in the sample; the leverage requirement reduces the previous sample to 58,027 observations. We require that firms have non-missing values of *Beta*, as calculated from firm-year regressions using equation (2), and this requirement leaves the sample unchanged at 58,027 firm-years. Firm-year observations must have values for *Size* (calculated as

$\log(\text{data\#6})$), $Std(ResidualAccrual)$, and $Std(IdioReturn)$ from the firm-year CAPM regressions, which results in a final sample of 58,027 observations for the E/P tests.

Table 1 Panel B also shows the sample selection procedures for the cost of debt tests. We calculate the variables in the following cost of debt regression from Francis, LaFond, Olsson, and Schipper (2005) equation 2:

$$CostDebt_{j,t} = \theta_0 + \theta_1Leverage_{j,t} + \theta_2Size_{j,t} + \theta_3ROA_{j,t} + \theta_4IntCov_{j,t} + \theta_5Std(NIBE) + \theta_6Std(ResidualAccrual)_{j,t} + \zeta_{j,t} \quad (4)$$

As with the previous tests, we start our analysis with the 90,013 firm-year observations (from Table 1 Panel A). We define $CostDebt$ as $(\text{data\#15}_{t+1}) / [((\text{data\#9}_t + \text{data\#34}_t) + (\text{data\#9}_{t+1} + \text{data\#34}_{t+1})) / 2]$ and require that all values of data\#15 , data\#9 , and data\#34 be positive and non-missing in order to remain in the sample; the cost of debt requirement reduces the previous sample of 90,013 down to 68,623 firm-year observations. We require observations to have non-missing values of $Leverage$ and $Size$, which are defined in the previous paragraph and do not affect the sample size. We calculate a firm's return on assets (ROA) as $\text{data\#18} / \text{data\#6}$. We also define a firm's interest coverage ($IntCov$) as $\text{data\#18} / \text{data\#15}$, and we require that data\#15 be positive and non-missing. We calculate the standard deviation of net income before extraordinary items ($Std(NIBE)$) for each firm-year observation using net income before extraordinary items, $\text{data\#18} / \text{data\#6}$, for the current year and the lag four year period, and this requirement reduces the sample to 67,049. The final sample size is 67,049 for the cost of debt tests.

4. The association between market beta and residual accruals volatility

4.1. Properties of residual accruals volatility

We first explore the properties of residual accruals volatility, which are shown in Table 2. In particular, we test our prediction that residual accruals volatility simply reflects a firm's underlying operating volatility. As discussed in section 3, we view cash flow volatility and idiosyncratic return volatility as measures of a firm's underlying operating risk which is associated with the volatility of a firm's past and future expected cash flows. Therefore, we first examine the relations among residual accruals volatility, cash flow volatility, and idiosyncratic return volatility, which are proxied by the variables $Std(ResidualAccrual)$, $Std(CFO)$, and $Std(IdioReturn)$. Table 2 Panel A shows that $Std(ResidualAccrual)$ exhibits an extremely high correlation with $Std(CFO)$ (of +0.71) and $Std(IdioReturn)$ (of +0.53). The remaining correlation between $Std(CFO)$ and $Std(IdioReturn)$ is also +0.53, which is also extremely high. These correlations are consistent with the argument that all three variables capture similar underlying properties of a firm's operating volatility.

We next conduct a regression analysis in order to document the determinants of $Std(ResidualAccrual)$. Table 2 Panel B summarizes the regression results, which indicate a very strong positive association between $Std(ResidualAccrual)$ and both $Std(CFO)$ (coefficient of 0.60 and a t-statistic of 224.63) and $Std(IdioReturn)$ (0.21 and a t-statistic of 0.21 and a t-statistic of 77.47). Most importantly, 53.6% of the variation in $Std(ResidualAccrual)$ is explained by $Std(CFO)$ and $Std(IdioReturn)$. Since more than half of the variation in $Std(ResidualAccrual)$ is explained by $Std(CFO)$ and $Std(IdioReturn)$, it is likely that testing for an association between $Std(ResidualAccrual)$ and a firm's cost of capital, without properly controlling for $Std(CFO)$ and $Std(IdioReturn)$, could potentially lead a researcher to draw incorrect inferences.

4.2. Replication of simple correlations from prior studies

We next investigate the empirical relation between a firm's market beta and residual accruals volatility. Similar to Francis et al (2005), we explore how average betas vary across five portfolios sorted on residual accruals volatility. Similar to Francis et al (2005), we see a distinct pattern of increasing betas across the residual accruals volatility quintiles. Panel A of Table 3 shows that the average market beta monotonically increases from 0.83 in the lowest accruals volatility quintile up to 1.33 in the highest accruals volatility quintile. Francis et al (2005) and subsequent studies cite this pattern as prima facie evidence that "accruals quality" is related to risk.

However, it is important to note that residual accruals volatility may simply reflect the underlying volatility of a firm's operating environment. For example, the early work of Beaver, Kettler and Scholes (1970) suggests that a firm's market beta is increasing in the volatility of its operating earnings. In our sample of firms, this is confirmed in Panel B of Table 3 by the correlation of +0.71 between the standard deviation of residual accruals (i.e., "accruals quality") and the standard deviation of operating cash flows. This implies that the apparent relation between beta and "accruals quality" is at least partially explained by operating risk rather than information risk. Therefore, we explore how average betas vary across five portfolios sorted by operating cash flow volatility, a test that removes an "accruals quality" interpretation of the correlation results. In Panel A of Table 3, we find a strong increasing pattern of market betas across the cash flow volatility quintiles, from 0.82 to 1.39. This is exactly the same pattern as we observed across the accruals volatility quintiles.

Another volatility variable that should be related to both residual accruals volatility and market betas is the volatility of a firm's idiosyncratic stock returns, or $Std(IdioReturn)$.¹⁰ Idiosyncratic return volatility captures times-series shocks to *expected future* cash flows (see, for example, Vuolteenaho, 2002) and thus complements *historical* measures of cash flow volatility. Interestingly, accruals volatility should also capture information about shocks to *expected future* cash flows because a fundamental property of accounting accruals is their ability to capture anticipated future cash flows. Therefore, we document how average betas vary across five portfolios sorted by idiosyncratic stock return volatility. Panel A of Table 3 shows an increasing pattern of market betas across the idiosyncratic return volatility quintiles. This pattern is even more pronounced than the previous pattern observed across the residual accruals volatility quintiles. The average market beta monotonically increases from 0.67 in the lowest stock return volatility quintile up to 1.56 in the highest stock return volatility quintile.

Next, we present the correlations between all of these variables in Panel B of Table 3. It can be seen that the $Std(ResidualAccrual)$ is strongly related to $Std(CFO)$ and $Std(IdioReturn)$. Moreover, both $Std(CFO)$ and $Std(IdioReturn)$ display a stronger positive correlation with market *Beta* of +0.21 and +0.31 than the correlation between $Std(ResidualAccrual)$ and *Beta* of +0.12. We also estimate the “orthogonalized” standard deviation of idiosyncratic stock returns ($OrthStd(IdioReturn)$) using the residuals from firm-specific regressions of $Std(IdioReturn)$ regressed on $Std(CFO)$.¹¹ This orthogonalized variable is in the spirit of the “information quality” proxy proposed by Berger, Chen and Li (2006). They argue that a higher variability in a firm's idiosyncratic stock returns (after controlling for cash flow volatility) should indicate

¹⁰ A firm-year standard deviation of idiosyncratic returns i ($Std(IdioReturn)$) is calculated for year t using monthly stock returns for the 36-month period ending June $t+1$ (a firm-year observation is included if there are at least 18 months of returns) and the market model regression $R_i - R_f = a + Beta*(R_{mkt} - R_f) + i$.

