Does the Accounting Hedge Ineffectiveness Measure under SFAS 133 Capture the Economic Ineffectiveness of a Firm’s Hedging Activities?

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Abstract
A key criterion for applying hedge accounting under SFAS 133 is the demonstration of hedge effectiveness. Retrospective assessment of hedge effectiveness may reveal hedge ineffectiveness – the extent to which a gain (loss) on the hedging derivative is not offset by a corresponding loss (gain) on the hedged item. SFAS 133 requires that this accounting measure of hedge ineffectiveness be reported in current period earnings. This paper examines whether the SFAS 133-mandated accounting measure of hedge ineffectiveness captures the economic ineffectiveness of a firm’s hedging activities. We find that, among hedge accounting users, firms reporting large hedge ineffectiveness gains/losses have (1) greater risk exposure to changes in interest rates and commodity prices, (2) higher forward-looking, market-implied default risk, and (3) higher implied cost of equity capital than those reporting small hedge ineffectiveness gains/losses. Our findings suggest that the accounting hedge ineffectiveness measure mandated by SFAS 133 is informative about the effectiveness of a firm’s risk management activities and thus is useful to financial statement users for assessing the firm’s underlying risk and the effectiveness of its risk management activities. Our findings also imply that standard setters should continue to require the disclosure of hedge ineffectiveness gains/losses.

Keywords: Hedge Effectiveness, Derivatives, Risk Relevance, SFAS 133, Standard Setting.

Data Availability: Data used in this study are available from the sources identified in the study.
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I. INTRODUCTION

Statement of Financial Accounting Standards No. 133 (SFAS 133), *Accounting for Derivative Instruments and Hedging Activities*, became effective in 2001. A key criterion for applying hedge accounting under SFAS 133 is the demonstration of hedge effectiveness. Retrospective assessment of hedge effectiveness may reveal hedge ineffectiveness – the extent to which a gain (loss) on the hedging derivative is not offset by a corresponding loss (gain) on the hedged item. SFAS 133 requires that this accounting measure of hedge ineffectiveness be reported in current period earnings. A decade after the adoption of SFAS 133, the accounting literature has provided little evidence on whether the accounting measure of hedge ineffectiveness (i.e., hedge ineffectiveness gains/losses) reflects a firm’s risk management activities and the extent to which these activities are successful. We fill this void in the literature by investigating whether the SFAS 133-mandated accounting hedge ineffectiveness measure captures the economic ineffectiveness of a firm’s hedging activities.

Our research question is important because whether retrospective assessment of hedge effectiveness and disclosure of hedge ineffectiveness required by SFAS 133 is necessary and provides useful information is controversial. First, many firms doubt the necessity of such an assessment and disclosure, claiming that such information is immaterial and the benefit of its disclosure is unclear while periodic calculation of hedge ineffectiveness imposes undue operational stress for hedge accounting users.\(^1\) On the other hand, users of financial reports

\(^1\) For example, see the comment letter submitted by Johnson & Johnson (2008) to FASB among many others.
believe such disclosure is useful for assessing the effectiveness of firms’ risk management activities.²

Second, critics have long questioned the usefulness of retrospective hedge effectiveness assessment and periodic reporting of hedge ineffectiveness gains/losses in net income. For example, some argue that the SFAS 133-mandated accounting hedge ineffectiveness measure has inherent weaknesses that limit its ability to capture the economic substance of firms’ hedging activities (see more detailed discussion in the hypothesis development section). Moreover, SFAS 133 allows considerable managerial discretion in assessing and measuring hedge effectiveness, which leads to skepticism on the comparability and reliability of the reported accounting hedge ineffectiveness measure.

Third, the FASB and the IASB differ in their recent hedge accounting revision proposals regarding whether retrospective assessment of hedge effectiveness should be required. While the IASB proposes to eliminate the retrospective assessment of hedge effectiveness, the FASB rejects such a proposal.³

Given the criticism and skepticism on the usefulness of the accounting hedge ineffectiveness measure, empirical evidence in this regard is much needed and can provide insight on whether the reported accounting hedge ineffectiveness measure is informative about the effectiveness of a firm’s risk management activities and thus on whether the reported accounting hedge ineffectiveness measure should be maintained as a mandatory disclosure.