¹¹ $OrthStd(IdioReturn) \mu_{j,t}$ is the firm-year residual from the regression $Std(IdioReturn)_{j,t} = a + b(Std(CFO))_{j,t} + \mu_{j,t}$.

higher firm-specific “information quality”. Interestingly, we find that a strong *positive* correlation exists between *OrthStd(IdioReturn)* and *Std(ResidualAccrual)* of +0.24. Because higher residual accruals volatility is supposed to imply lower accounting quality (with a predicted negative correlation), our evidence of a *positive* correlation potentially undermines the claim that residual accruals volatility captures accounting quality.

4.3. Multiple regression tests of the relation between residual accruals volatility and market beta

Given that market *Beta* and the volatility measures show strong inter-relations, we explore the association between *Beta* and residual accruals volatility in a multiple regression setting. Panel C of Table 3 presents a series of regressions that test the various volatility-based determinants of a firm’s market *Beta*. In column 1 of Panel C, we estimate a simple regression of the association between market *Beta* (estimated using 5 years of historical monthly return data) and *Std(ResidualAccrual)* which is also estimated using annual data over the same 5 years. To avoid overstating the significance of the results, the first regression sample consists of 22,698 observations that are taken every five years, a technique that avoids the use of repeated observations of estimated *Beta* and *Std(ResidualAccrual)* derived from essentially the same underlying data. In this analysis, we use the yearly decile ranks of the variables and pool the observations across time to remove the potential confounding effect of systematic time-series variation in market betas and volatilities. Column 1 shows that in the simple regression relating *Beta* to *Std(ResidualAccrual)* only, the coefficient on *Std(ResidualAccrual)* is positive and highly significant. The adjusted R^2 of the regression is 5.4%.

In column 2 of Panel C, we use the same sample of 22,698 observations to estimate a regression of the association between annual decile-ranked observations of market *Beta* and the

firm-level operating variables $Std(CFO)$ and $Std(IdioReturn)$ using underlying data from non-overlapping 5-years windows. Column 2 shows that the coefficients on $Std(CFO)$ and $Std(IdioReturn)$ are positive and highly significant. Moreover, the adjusted R^2 of the regression jumps to 17.2%. Next, we add $Std(ResidualAccrual)$ to this regression, and the results are shown in Column 3. Interestingly, both the coefficients on the variables $Std(CFO)$ and $Std(IdioReturn)$ remain positive and highly significant. However, $Std(ResidualAccrual)$ is not significant and does not appear to add any incremental explanatory power to the model. In other words, after controlling for cash flow volatility and idiosyncratic return volatility, there is *no* association between residual accrual volatility and a firm's estimated market beta.

As a robustness check, we re-estimate the main regression using a larger sample of 90,013 firm-year observations that contain overlapping windows, which we use for the rolling calculations of $Beta$, $Std(ResidualAccrual)$, $Std(CFO)$, and $Std(IdioReturn)$. In column 4 of Panel C, we show the estimated regression coefficients using robust standard errors clustered by firm. We further estimate the regression coefficients using firm-specific Newey-West corrected standard errors, as shown in column 5 of Panel C. In both cases, the regression results are similar: after controlling for cash flow volatility and idiosyncratic return volatility, there is no association between residual accrual volatility and a firm's estimated market beta.

5. The association between residual accruals volatility and other cost of capital proxies

In this section, we re-examine the tests presented by Francis et al (2005) on the relation between residual accruals volatility and two accounting-based cost of capital measures, namely a firm's earnings-to-price ratio and its cost of debt.

5.1. Descriptive Statistics

In Table 4 Panel A, we present the descriptive statistics for the sample used in the earnings-to-price tests (58,027 firm-years) and the sample used in the cost of debt tests (67,049 firm-years). The mean value of *Std(ResidualAccrual)* is 0.035 for the E/P sample and 0.044 for the cost of debt sample. Francis et al (2005) report a mean value of 0.0442 for *Std(ResidualAccrual)*, which appears to be consistent with our sample. We also report the main variables of interest *Std(ResidualAccrual)*, *Std(CFO)*, and *Std(IdioReturn)* for both samples. The mean values across the two samples are consistent with all three variables exhibiting a high degree of correlation with each other. In the E/P sample, the means for *Std(ResidualAccrual)*, *Std(CFO)*, and *Std(IdioReturn)* are 0.035, 0.057, and 0.099 respectively; however, in the Cost of Debt sample, the means for the three variables are all higher at 0.044, 0.072, and 0.118 respectively. This pattern continues for the standard deviations, the lower and upper quartiles, and the medians as well.

For our E/P tests, the descriptive statistics for our main variable *IndEP* are quite similar to those of Francis et al (2005). In Table 4 Panel A, we report a mean and median value for *IndEP* of 0.006 and 0.000, while Francis et al (2005) report a mean and median for *IndEP* of 0.008 and 0.001. We also report a mean and median value for *Leverage* of 0.265 and 0.249, which is similar to the Francis et al (2005) values of 0.276 and 0.248. Our statistics differ from those of Francis et al (2005) with respect to the variables *Growth* (in book value of equity) and *Size*. For the variable *Growth*, we report mean and median values of 0.470 and 0.395, while Francis et al (2005) report analogous numbers of twice the magnitude (1.056 and 0.961). The opposite pattern holds for the variable *Size*. We report mean and median values of *Size* of 6.133 and 5.959, while the Francis et al (2005) statistics for *Size* are lower at 4.805 and 4.602.

For the cost of debt tests, our main variable *CostDebt* is extremely similar to that of Francis et al (2005). Francis et al (2005) report a *CostDebt* variable with a mean and median of 9.9% and 9.2%, whereas we report similar statistics of 10.0% and 8.7% in Table 4 Panel A. Francis et al (2005)'s *CostDebt* has a lower and upper quartile values of 7.4% and 11.4%, respectively, whereas we report analogous statistics of 7.0% and 10.9%, respectively, in Table 3 Panel A. The variables *Leverage* and *Size* were previously reported along with the E/P variables, but here in the cost of debt tests, values for *Leverage* are slightly larger, while values for *Size* are lower and closer to those reported in Francis et al (2005). Our mean value for *ROA* of 0.012 is higher than the mean value in Francis et al (2005) of 0.003, but the medians are similar in magnitude. The descriptive statistics for *IntCov* is not reported in Francis et al (2005), but the remaining variable *Std(NIBE)* is slightly lower than that reported in their study.

The correlations between *Std(ResidualAccrual)* and the operating variables *Std(CFO)* and *Std(IdioReturn)* are reported in Table 4 Panel B. For the E/P variables, *Std(ResidualAccrual)* exhibits a correlation of +0.66 with *Std(CFO)* and a correlation of +0.40 with *Std(IdioReturn)*. Both of these correlations are significant at the 1% level, and they are by far the largest correlations in the matrix. When examining the main E/P variable *IndEP*, we note that *IndEP* is more strongly correlated with the variables *Std(CFO)* and *Std(IdioReturn)* (with correlations of +0.10 and +0.09) than it is with *Std(ResidualAccrual)* (with a correlation of +0.07).

The strong correlations between *Std(ResidualAccrual)* and the operating variables *Std(CFO)* and *Std(IdioReturn)* are very similar for the cost of debt variables as well. In this case, the main variable *CostDebt* exhibits a stronger correlation with *Std(CFO)* of +0.06 than it does with *Std(ResidualAccrual)* of +0.05. It is important to note that the variable *Std(NIBE)* exhibits a correlation of +0.67 with *Std(CFO)* and a correlation of +0.35 with *Std(ResidualAccrual)*.

These correlations for $Std(NIBE)$ are the largest correlations in the entire matrix and are likely induced by the fact that net income is the sum of accruals and cash flows. To ensure that the relative explanatory power and significance of either $Std(ResidualAccrual)$ or $Std(CFO)$ is not induced “mechanically”, we remove $Std(NIBE)$ from the cost of debt regression in Table 6.

5.2. The association between residual accruals volatility and earnings-to-price ratio

Francis et al (2005) use a firm’s earnings-to-price (E/P) ratio as short-hand method of calculating a firm’s implied cost of equity capital. A higher E/P ratio is interpreted as a higher implied cost of equity capital. Specifically, we test whether residual accruals volatility explains industry-adjusted E/P ratios by replicating the following industry-adjusted E/P regressions presented in Francis et al (2005):

$$IndEP_{j,t} = \delta_{0,j} + \delta_1 Growth_{j,t} + \delta_2 Leverage_{j,t} + \delta_3 Beta_{j,t} + \delta_4 Size_{j,t} + \delta_5 Std(ResidualAccrual)_{j,t} + \zeta_{j,t}$$

where the variables are the same as those used by Francis et al (2005) and are defined in section 3 of this paper. We estimate an OLS regression with robust standard errors. The results are presented in column 1 of Table 5. Similar to Francis et al (2005), we find that $IndEP$ is negatively related to $Growth$, $Size$, and $Beta$, and positively related to $Leverage$. The magnitudes of the estimated coefficients are also similar to those reported in Francis et al (2005). Finally, we also find that the coefficient on residual accruals volatility $Std(ResidualAccrual)$ is positive and significant (with a coefficient of 0.114 and a t-statistic of 11.88). Francis et al (2005) cite this as evidence that firms with lower accruals quality have a higher average implied equity cost of capital.

We next explore how operating risk variables are associated with a firm's industry-adjusted earnings-to-price ratio. We first replace *Std(ResidualAccrual)* with *Std(CFO)* and *Std(IdioReturn)* in the regression. These two operating risk variables are intended to capture both historical variation and future expected variation in a firm's operating cash flows. The results of this modified OLS regression are presented in column 2 of Table 5. Again, we find similar coefficients on the *Growth*, *Size*, *Beta*, and *Leverage* variables. In addition, we find that the coefficients on both *Std(CFO)* and *Std(IdioReturn)* are positive and statistically significant. Therefore, these operating risk variables show a positive association with a firm's implied equity cost of capital.

Given that *Std(ResidualAccrual)*, *Std(CFO)* and *Std(IdioReturn)* are strongly inter-related, we next estimate an *IndEP* regression that includes all three of these volatility variables. The results of this full OLS regression are presented in column 3 of Table 5. We see that the coefficients on *Std(CFO)* and *Std(IdioReturn)* remain positive and strongly significant. However, the coefficient on *Std(ResidualAccrual)* is not significant at 0.001 with a t-statistic of 0.08. These findings are consistent with our argument that a firm's underlying operating risks (as captured by cash flow volatility and idiosyncratic return volatility) are related to its cost of capital. Moreover, after controlling for these operating risks, a firm's residual accruals volatility is unrelated to its earnings-to-price ratio.

5.3. *The association between cost of debt and residual accruals volatility*

Francis et al (2005) also test whether residual accruals volatility explains variation in a firm's realized cost of debt (*CostDebt*). We perform similar tests using the ratio of a firm's interest expense in year $t+1$ to average interest-bearing debt outstanding during years t and $t+1$

as a measure of the cost of debt. We test whether residual accruals volatility explains *CostDebt* using the following multiple regression which is similar to the regression in Francis et al (2005):

$$CostDebt_{j,t} = \theta_0 + \theta_1 Leverage_{j,t} + \theta_2 Size_{j,t} + \theta_3 ROA_{j,t} + \theta_4 IntCov_{j,t} + \theta_5 Std(ResidualAccrual)_{j,t} + \zeta_{j,t}$$

where the variables are the same as those used by Francis et al (2005) and are defined in section 3 of this paper. In contrast to Francis et al (2005), we initially exclude *Std(NIBE)* as an explanatory variable from our primary regressions. The reason for this exclusion is that earnings are comprised of cash flows and accruals and, therefore, earnings volatility is highly correlated with the volatilities of its underlying constituent parts. This is confirmed in Table 4 Panel B that shows that *Std(NIBE)* exhibits a correlation of +0.35 with *Std(ResidualAccrual)* and a correlation of +0.67 with *Std(CFO)*. Our concern is that we may bias against finding any explanatory power for *Std(ResidualAccrual)* due to issues of multicollinearity. However, as a robustness check, we also re-estimate the cost of debt regression and include *Std(NIBE)* as an explanatory variable.

We present OLS regression estimates with robust standard errors in Table 6. In column 1 of Table 6, we find similar coefficients to Francis et al (2005) on the control variables: *Leverage*, *Size*, *ROA*, and *IntCov*. We also find that the coefficient on *Std(ResidualAccrual)* is positive and significant. For *Std(ResidualAccrual)*, the coefficient is 0.002 and the t-statistic is 2.76. Again, Francis et al (2005) cite this as evidence that firms with lower “accruals quality” have a higher average realized cost of debt.

We next explore how operating risk variables are associated with a firm’s cost of debt. We first replace *Std(ResidualAccrual)* with *Std(CFO)* and *Std(IdioReturn)* in the cost of debt regression. Again, these two operating risk variables are intended to capture both historical

variation and future expected variation in a firm's operating cash flows. The results of this OLS regression are presented in column 2 of Table 6. We find similar coefficients on the control variables as those present in column 1. In addition, we find that the coefficient on *Std(CFO)* is positive and statistically significant. Therefore, operating risk is positively associated with a firm's realized cost of debt. We also find that the coefficient on *Std(IdioReturn)* is positive, albeit not significant.

Given the strong inter-relation between *Std(ResidualAccrual)*, *Std(CFO)* and *Std(IdioReturn)*, we next estimate a cost of debt regression that includes all three of these volatility variables. The results of this full regression are presented in column 3 of Table 6. We see that the coefficients on *Std(IdioReturn)* and *Std(CFO)* remain positive, and the coefficient on the latter remains significant. However, the coefficient on *Std(ResidualAccrual)* is now insignificant. For *Std(ResidualAccrual)*, the coefficient drops to 0.000, and the t-statistic is now 0.11. Finally, as a robustness check, we estimate a regression that also includes *Std(NIBE)* as an additional explanatory variable (for consistency with the tests in Francis et al, 2005). The results of this robustness check are presented in column 4 of Table 6. We see that the coefficients on *Std(IdioReturn)*, *Std(CFO)* and *Std(NIBE)* are all positive, and, most importantly, the coefficient on *Std(CFO)* remains statistically significant. Moreover, the coefficient on *Std(ResidualAccrual)* remains small and is not statistically significant.

These findings are again consistent with our argument that a firm's underlying operating risks are the primary determinants of its cost of debt capital. Moreover, after controlling for these operating risks, a firm's residual accruals volatility is unrelated to its accounting-based cost of debt..

6. The association between the “accruals quality factor” and other operating risk factors

Francis et al (2005) use a firm’s standard deviation of residual accruals to create an “accruals quality” risk factor; their study uses this variable in asset-pricing regressions to explain ex-post returns realizations. The “accruals quality” factor is created by using an “accruals quality” mimicking portfolio equal to the difference between the monthly excess returns on the top two quintiles of residual accruals volatility (Q4 and Q5) and the bottom two quintiles of residual accruals volatility (Q1 and Q2). Francis et al (2005) use this “accruals quality” risk factor in firm-specific asset-pricing regressions and claim to find a positive and statistically significant loading on this factor. However, Nichols (2006) and Core, Guay and Verdi (2006) question the validity of specifications of these asset-pricing tests using the residual accruals volatility “risk factor”. These studies show that in the presence of beta, size, and distress factors, a residual accruals volatility “risk factor” has limited ability to explain the cross-section of stock returns.