² For example, CFA Institute (2008), the largest and most influential association of investment professionals, strongly opposes eliminating periodic retrospective assessment of hedge effectiveness, arguing such information contributes to the transparency of firms’ performance in risk management and underlying risk exposures.
³ IASB (2010) proposes revisions to hedge accounting including elimination of the requirement of retrospective hedge effectiveness assessment (and thus the periodic reporting of accounting hedge ineffectiveness). In contrast, FASB (2008) states that the board “considered but decided against eliminating any assessment of effectiveness after the inception of the hedging relationship.” FASB (2011) addresses differences in the hedge accounting rules proposed by the two standard setters and seek feedback from its constituents. FASB (2011) retains the requirement of retrospective assessment of hedge effectiveness.
However, prior studies on SFAS 133 mainly focus on its impact on (1) earnings volatility and (2) corporate risk-management behavior but have not directly examined whether the SFAS 133-mandated accounting measure of hedge ineffectiveness captures the economic ineffectiveness of a firm’s hedging activities. To our knowledge, we are the first to directly examine this issue.

We investigate the informativeness of the SFAS 133-mandated accounting hedge ineffectiveness measure by relating it to the economic consequences of ineffective hedges. All else equal, firms with more economically effective hedges ex post should have lower risk or risk exposure than firms with less economically effective hedges. If the reported accounting hedge ineffectiveness measure truly reflects economic hedge ineffectiveness, we should observe that firms reporting large (small) hedge ineffectiveness gains/losses have high (low) risk and risk exposure. It is worth noting that the accounting measure of hedge ineffectiveness (i.e., hedge ineffectiveness gains/losses) is the only quantitative information disclosed under SFAS 133 for investors to assess the economic effectiveness of firms’ risk management effort and thus is an important summary measure of firms’ hedging activities. Anecdotal evidence shows that hedge ineffectiveness can have a significant impact on firms’ reported earnings.4

We examine the informativeness of the accounting hedge ineffectiveness measure in two steps. First, we examine the association between hedge ineffectiveness gains/losses and a set of market-based risk measures consisting of three measures of risk exposure: (1) interest rate risk exposure, (2) foreign exchange rate risk exposure, and (3) commodity price risk exposure. Specifically, we investigate whether firms reporting large (small) hedge ineffectiveness

4 For example, in the second quarter of 2008, Continental Airlines recognized ineffectiveness gains of $33 million from its fuel hedge, 43% of its concurrent operating loss. As another example, PPL Corporation, a large utility company, reported in its 2009 10-K (page 178) losses of $174 million and gains of $310 million for 2009 and 2008, respectively, for hedge ineffectiveness associated with energy derivatives. The hedge ineffectiveness amounts represented 42.75% and 33.33% of PPL’s 2009 and 2008 net income. These two examples highlight the potentially enormous impact of ineffective hedges on the bottom line.
gains/losses are associated with high (low) concurrent risk exposures stemming from fluctuations in interest rates, foreign exchange rates, and commodity prices.

Second, we examine the informativeness of the accounting hedge ineffectiveness measure by investigating whether the market perceives firms reporting larger hedge ineffectiveness gains/losses as being riskier in the future. Specifically, we examine whether firms reporting large (small) hedge ineffectiveness gains/losses face high (low) implied default risk and high (low) implied cost of equity capital. The market-implied default risk and cost of equity capital not only gauge investor perceptions of a firm’s overall risk but also measure the economic consequences of hedge ineffectiveness. Our approach to examining the informativeness of the reported hedge ineffectiveness gains/losses using market-based risk measures as benchmark follows the tradition of Ball and Brown (1968) who examined the value relevance of reported earnings using stock returns as benchmark amidst criticism that accounting net income is a “meaningless” figure due to its being an aggregate of heterogeneous comments.

Using the recently available hedge ineffectiveness data in Compustat, we identify 5,964 firm-year observations during 2005-2008 where firms are likely hedge accounting users. After controlling for industry effect and other known firm characteristics that affect risk, we find that firms reporting large (small) hedge ineffectiveness gains/losses are associated with high (low) risk exposures to changes in interest rates and commodity prices. We do not find robust association between hedge ineffectiveness gains/losses and the risk exposure to changes in foreign exchange rates. Next, we show that firms reporting large (small) hedge ineffectiveness gains/losses face high (low) default risk and high (low) implied cost of equity capital. On average, the implied cost of capital is 79 basis points higher for firms reporting large hedge ineffectiveness gains/losses than those reporting small hedge ineffectiveness gains/losses.
Overall, our empirical evidence suggests that the accounting hedge ineffectiveness measure reported under SFAS 133 reflects a firm’s contemporaneous risk profile and is informative to creditors and equity investors for assessing the firm’s risk and the effectiveness of its risk management activities.