The purpose of our tests is to show that variation in the residual accruals volatility “risk factor” is largely driven by variation in similarly constructed factors based on firms’ cash flow volatilities and idiosyncratic return volatilities. We use the same procedure as Francis et al (2005) to construct factor-mimicking portfolios for a residual accruals volatility factor (i.e., the *ResidAccrual_{factor}*), a cash flow volatility factor (*CFO_{factor}*), and idiosyncratic return volatility factor (*Idio_{factor}*), as shown in Table 7. Each factor-mimicking portfolio is calculated using the difference between the 408 monthly excess returns on the top two quintiles of each volatility variable (Q4 and Q5) and the bottom two quintiles of each volatility variable (Q1 and Q2). This data series ranges from 1970 to 2004, which results in 34 years of data with 12 monthly observations per year in order to yield 408 total observations.

In Panel A of Table 7 we present the simple correlations between the returns to the $ResidAccrual_{factor}$, CFO_{factor} , and $Idio_{factor}$ mimicking portfolios as well as the returns to the market factor ($R_m - R_f$), and the Fama-French book-to-market and size factor mimicking portfolios (R_{HML} and R_{SMB}). While many of the factor returns are correlated, it is striking to see the very high positive correlations between the $ResidAccrual_{factor}$, CFO_{factor} , and $Idio_{factor}$ mimicking portfolios (>0.97). Given these high correlations, we next use a multiple regression to relate the time-series returns of the $ResidAccrual_{factor}$ mimicking portfolios to the returns to the CFO_{factor} and $Idio_{factor}$ mimicking portfolios. These results are presented in Panel B of Table 7. The most important statistic is the explanatory power of the regression. We see that over 96% of the variation in $ResidAccrual_{factor}$ (i.e., the supposed “accruals quality” factor) is explained by variation in the cash flow volatility and idiosyncratic return volatility factor mimicking portfolios. Overall, the variation in the $ResidAccrual_{factor}$ can be explained by simple operating factors that have little relation to the quality of a firm’s accounting information. In addition, these findings reinforce the asset-pricing results in Nichols (2006) which suggests that the residual accruals volatility “risk factor” does not behave like a traditional risk factor but instead picks up information already captured by macroeconomic variation in corporate cash flows.

8. Summary and conclusion

The effect of accounting quality on capital markets is an important area of research and it has potentially important implications for firms, investors, and policy makers. Francis, LaFond, Olsson and Schipper (2004 and 2005) attempt to provide empirical evidence on the capital market effects of accounting quality by testing the *joint hypothesis* that: (1) residual accruals volatility captures information risk, and (2) information risk affects a firm’s cost of capital. The

evidence in Francis et al (2005) suggests that residual accruals volatility is positively correlated with a firm's beta, earnings-to-price ratio, cost of debt, and expected future returns (through a priced "accruals quality" risk factor). However, there is also strong competing evidence that suggests an alternative interpretation -- that residual accruals volatility is neither a valid measure of accruals or earnings "quality" (e.g., Wysocki, 2005), nor is it a priced equity risk factor (e.g., Core, Guay and Verdi, 2006, and Nichols, 2006).

This study goes further and examines the empirical validity of and conclusions drawn from a broad range of the cost of capital tests presented in Francis et al (2005). We propose and test a simple, yet compelling, alternative explanation for the previous empirical findings; namely, residual accruals volatility is correlated with a firm's operating risk and operating risk is the true underlying factor associated with a firm's cost of capital. Our empirical results show that after controlling for operating risk characteristics such as a firm's cash flow and idiosyncratic stock return volatility, residual accruals volatility is *not* positively associated with beta, earnings-to-price ratio, or cost of debt. In addition, we show that over 96% of the time-series variation in the residual accruals volatility asset-pricing factor is explained by variation in operating risk factors related to cash flow volatility and idiosyncratic return volatility. Together, our findings suggest that residual accruals volatility is not a good measure of information risk nor does it display a robust association with a firm's cost of capital.

Core, Guay and Verdi (2006) and Nichols (2006) suggest that the "accruals quality risk factor" (created using cross-sectional dispersion in firms' residual accruals volatilities) is *not* a separate priced factor capturing information risk. This leaves open the possibility that residual accruals volatility can still capture information risk, but that this risk is already impounded in a firm's market beta. For example, Hughes, Liu and Liu (2005) and Lambert, Leuz and Verrecchia

(2006) predict that a *valid* measure of a firm's information risk should be associated with its market beta. However, we show that residual accruals volatility displays no association with market betas after controlling for cash flow volatility and idiosyncratic return volatility. While information risk may affect a firm's market beta, our findings suggest that residual accruals volatility is a poor candidate to proxy for information risk. Therefore, future research may find it fruitful to look elsewhere for proxies for information risk to test the hypothesis that information risk affects a firm's cost of capital.

Our empirical results also add to our understanding of the relation among measures of operating risk, operating volatility and a firm's observed cost of capital. Our findings on operating risk relate to the recent work of Minton and Schrand (1999), Minton, Schrand, and Walther (2002), Baginski and Whalen (2003), Barnes (2003), and Allayannis, Rountree, and Weston (2005). These papers highlight the fundamental connection between cash flow volatility, operating risk, and cost of capital.

Our paper also contributes to the growing literature on the relation between the idiosyncratic return volatility and future stock returns (see, for example, Merton, 1987; French, Schwert and Stambaugh, 1987; Malkiel and Xu, 2002; and Fu, 2005). Our study suggests that the idiosyncratic return volatility is associated with other cost of capital measures beyond just realized future stock returns. Future research on accruals and accounting quality may benefit from the insights provided by this prior research on operating risk and the cost of capital.

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Table 1 – Panel A
Sample Selection for Full Sample Tests

Sample selection procedure for full sample

Firm-years obtained (from the 2006 Compustat annual industrial and research files) with non-missing values of total assets (data#6).	307,263	
Firm-years with non-missing values of variables used in accruals expectation model, equation (1) (e.g., working capital accruals, cash flow from operations, lag and lead values of cash flow from operations, changes in revenues, and property, plant, and equipment, as calculated using Compustat balance sheet variables).	257,152	
Firm-years with non-missing residuals from accruals regression.	257,152	
Firm-years with values (for the current year and lag four years) of accrual regression residuals (to calculate the standard deviation of the residual, or $Std(ResidualAccrual)$) and CFO (to calculate the standard deviation of CFO, or $StdCFO$). The earliest and latest firm-years with $Std(ResidualAccrual)$ and $StdCFO$ are 1956 and 2004.	176,464	
Firm-years (from previous sample of 176,464) from the time period of 1970 to 2004.	159,055	
Firm-years with NPERMNO identifier on CRSP.	126,154	
Firm-years with non-missing values of $Beta$ and $Std(IdioReturn)$, from firm-year CAPM regressions over a CRSP pre-formation window. A firm in year t must have at least 18 monthly returns in the CRSP pre-formation window (i.e., the 36-month return period ending June $t+1$) in order to conduct the firm-year CAPM regression $R_i - R_f = a + Beta*(R_{mkt} - R_f) + i$. The coefficient $Beta$ is the firm-year $Beta$, and the standard deviation of the idiosyncratic returns i is the firm-year $Std(IdioReturn)$. Firm-years also used to calculate $OrthStd(IdioReturn)_{\mu_{i,t}}$, which is the firm-year residual from the regression $Std(IdioReturn)_{i,t} = a + b(Std(CFO))_{j,t} + \mu_{j,t}$.	90,013	<p>Full Sample (Used to Assign Decile Ranks)</p> <p>See Tables 2 and 3</p>

Table 1 – Panel B
Sample Selection for Earnings-to-Price and Cost of Debt Tests

Earnings-to-Price Ratio (E/P) Sample Selection

Firm-years in full sample (from Panel A), with firm-year values of <i>Std(ResidualAccrual)</i> , <i>Std(CFO)</i> , <i>Beta</i> , <i>Std(IdioReturn)</i> , and <i>OrthStd(IdioReturn)</i> .	90,013	from Table 1 Panel A
*Note that all 307,263 firm-year observations were used to calculate each of the following variables (for both the E/P tests and Cost of debt tests), meaning that we do not delete observations during the calculation process. We delete observations when performing the test, as follows:		
Remaining firm-years with industry-adjusted earnings/price ratio (<i>IndEP</i>).	68,797	
Remaining firm-years with non-missing values of <i>Growth</i> in book value of equity.	67,425	
Remaining firm-years with non-missing values of <i>Leverage</i> .	58,027	
Remaining firm-years with non-missing values of <i>Beta</i> from the firm-year CAPM regressions.	58,027	
Remaining firm-years with non-missing values of <i>Size</i> .	58,027	Tables 3 & 4

Cost of Debt Sample Selection

Firm-years in full sample (from Panel A), with firm-year values of <i>Std(ResidualAccrual)</i> , <i>Std(CFO)</i> , <i>Beta</i> , <i>Std(IdioReturn)</i> , and <i>OrthStd(IdioReturn)</i> .	90,013	from Table 1 Panel A
*Note that all 307,263 firm-year observations were used to calculate each of the following variables (for both the E/P tests and Cost of debt tests), meaning that we do not delete observations during the calculation process. We delete observations when performing the test, as follows:		
Remaining firm-years with non-missing values of cost of debt (<i>CostDebt</i>).	68,623	
Remaining firm-years with non-missing values of <i>Leverage</i> .	68,623	
Remaining firm-years with non-missing values of <i>Size</i> .	68,623	
Remaining firm-years with non-missing values of return on assets (<i>ROA</i>).	68,623	
Remaining firm-years with interest coverage (<i>IntCov</i>).	68,623	
Remaining firm-years with values (for the current year and lag four years) of net income before extraordinary items (to calculate the standard deviation of net income or <i>Std(NIBE)</i>).	67,049	Tables 3 & 5

Table 2
Association Between Residual Accruals Volatility and Operating Volatility

This table presents descriptive correlation and regressions of the association between firm-year standard deviation of residual accruals volatility ($Std(ResidualAccrual)$), standard deviation of cash flow from operations ($Std(CFO)$), and standard deviation of idiosyncratic stock returns ($Std(IdioReturn)$). Each variable is constructed based on its annual decile rank of the underlying variable. $Std(ResidualAccrual)$ is a firm-year observation of “accruals quality” in year t , measured as the 5-year standard deviation of residuals (e.g., $v_{j,t}$, $v_{j,t-1}$, $v_{j,t-2}$, $v_{j,t-3}$, $v_{j,t-4}$) from firm-year regressions of the modified DD model $TCA_{j,t} = \Phi_{0,j} + \Phi_{1,j}CFO_{j,t-1} + \Phi_{2,j}CFO_{j,t} + \Phi_{3,j}CFO_{j,t+1} + \Phi_{4,j}\Delta Rev_{j,t} + \Phi_{5,j}PPE_{j,t} + v_{j,t}$ (see, Dechow and Dichev, 2002; McNichols, 2002; Francis, LaFond, Olsson, and Schipper, 2005). $Std(CFO)$ is the 5-year standard deviation of cash flow from operations (e.g., $CFO_{j,t}$, $CFO_{j,t-1}$, $CFO_{j,t-2}$, $CFO_{j,t-3}$, $CFO_{j,t-4}$), as calculated from the balance sheet. A firm-year standard deviation of idiosyncratic returns i ($Std(IdioReturn)$) is calculated for year t using monthly stock returns for the 36-month period ending June $t+1$ (a firm-year observation is included if there are at least 18 months of returns) and the market model regression $R_i - R_f = a + Beta*(R_{mkt} - R_f) + i$. The sample consists of 90,013 firm-year observations between 1970 and 2004.

Panel A – Correlations between $Std(ResidualAccrual)$, $Std(CFO)$, and $Std(IdioReturn)$

	$Std(ResidualAccrual)$	$Std(CFO)$
$Std(CFO)$	0.71**	
$Std(IdioReturn)$	0.53**	0.53**

** indicates significance at the 1% level

Panel B – Regression test of determinants of residual accruals volatility

$$Regression\ Model: Std(ResidualAccrual)_{i,t} = \alpha + \beta_1 * Std(CFO)_{i,t} + \beta_2 Std(IdioReturn)_{i,t}$$

$Intercept$	0.86 (64.47)**
$Std(CFO)$	0.60 (224.63)**
$Std(IdioReturn)$	0.21 (77.47)**
$\# Obs$	90,013
$Adj. R^2$	53.6%

* and ** indicate significance at 5% and 1% level, respectively.

Table 3 – Panel A and B
Association Between CAPM Beta, Operating Volatility and “Accruals Quality”

This table presents descriptive statistics and regressions of the association between firm-year CAPM market *Beta*, standard deviation of residual accruals volatility (*Std(ResidualAccrual)*), standard deviation of cash flow from operations (*Std(CFO)*), and standard deviation of idiosyncratic stock returns (*Std(IdioReturn)*). The firm-year variables are annual decile ranks of the underlying variables. A firm-year CAPM *Beta* and firm-year standard deviation of idiosyncratic returns *i* (*Std(IdioReturn)*) is calculated for year *t* using monthly stock returns for the 36-month period ending June *t+1* (a firm-year observation is included if there are at least 18 months of returns) and the market model regression $R_i - R_f = a + \text{Beta} * (R_{mkt} - R_f) + i$. *OrthStd(IdioReturn)* $\mu_{j,t}$ is the firm-year residual from the regression $\text{Std(IdioReturn)}_{j,t} = a + b(\text{Std(CFO)})_{j,t} + \mu_{j,t}$. *Std(ResidualAccrual)* is a firm-year observation of “accruals quality” in year *t*, measured as the 5-year standard deviation of residuals (e.g., $v_{j,t}, v_{j,t-1}, v_{j,t-2}, v_{j,t-3}, v_{j,t-4}$) from firm-year regressions of the modified DD model $TCA_{j,t} = \Phi_{0,j} + \Phi_{1,j}CFO_{j,t-1} + \Phi_{2,j}CFO_{j,t} + \Phi_{3,j}CFO_{j,t+1} + \Phi_{4,j}\Delta Rev_{j,t} + \Phi_{5,j}PPE_{j,t} + v_{j,t}$ (see, Dechow and Dichev, 2002; McNichols, 2002; Francis, LaFond, Olsson, and Schipper, 2005). *Std(CFO)* is the 5-year standard deviation of cash flow from operations (e.g., $CFO_{j,t}, CFO_{j,t-1}, CFO_{j,t-2}, CFO_{j,t-3}, CFO_{j,t-4}$), as calculated from the balance sheet. The sample consists of 90,013 firm-year observations between 1970 and 2004.