We contribute to the accounting literature in several ways. First, we provide the first and much needed empirical evidence on the usefulness of accounting hedge ineffectiveness measure resulting from retrospective assessment of hedge effectiveness. Whether an accounting measure captures the economic substance of the underlying transaction is a key question for standard quality assessment and standard revision. The significant positive associations between hedge ineffectiveness gains/losses and market-based risk measures documented in this paper suggest that the reported accounting hedge ineffectiveness measure is risk relevant and thus useful to financial statement users. Given the conflicting views among preparers and users of financial statements as well as between the FASB and the IASB on whether retrospective assessment of hedge effectiveness and periodic reporting of hedge ineffectiveness should remain as a mandatory disclosure, our findings have implications for accounting standard-setting.

Second, we show that the implied cost of equity capital is, on average, 79 basis points higher for firms reporting large accounting hedge ineffectiveness than for those reporting small accounting hedge ineffectiveness after controlling for other determinants of the cost of capital. This cost of capital differential is economically significant.

Last, our results suggest that the reported accounting hedge ineffectiveness measure (i.e., hedge ineffectiveness gains/losses) is informative about whether a firm’s risk management effort is successful, which supports its use in future research on issues related to the effectiveness of a firm’s hedging activities. Prior studies on corporate derivative use either assume firms’ hedging
activities to be effective, on average, in reducing risk or rely on market-based risk measures to
differentiate between effective and ineffective hedgers. Our findings show that accounting hedge
ineffectiveness can be used as an alternative measure to assess the effectiveness of corporate risk
management.

The rest of the paper is organized as follows. Section II reviews the pertinent literature
and develops the hypotheses. Section III describes the research design, and Section IV presents
the empirical results. We conclude in Section V.

II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

In this section, we first review SFAS 133 and hedge accounting. We then review the
related literature. Finally, we develop our hypotheses.

2.1 SFAS 133 and hedge accounting

Prior to 2000, firms’ use of derivatives to manage risk was generally not reported on the
balance sheet, especially for non-financial firms. SFAS 133 significantly changed the recognition
and disclosure of derivatives by requiring that derivatives in general be recognized as either
assets or liabilities at fair value and their related unrealized gains or losses (i.e., changes in fair
value of derivatives) be recognized in net income. This may increase the volatility of reported
earnings. However, if certain conditions are met, a derivative can be designated as a fair value
hedge or a cash flow hedge, and the unrealized gain (loss) resulting from the change in the
derivative’s fair value is allowed to offset the corresponding unrealized loss (gain) on the hedged
item. This so-called “hedge accounting” reflects the intended use of the derivative for hedging
purposes and helps firms reduce the volatility in reported earnings.
An important *ex ante* criterion for applying hedge accounting is that the designated hedge is expected to be “highly effective” at inception as well as on an ongoing basis. SFAS 133 uses the term “highly effective” to mean that the hedging relationship is highly effective in achieving offsetting changes in fair value or cash flows attributable to the hedged risk, that is, the change in fair value or cash flows of the hedging instrument (a derivative) should effectively offset the corresponding change in the fair value or cash flows of the hedged item (e.g., an asset, a liability, a net investment in a foreign operation, or a forecasted transaction) attributable to the hedged risk.

However, “highly effective” does not mean “zero ineffectiveness” (see SFAS 133, as amended, paragraph 22). On occasions when the change in fair value or cash flows of the hedging instrument does not exactly offset the corresponding change in the fair value or cash flows of the hedged item, hedge ineffectiveness results.\(^5\) Retrospective assessment of hedge effectiveness and disclosure of quantitative information about hedge ineffectiveness provide financial statement users the opportunity to evaluate the economic effectiveness of a firm’s risk management activities. Therefore, SFAS 133 requires hedge accounting users not only to document the method used for assessing and measuring hedge effectiveness at the inception of the hedge but also to continue to monitor hedge effectiveness on an ongoing basis and report the amount of hedge ineffectiveness as gains or losses in current period earnings.\(^6\) Currently, hedge ineffectiveness gains/losses are the only quantitative information disclosed under SFAS 133 for investors to retrospectively assess a firm’s risk management activities.

### 2.2 Literature on derivatives, SFAS 133, and risk relevance

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\(^5\) See Appendix A for more detailed illustrations of assessment of hedge effectiveness and measurement of hedge ineffectiveness in SFAS 133.

\(^6\) See SFAS 133, paragraph 20(a) (b) for fair value hedges and paragraph 28(a) (b) for cash flow hedges.
The extant literature documents that fair values of derivatives are both risk and value relevant. For example, using a small pre-SFAS 133 sample, Wong (2000) provides support for the usefulness of fair values and notional amounts of foreign exchange derivatives for assessing firms' currency risk exposures. Ahmed, Kilic, and Lobo (2006) compare the market valuation of derivative fair values recognized in the financial statements with the market valuation of derivative fair values disclosed in the footnotes using two samples: (1) a pre-SFAS 133 sample of banks that simultaneously hold recognized derivatives and disclosed derivatives and (2) a trans-SFAS 133 sample of banks that hold only disclosed derivatives before SFAS 133, which are recognized after SFASS 133. They find that the valuation coefficient on recognized (disclosed) derivative fair values is significant (insignificant). Their findings suggest that SFAS 133 has improved the transparency of derivative financial instruments.

Prior research on SFAS 133 mainly addresses issues related to whether and how SFAS 133 affects firms’ risk-management activities. Melumad, Weyns, and Ziv (1999) in their theoretical work show that fair-value based hedge accounting can induce optimal economic hedge, to the extent that undiversified shareholders demand hedging at the firm level. Demarzo and Duffie (1995), however, argue that the optimal hedging policy adopted by managers depends on the type of accounting information disclosed to shareholders and hedging accounting risk instead of economic risk may deter optimal hedging activities. Zhang (2009) provides direct evidence about the effects of SFAS 133 on corporate risk-management behavior. She documents a significant decline in risk exposures and cash flow volatility after the adoption of SFAS 133 for firms that were previously ineffective hedgers/speculators, which suggests that these firms become more prudent in their risk-management activities after the adoption of SFAS 133.
Two recent studies directly examine the usefulness of information disclosed under SFAS 133. Campbell (2010) documents that the reported unrealized cash flow hedge gains or losses in other comprehensive incomes are associated with firms’ future performance and investors do not fully incorporate this association into stock valuation. Ahmed, Kilic, and Lobo (2011) show that banks’ exposures of hedging derivatives are more negatively associated with their bond spreads after the adoption of SFAS 133 and suggest that SFAS 133 increased the risk relevance of accounting measures of banks’ hedging/trading derivative exposures to the bond market. However, neither of these two papers examines whether the reported accounting hedge ineffectiveness measure under SFAS 133 is informative about the economic effectiveness of firm’s risk management efforts.

Prior research shows that risk related disclosures are useful to investors. Rajgopal (1999) provides evidence on the informativeness of commodity price risk measures required by the Securities and Exchange Commission’s (SEC) market risk disclosure rules effective after June 15, 1998. Using 10-K disclosures for a sample of oil and gas producers, he finds that market risk disclosures similar to those required by the SEC are significantly associated with the sample firms’ stock return sensitivities to changes in energy prices (i.e., commodity price risk exposure). Likewise, Jorion (2002) documents the usefulness of value-at-risk disclosures for predicting the variability of trading revenues of a sample of U.S. commercial banks. Again, these studies did not examine the usefulness of SFAS 133-mandated accounting measure of hedge ineffectiveness.

An important objective of SFAS 133 is to provide useful information to investors for evaluating a firm’s risk-management activities. However, evidence on whether the reported accounting hedge ineffectiveness measure under SFAS 133 is informative about the economic effectiveness of firm’s risk management efforts.

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7 Only gains/losses from the effective portion of a hedge relationship can be recognized in the other comprehensive income. Gains/losses from the ineffective portion of a hedge relationship should be recognized in current period earnings.
accounting hedge ineffectiveness measure under SFAS 133 truly reflects the effectiveness of the firm’s hedging activities is largely nonexistent in the literature as reviewed above. We examine this unexplored issue in this paper.