Panel A – Average *Beta* across *Std(ResidualAccrual)*, *Std(CFO)*, and *Std(IdioReturn)* quintiles

Quintiles based on <i>Std(ResidualAccrual)</i> - “Accruals Quality”					
	<i>Lo Std</i>				<i>Hi Std</i>
	<i>Q1</i>	<i>Q2</i>	<i>Q3</i>	<i>Q4</i>	<i>Q5</i>
Average <i>Beta</i>	0.83	1.01	1.12	1.21	1.33
Quintiles based on <i>Std(CFO)</i>					
	<i>Lo Std</i>				<i>Hi Std</i>
	<i>Q1</i>	<i>Q2</i>	<i>Q3</i>	<i>Q4</i>	<i>Q5</i>
Average <i>Beta</i>	0.82	1.00	1.09	1.21	1.39
Quintiles based on <i>Std(IdioReturn)</i>					
	<i>Lo Std</i>				<i>Hi Std</i>
	<i>Q1</i>	<i>Q2</i>	<i>Q3</i>	<i>Q4</i>	<i>Q5</i>
Average <i>Beta</i>	0.67	0.89	1.09	1.29	1.56

Panel B – Correlations between *Beta*, *Std(ResidualAccrual)*, *Std(CFO)*, and *Std(IdioReturn)*

	<i>Beta</i>	<i>Std(ResidualAccrual)</i>	<i>Std(CFO)</i>	<i>Std(IdioReturn)</i>
<i>Std(ResidualAccrual)</i>	0.12**			
<i>Std(CFO)</i>	0.21**	0.71**		
<i>Std(IdioReturn)</i>	0.31**	0.53**	0.53**	
<i>Orth Std(IdioReturn)</i>	0.24**	0.18**	0.00	0.85**

** indicates significance at the 1% level

Table 3 – continued

Panel C – Multiple Regression Determinants of CAPM *Beta*

The sample consists of 90,013 firm-year observations between 1970 and 2004. Several firm variables for year t are calculated over a rolling 5-year window (of years t , $t-1$, $t-2$, $t-3$, and $t-4$), which creates “overlap” for firms with more than 5 years of data. To mitigate “overlap” in firm-year observations, we include every 5th fiscal year for each firm in the “non-overlap” sample, which consists of 22,698 firm-year observations. t -statistics are reported parentheses. The firm-year variables $Beta$, $Std(ResidualAccrual)$, $Std(CFO)$, and $Std(IdioReturn)$ are annual decile ranks. The robust standard errors use a Huber-White correction for general heteroscedasticity in the standard errors. The Newey-West correction to the standard errors involves specifying four fiscal year lags for each firm.

$$Beta_{it} = \alpha + \gamma_1 Std(ResidualAccrual)_{it} + \gamma_2 Std(CFO)_{it} + \gamma_3 Std(IdioReturn)_{it} + \varepsilon_{it}$$

Variable	Pooled OLS Rank Regression (Non-overlapping sample variables taken every 5th year)			Robust standard errors (Annual overlapping variables)	Newey-West standard errors (Annual overlapping variables)
	(1)	(2)	(3)	(4)	(5)
<i>Std(ResidualAccrual)</i>	0.237 (36.10)**		0.002 (0.22)	0.003 (0.70)	0.003 (0.50)
<i>Std(CFO)</i>		0.044 (6.06)**	0.042 (4.70)**	0.040 (8.74)**	0.040 (6.23)**
<i>Std(IdioRet)</i>		0.396 (54.77)**	0.396 (53.22)**	0.380 (101.92)**	0.380 (67.70)**
<i>Adj R²</i>	5.4%	17.2%	17.2%	16.4%	16.4%
<i>#Obs</i>	22,698	22,698	22,698	90,013	90,013

* and ** indicated significance at 5% and 1% levels, respectively.

Table 4 – Panel A
Descriptive Statistics for E/P and Cost of Debt Tests

Variable Definitions: *Std(ResidualAccrual)* is a firm-year observation of “accruals quality” in year t , measured as the 5-year standard deviation of residuals (e.g., $v_{j,t}, v_{j,t-1}, v_{j,t-2}, v_{j,t-3}, v_{j,t-4}$) from firm-year regressions of the modified DD model $TCA_{j,t} = \Phi_{0,j} + \Phi_{1,j}CFO_{j,t-1} + \Phi_{2,j}CFO_{j,t} + \Phi_{3,j}CFO_{j,t+1} + \Phi_{4,j}\Delta Rev_{j,t} + \Phi_{5,j}PPE_{j,t} + v_{j,t}$ (see, Dechow and Dichev, 2002; McNichols, 2002; Francis, LaFond, Olsson, and Schipper, 2005). *Std(CFO)* is the 5-year standard deviation of cash flow from operations (e.g., $CFO_{j,t}, CFO_{j,t-1}, CFO_{j,t-2}, CFO_{j,t-3}, CFO_{j,t-4}$), as calculated from the balance sheet. *Std(IdioReturn)* is a firm-year standard deviation of idiosyncratic returns i , calculated for year t using monthly stock returns for the 36-month period ending June $t+1$ (a firm-year observation is included if there are at least 18 months of returns) from the market model regression $R_i - R_f = a + Beta*(R_{mkt} - R_f) + i$.

Variable Definitions for Earnings-to-Price (E/P) Tests: $IndEP_{j,t} = (E/P - median\ E/P)$, where $E/P = (data\#58 / data\#199)$ and E/P is greater than 0 and less than 1, where *median E/P* is the median value of E/P (fitting the previous criteria) for each fiscal year for each of the 48 Fama and French (1997) industry groups. $Growth_{j,t} = \log(1 + ((data\#60_t / data\#60_{t-4}) - 1))$. $Leverage_{j,t} = (data\#9 + data\#34) / data\#6$, for firm-years with positive values of components. $Beta_{j,t}$ is calculated from the firm-year CAPM regression shown above. $Size_{j,t} = \log(data\#6)$.

Variable Definitions for Cost of Debt Tests: $CostDebt_{j,t} = (data\#15_{t+1}) / [((data\#9_t + data\#34_t) + (data\#9_{t+1} + data\#34_{t+1})) / 2]$ for firm-years with positive values of components. $Leverage_{j,t} = (data\#9 + data\#34) / data\#6$, for firm-years with positive values of components. $Size_{j,t} = \log(data\#6)$. $ROA_{j,t} = data\#18 / data\#6$. $IntCov_{j,t} = data\#18 / data\#15$ for firm-years with positive values of $data\#15$. $Std(NIBE)_{j,t}$ = standard deviation of $NIBE_{j,t}, NIBE_{j,t-1}, NIBE_{j,t-2}, NIBE_{j,t-3}, NIBE_{j,t-4}$, where net income before extraordinary items $NIBE = data\#18 / data\#6$.