2.3 Hypotheses

As summarized above, the extant accounting literature is yet to provide direct evidence on whether the accounting hedge ineffectiveness measure mandated by SFAS 133 truly reflects (and therefore is useful for assessing) firms’ risk management activities. We fill this void by investigating whether the reported accounting hedge ineffectiveness measure provides useful information to investors, regulators, and other constituents. Specifically, we assess the usefulness of the reported hedge ineffectiveness gains/losses by examining its association with three risk exposures (interest rate, foreign exchange rate, and commodity price) and the market-implied default risk and cost of equity capital.

We address the following three related questions. As our first research question, we investigate whether the accounting hedge ineffectiveness reported under SFAS 133 is positively associated with concurrent market-based risk exposures. Without separating hedges into effective versus ineffective hedges, Guay (1999) and Jin and Jorion (2006) show that hedging activities, on average, reduce firms’ exposure to specific risks stemming from fluctuations in interest rates, foreign exchange rates, and commodity prices. Their findings suggest that firms with ineffective (effective) hedges are associated with high (low) risk in the cross-section, ceteris paribus. If the accounting hedge ineffectiveness measure under SFAS 133 truly reflects the economic ineffectiveness of their hedging activities, firms with large (small) hedge ineffectiveness gains/losses should have large (small) exposure to interest rate risk, foreign exchange rate risk, and commodity price risk.
In contrast, critics have questioned the usefulness of retrospective hedge effectiveness assessment and periodic reporting of hedge ineffectiveness gains/losses in net income ever since the adoption of SFAS 133. First, many firms, like Johnson & Johnson (2008), argue that the cost of continuously monitoring and quantitatively assessing hedge effectiveness on an ongoing basis is onerous while the benefit of doing so is unclear (e.g. it might be unlikely to have material hedge ineffectiveness gains/losses for a hedge that was deemed highly effective at inception). Similar views are shared by other firms as indicated in a survey conducted by Mulford and Comiskey (2008). Second, there are concerns that the usefulness of the SFAS 133-mandated accounting hedge ineffectiveness measure is hampered by the complexity of SFAS 133\(^8\) and limitations of the disclosed accounting hedge ineffectiveness measure itself. For example, the reported accounting hedge ineffectiveness measure is more likely to capture the effect of over-hedging than that of under-hedging and does not perform well in measuring certain risk components such as the time value component of options (CFA Institute (2008)). Thus, the accounting hedge ineffectiveness measure may not faithfully capture the economic substance of a firm’s hedging program. For another example, SFAS 133 does not specify “a single method for either assessing whether a hedge is expected to be highly effective or measuring hedge effectiveness” (SFAS 133, paragraph 62). This lack of a bright-line procedure for assessing and measuring hedge effectiveness allows firms to use discretion in applying different methods and therefore calls into question the reliability and comparability of the accounting hedge ineffectiveness measure reported under SFAS 133.\(^9\)

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\(^8\) As of June 12, 2009, FASB has issued over 800 pages of rules and about 190 FASB staff opinions on implementation.

\(^9\) For instance, in 2011 GE had a settlement with SEC of $50 million for questionable accounting related to the assessment of hedge effectiveness.
Third, the IASB and the FASB differ in their recent proposed hedge accounting revisions regarding whether retrospective examination of hedge effectiveness is required. The IASB (2010) proposes to eliminate the requirement of retrospective hedge effectiveness assessment, which *de facto* eliminates the periodic reporting of hedge ineffectiveness. On the contrary, the FASB (2008, 2011) is adamant that retrospective examination of hedge effectiveness is necessary.

To summarize, although the accounting measure of hedge ineffectiveness under SFAS 133 is meant to provide useful information to financial statement users for assessing the effectiveness of firms’ hedging activities, there are many reasons to believe that the accounting hedge ineffectiveness measure may not capture the economic substance of firms’ hedging activities. We formalize our first alternative (H1a) and null (H1b) hypotheses as follows:

**H1a:** *If the accounting hedge ineffectiveness measure truly reflects the economic ineffectiveness of firms’ hedging activities, among hedge accounting users those reporting large (small) hedge ineffectiveness gains/losses are associated with high (low) interest-rate, foreign-exchange-rate, and commodity-price risk exposures, ceteris paribus.*

**H1b:** *If the accounting hedge ineffectiveness measure fails to capture the economic ineffectiveness of firms’ hedging activities, there will be no relation between hedge ineffectiveness gains/losses and interest-rate, foreign-exchange-rate, and commodity-price risk exposures among hedge accounting users, ceteris paribus.*

As our second research question, we investigate whether creditors perceive firms reporting larger accounting hedge ineffectiveness measures as being riskier than firms reporting small accounting hedge ineffectiveness measures. Specifically, we examine the association
between hedge ineffectiveness gains/losses and the concurrent market-implied default risk. An important motivation for firms to use derivatives for hedging purposes is the costs related to financial distress. Smith and Stulz (1985) posit that hedging lowers the probability of financial distress by reducing the volatilities of future value of the firm. Visvanathan (1998) examines the use of interest rate swaps by U.S. non-financial firms and Haushalter (2000) examines the use of commodity derivatives by oil-and-gas firms. Both studies find empirical support for the argument that hedging lowers the probability of financial distress. These studies do not separate hedges into effective and ineffective hedges and thus their findings suggest that hedging, on average, reduces the probability of financial distress. More importantly, these findings suggest that firms with ineffective (effective) hedges are associated with high (low) probability of financial distress in the cross-section, ceteris paribus.

If the accounting hedge ineffectiveness measure under SFAS 133 truly reflects the economic ineffectiveness of firms’ hedging activities, firms reporting large hedge ineffectiveness gains/losses should have greater default risk than firms reporting small hedge ineffectiveness gains/losses. On the other hand, if the critics are right and the accounting hedge ineffectiveness measure does not capture the economic ineffectiveness of firms’ hedging activities, then we do not expect to see any relation between hedge ineffectiveness gains/losses and default risk. We formalize our hypotheses H2a and H2b as follows:

H2a:  *If the accounting hedge ineffectiveness measure truly reflects the economic ineffectiveness of firms’ hedging activities, among hedge accounting users those reporting large (small) hedge ineffectiveness gains/losses are associated with high (low) default risk, ceteris paribus.*
H2b: If the accounting hedge ineffectiveness measure fails to capture the economic ineffectiveness of firms’ hedging activities, there will be no relation between hedge ineffectiveness gains/losses and default risk among hedge accounting users, ceteris paribus.

As our third research question, we investigate whether equity investors perceive firms reporting larger accounting hedge ineffectiveness measures as being riskier than firms reporting small accounting hedge ineffectiveness measures by examining the association between the accounting hedge ineffectiveness measure and the concurrent market-implied cost of equity capital. Smith and Stulz (1985), Visvanathan (1998), and Haushalter (2000) suggest, as discussed above, that firms with ineffective (effective) hedges are associated with high (low) probability of financial distress and thus with high (low) implied cost of equity capital in the cross-section, ceteris paribus.

If the accounting hedge ineffectiveness measure under SFAS 133 truly reflects the economic ineffectiveness of firms’ hedging activities, firms reporting large hedge ineffectiveness gains/losses should have higher implied cost of equity capital than those reporting small hedge ineffectiveness gains/losses. On the other hand, if the accounting hedge ineffectiveness measure does not capture the economic ineffectiveness of firms’ hedging activities as claimed by the critics, then we do not expect any relation between hedge ineffectiveness gains/losses and the concurrent market-implied cost of equity capital. We formalize our hypotheses H3a and H3b as follows:

H3a: If the accounting hedge ineffectiveness measure truly reflects the economic ineffectiveness of firms’ hedging activities, among hedge accounting users those
reporting large (small) hedge ineffectiveness gains/losses are associated with high (low) implied cost of equity capital, ceteris paribus.

H3b: If the accounting hedge ineffectiveness measure fails to capture the economic ineffectiveness of firms’ hedging activities, there will be no relation between hedge ineffectiveness gains/losses and the implied cost of equity capital among hedge accounting users, ceteris paribus.