	Mean	Standard Deviation	Lower Quartile	Median	Upper Quartile
<u>E/P Variables (N= 58,027 firm-years)</u>					
<i>Std(ResidualAccrual)</i>	0.035	0.034	0.015	0.025	0.044
<i>Std(CFO)</i>	0.057	0.054	0.025	0.043	0.071
<i>Std(IdioReturn)</i>	0.099	0.054	0.064	0.087	0.120
<i>IndEP</i>	0.006	0.053	-0.020	0.000	0.023
<i>Growth</i>	0.470	0.617	0.175	0.395	0.691
<i>Leverage</i>	0.265	0.168	0.137	0.249	0.369
<i>Beta</i>	1.034	0.696	0.586	0.992	1.411
<i>Size</i>	6.133	2.057	4.591	5.959	7.537
<u>Cost of Debt Variables (N= 67,049 firm-years)</u>					
<i>Std(ResidualAccrual)</i>	0.044	0.044	0.017	0.030	0.054
<i>Std(CFO)</i>	0.072	0.087	0.028	0.049	0.085
<i>Std(IdioReturn)</i>	0.118	0.076	0.070	0.099	0.142
<i>CostDebt</i>	0.102	0.537	0.070	0.087	0.109
<i>Leverage</i>	0.304	0.232	0.162	0.281	0.408
<i>Size</i>	5.736	2.020	4.238	5.573	7.104
<i>ROA</i>	0.012	0.203	0.009	0.039	0.068
<i>IntCov</i>	2.466	150.486	0.270	1.551	4.115
<i>Std(NIBE)</i>	0.045	0.117	0.011	0.023	0.048

Table 4 – Panel B
Pearson Correlations for E/P and Cost of Debt Tests

Variable Definitions: *Std(ResidualAccrual)* is a firm-year observation of “accruals quality” in year t, measured as the 5-year standard deviation of residuals (e.g., $v_{j,t}$, $v_{j,t-1}$, $v_{j,t-2}$, $v_{j,t-3}$, $v_{j,t-4}$) from firm-year regressions of the modified DD model $TCA_{j,t} = \Phi_{0,j} + \Phi_{1,j}CFO_{j,t-1} + \Phi_{2,j}CFO_{j,t} + \Phi_{3,j}CFO_{j,t+1} + \Phi_{4,j}\Delta Rev_{j,t} + \Phi_{5,j}PPE_{j,t} + v_{j,t}$ (see, Dechow and Dichev, 2002; McNichols, 2002; Francis, LaFond, Olsson, and Schipper, 2005). *Std(CFO)* is the 5-year standard deviation of cash flow from operations (e.g., $CFO_{j,t}$, $CFO_{j,t-1}$, $CFO_{j,t-2}$, $CFO_{j,t-3}$, $CFO_{j,t-4}$), as calculated from the balance sheet. *Std(IdioReturn)* is a firm-year standard deviation of idiosyncratic returns i , calculated for year t using monthly stock returns for the 36-month period ending June t+1 (a firm-year observation is included if there are at least 18 months of returns) from the CAPM regression $R_i - R_f = a + \text{Beta}*(R_{mkt} - R_f) + i$.

Variable Definitions for Earnings-to-Price (E/P) Tests: $IndEP_{j,t} = (E/P - \text{median } E/P)$, where $E/P = (\text{data}\#58 / \text{data}\#199)$ and E/P is greater than 0 and less than 1, where *median E/P* is the median value of E/P (fitting the previous criteria) for each fiscal year for each of the 48 Fama and French (1997) industry groups. $Growth_{j,t} = \log(1 + ((\text{data}\#60_t / \text{data}\#60_{t-4}) - 1))$. $Leverage_{j,t} = (\text{data}\#9 + \text{data}\#34) / \text{data}\#6$, for firm-years with positive values of components. $Beta_{j,t}$ is calculated from the firm-year CAPM regression shown above. $Size_{j,t} = \log(\text{data}\#6)$.

Variable Definitions for Cost of Debt Tests: $CostDebt_{j,t} = (\text{data}\#15_{t+1}) / [((\text{data}\#9_t + \text{data}\#34_t) + (\text{data}\#9_{t+1} + \text{data}\#34_{t+1})) / 2]$ for firm-years with positive values of components. $Leverage_{j,t} = (\text{data}\#9 + \text{data}\#34) / \text{data}\#6$, for firm-years with positive values of components. $Size_{j,t} = \log(\text{data}\#6)$. $ROA_{j,t} = \text{data}\#18 / \text{data}\#6$. $IntCov_{j,t} = \text{data}\#18 / \text{data}\#15$ for firm-years with positive values of $\text{data}\#15$. $Std(NIBE)_{j,t}$ = standard deviation of $NIBE_{j,t}$, $NIBE_{j,t-1}$, $NIBE_{j,t-2}$, $NIBE_{j,t-3}$, $NIBE_{j,t-4}$, where net income before extraordinary items $NIBE = \text{data}\#18 / \text{data}\#6$.

E/P Variables (N= 58,027 firm-years)

	<i>Std</i> (<i>Residual</i> <i>Accrual</i>)	<i>Std</i> (<i>Idio</i> <i>Return</i>)	<i>IndEP</i>	<i>Growth</i>	<i>Leverage</i>	<i>Beta</i>	
<i>Std(CFO)</i>	0.66*						
<i>Std(IdioReturn)</i>	0.40*	0.37*					
<i>IndEP</i>	0.07*	0.10*	0.09*				
<i>Growth</i>	0.04*	0.06*	0.07*	-0.02*			
<i>Leverage</i>	-0.01	0.02*	-0.01	0.04*	-0.11*		
<i>Beta</i>	0.08*	0.14*	0.31*	0.00	0.13*	-0.05*	
<i>Size</i>	-0.24*	-0.28*	-0.43*	-0.04*	-0.01	0.08*	-0.17*

Cost of Debt Variables (N= 67,049 firm-years)

	<i>Std</i> (<i>Residual</i> <i>Accrual</i>)	<i>Std</i> (<i>Idio</i> <i>Return</i>)	<i>Cost</i> <i>Debt</i>	<i>Leverage</i>	<i>Size</i>	<i>ROA</i>	<i>IntCov</i>
<i>Std(CFO)</i>	0.61*						
<i>Std(IdioReturn)</i>	0.45*	0.42*					
<i>CostDebt</i>	0.05*	0.06*	0.04*				
<i>Leverage</i>	0.08*	0.11*	0.10*	-0.02*			
<i>Size</i>	-0.29*	-0.30*	-0.43*	-0.03*	0.04*		
<i>ROA</i>	-0.32*	-0.49*	-0.31*	-0.06*	-0.21*	0.17*	
<i>IntCov</i>	-0.03*	-0.07*	-0.04*	-0.01	-0.02*	0.02*	0.15*
<i>StdNIBE</i>	0.35*	0.67*	0.31*	0.04*	0.04*	-0.20*	-0.07*

* indicates significance at 1% level

Table 5
Association between E/P Ratio, Residual Accruals Volatility, and Operating Volatilities

This table presents regressions relating earnings-to-price (E/P) ratios, “accruals quality” ($Std(ResidualAccrual)$), standard deviation of cash flow from operations ($Std(CFO)$), and standard deviation of idiosyncratic returns i ($Std(IdioReturn)$) in the following regression from Francis, LaFond, Olsson, and Schipper (2005):

$$IndEP_{j,t} = \delta_{0j} + \delta_1 Growth_{j,t} + \delta_2 Leverage_{j,t} + \delta_3 Beta_{j,t} + \delta_4 Size_{j,t} + \delta_5 AQ_{j,t} + \zeta_{j,t}$$

Variable Definitions: $IndEP_{j,t} = (E/P - median\ E/P)$, where $E/P = (data\#58 / data\#199)$ and E/P is greater than 0 and less than 1, where *median E/P* is the median value of E/P (fitting the previous criteria) for each fiscal year for each of the 48 Fama and French (1997) industry groups. $Growth_{j,t} = \log(1 + ((data\#60_t / data\#60_{t-4}) - 1))$. $Leverage_{j,t} = (data\#9 + data\#34) / data\#6$, for firm-years with positive values of components. $Beta_{j,t}$ is calculated from the firm-year CAPM regression shown above. $Size_{j,t} = \log(data\#6)$. Yearly decile rankings of the firm-year variables are used for $Std(ResidualAccrual)$, $Std(CFO)$, and $Std(IdioReturn)$.

Note: In this table only, the coefficients have been adjusted by a factor of 100 for ease of interpretation.

Variable	Dependent Variable is Industry-Adjusted Earnings-to-Price Ratio (<i>IndEP</i>)		
	(OLS regressions with robust standard errors)		
	(1)	(2)	(3)
<i>Intercept</i>	0.487 (4.40)**	-0.417 (3.36)**	-0.418 (3.37)**
<i>Growth</i>	-0.128 (2.59)**	-0.176 (3.51)**	-0.176 (3.51)**
<i>Leverage</i>	1.249 (7.71)**	1.064 (6.67)**	1.065 (6.68)**
<i>Beta</i>	-0.052 (1.31)	-0.205 (5.08)**	-0.204 (5.03)**
<i>Size</i>	-0.083 (7.25)**	0.017 (1.29)	0.017 (1.28)
<i>Std(ResidualAccrual)_Decile</i>	0.114 (11.88)**		0.001 (0.08)
<i>StdCFO_Decile</i>		0.109 (10.27)**	0.108 (7.89)**
<i>Std(IdioReturns)_Decile</i>		0.151 (12.04)**	0.151 (11.42)**
<i>#Obs</i>	58,027	58,027	58,027
<i>Adj. R²</i>	0.6%	1.1%	1.1%

* and ** indicate significance at 5% and 1% levels, respectively

Table 6
Association between Cost of Debt, Residual Accruals
Volatility, and Operating Volatilities

This table presents regressions relating Cost of Debt (*CostDebt*), “accruals quality” (*Std(ResidualAccrual)*), standard deviation of cash flow from operations (*Std(CFO)*), and standard deviation of idiosyncratic returns (*Std(IdioReturn)*) in the following regression from Francis, LaFond, Olsson, and Schipper (2005):

$$CostDebt_{j,t} = \theta_0 + \theta_1Leverage_{j,t} + \theta_2Size_{j,t} + \theta_3ROA_{j,t} + \theta_4IntCov_{j,t} + \theta_5Std(NIBE) + \theta_6AQ_{j,t} + \zeta_{j,t}$$

Variable Definitions *CostDebt*_{*j,t*} = (data#15_{*t+1*}) / [(data#9_{*t*} + data#34_{*t*}) + (data#9_{*t+1*} + data#34_{*t+1*}) / 2] for firm-years with positive values of components. *Leverage*_{*j,t*} = (data#9 + data#34) / data#6, for firm-years with positive values of components. *Size*_{*j,t*} = log(data#6). *ROA*_{*j,t*} = data#18 / data#6. *IntCov*_{*j,t*} = data#18 / data#15 for firm-years with positive values of data#15. *Std(NIBE)*_{*j,t*} = standard deviation of *NIBE*_{*j,t*}, *NIBE*_{*j,t-1*}, *NIBE*_{*j,t-2*}, *NIBE*_{*j,t-3*}, *NIBE*_{*j,t-4*}, where net income before extraordinary items NIBE = data#18 / data#6.

Variable	Dependent Variable is Realized Cost of Debt			
	OLS regressions with robust standard errors			
	(1)	(2)	(3)	(4)
<i>Intercept</i>	0.139 (9.01)**	0.129 (6.47)**	0.129 (6.46)**	0.125 (7.81)**
<i>Leverage</i>	-0.082 (2.71)**	-0.084 (2.81)**	-0.084 (2.81)**	-0.083 (2.77)**
<i>Size</i>	-0.003 (4.25)**	-0.002 (2.03)*	-0.002 (2.02)*	-0.002 (2.28)*
<i>ROA</i>	-0.155 (1.58)	-0.153 (1.55)	-0.153 (1.55)	-0.145 (1.55)
<i>IntCov</i>	0.000 (0.23)	0.000 (0.28)	0.000 (0.28)	0.000 (0.33)
<i>Std(NIBE)</i>				0.040 (0.94)
<i>Std(ResidualAccrual)_Decile</i>	0.002 (2.76)**		0.000 (0.11)	0.000 (0.52)
<i>StdCFO_Decile</i>		0.003 (5.13)**	0.003 (5.59)**	0.003 (3.47)**
<i>Std(IdioReturns)_Decile</i>		0.000 (0.53)	0.000 (0.52)	0.000 (1.13)
<i>#Obs</i>	67,049	67,049	67,049	67,049
<i>Adj. R²</i>	0.5%	0.5%	0.5%	0.5%

* and ** indicate significance at 5% and 1% levels, respectively

Table 7
Association between “Accruals Quality Factor” and Other Factors

This table presents correlations and regressions on the association between the “accruals quality” factor ($ResidAccrual_{factor}$), standard deviation of cash flow from operations factor (CFO_{factor}), standard deviation of idiosyncratic returns factor ($Idio_{factor}$), and other factors ($(R_{mkt}-R_f)$, R_{HML} , and R_{SMB}). The $ResidAccrual_{factor}$ is calculated based on a firm’s standard deviation of the residual accruals. For each fiscal year t , firms are placed into quintiles based on values of the standard deviation of the residual for year t , with quintile one (five) holding firms with the lowest (highest) standard deviation of the residual for year t (thereby exhibiting the highest (lowest) “accruals quality”). Each firm in the quintiles of year t is matched up with its monthly returns for the 12-month period of July $t+1$ to June $t+2$. For each month from July $t+1$ to June $t+2$, we calculate the equal-weighted monthly returns for each quintile. For each month from July $t+1$ to June $t+2$, we calculate the average of the returns for quintile 4 and 5 (with the highest standard deviation of the residual), and then we subtract the average of the returns for quintile 1 and 2 (with the lowest standard deviation of residual accruals); the difference in the returns of these quintiles is the $ResidAccrual_{factor}$. Based on the standard deviation of the residual in year t , we calculate a monthly $ResidAccrual_{factor}$ for each month from July $t+1$ to June $t+2$. Using identical methods and information in year t , we also calculate a CFO_{factor} (based on the standard deviation of CFO) and an $Idio_{factor}$ (based on the standard deviation of idiosyncratic returns i , which is calculated for year t using monthly stock returns for the 36-month period ending June $t+1$ using the market model regression $R_i - R_f = a + Beta*(R_{mkt}-R_f) + i$). We obtain monthly data for the risk free rate (R_f), the market factor ($R_{mkt}-R_f$), the book to market factor (R_{HML}), and the size factor (R_{SMB}) from CRSP. *Note:* Firm-years with non-missing values of $Std(ResidualAccrual)$ span the time period of 1970-2004, or 34 years. Since a firm’s fiscal year t is matched with monthly returns for the 12-month period of July $t+1$ to June $t+2$, the sample for the factor tests contain 408 monthly observations (34 years * 12 months).

Panel A – Pearson Correlations (N = 408 months)

	$ResidAccrual_{factor}$	CFO_{factor}	$Idio_{factor}$	R_m-R_f	R_{HML}
CFO_{factor}	0.98**				
$Idio_{factor}$	0.97**	0.97**			
R_m-R_f	0.43**	0.44**	0.49**		
R_{HML}	-0.49**	-0.49**	-0.47**	-0.45**	
R_{SMB}	0.73**	0.73**	0.74**	0.26**	-0.29**

** indicates significance at 1% level.

Panel B – Regression test of the association between $ResidAccrual_{factor}$ and operating risk factors

$$Regression\ Model: ResidAccrual_{factor,t} = \alpha + \beta_1 CFO_{factor,t} + \beta_2 Idio_{factor,t}$$

<i>Intercept</i>	0.00 (0.15)
CFO_{factor}	0.59** (15.03)
$Idio_{factor}$	0.25** (9.05)
<i># monthly observations</i>	408
<i>Adj. R²</i>	96.2%

* and ** indicate significance at 5% and 1% level, respectively.