III. RESEARCH DESIGN

3.1 Sample Selection

While SFAS 133 requires disclosure of quantitative information on hedge ineffectiveness, large scale machine-readable data became available only after the introduction of the new Compustat Xpressfeed database. Based on hedge accounting rules, we use three variables in the Compustat Xpressfeed database to identify firms that use hedge accounting for derivatives: (1) hedge ineffective gains/losses (Compustat mnemonic, HEDGEGL), (2) accumulated other comprehensive income – derivative unrealized gains/losses (AOCIDERGL), and (3) comprehensive income – derivative gains/losses (CIDERGL). Our variable of interest is HEDGEGL, hedge ineffectiveness gains/losses (annual data is available from 2005 onward), which represents the gains/losses on hedging transactions that do not offset specific hedged risks. HEDGEGL includes both fair value hedge ineffectiveness and cash flow hedge ineffectiveness. It does not include gains/losses for non-hedge designated derivatives, i.e. freestanding derivatives. AOCIDERGL and CIDERGL are the gains/losses on derivatives reported as part of the cumulative and current comprehensive income, respectively. These two data items include unrealized gains/losses from derivative contracts such as interest rate swap contracts, foreign
currency forward contracts, and net investment hedges. We use these two additional variables to identify hedge accounting users if the value of HEDGEGL is missing.\textsuperscript{10}

Using these three data items, we are able to identify firms that use derivatives and are likely to designate all or a portion of their derivatives as hedges under the requirements of SFAS 133. We construct our hedge sample from the 2009 Compustat Xpressfeed annual database for the period of 2005-2008 using the following procedure. First, we delete all non-U.S. firms. Second, for the remaining U.S. firm-year observations where HEDGEGL is either zero or missing, we delete firm-years where AOCIDERGL is either zero or missing or where CIDERGL is either zero or missing. Following the above procedures, we identify 5,964 U.S. firm-year observations during 2005-2008 where (1) HEDGEGL is positive, (2) HEDGEGL is negative, (3) HEDGEGL is zero but AOCIDERGL is neither zero nor missing or CIDERGL is neither zero nor missing, or (4) HEDGEGL is missing but AOCIDERGL is neither zero nor missing or CIDERGL is neither zero nor missing. These 5,964 firm-years (2,065 unique firms) form our preliminary hedge sample because firms in this sample are likely users of hedge accounting under SFAS 133.\textsuperscript{11} Since we select our sample based on HEDGEGL, AOCIDERGL, and CIDERGL, our preliminary hedge sample contains all (fair value and cash flow) hedge accounting users. This sample is also the largest hedge sample in this paper because its construction requires the availability of only three Compustat data items: HEDGEGL, AOCIDERGL, and CIDERGL. Actual number of observations used in the analysis varies across tests due to the availability of additional variables (see details below).

\textsuperscript{10} AOCIDERGL and CIDERGL result from cash flow hedges. Appendix B contains more detailed descriptions of the three variables used in sample selection.

\textsuperscript{11} In our preliminary sample of 5,964 firm-year observations, 1,407 observations are in the financial industry. None of the results reported in the paper is qualitatively changed if we delete these 1,407 observations.
We also construct a nonhedge sample to control for cross-industry variation in the dependent variables. Our preliminary nonhedge sample is simply all U.S. firm-years during 2005-2008 that are not included in the preliminary hedge sample. The preliminary nonhedge sample contains 24,642 firm-year observations (7,845 unique firms).

3.2 Variable Measurement

Our variable of primary interest is the accounting hedge ineffectiveness measure reported under SFAS 133, $HEDGEGL$. The raw value of $HEDGEGL$ is fairly large in magnitude, with minimum being -$1,357,000,000 (hedge ineffectiveness loss) and maximum being $452,000,000 (hedge ineffectiveness gain) for our preliminary sample (untabulated), suggesting that hedge ineffectiveness gains/losses can potentially have a significant impact on firms’ reported earnings. A large percentage of $HEDGEGL$ has missing values. We set missing values to zero (see the empirical results section for the justification). Since hedge ineffective gains and hedge ineffective losses both indicate hedge ineffectiveness, we take the absolute value of $HEDGEGL$ and scale it by the absolute value of net income ($NI$). The resulting variable, $\frac{|HEDGEGL|}{|NI|}$, is highly skewed.\(^{12}\) So we use a dummy variable, accounting hedge ineffectiveness ($ACCHINEFF$), for $\frac{|HEDGEGL|}{|NI|}$. Specifically, we set $ACCHINEFF$ to one if $\frac{|HEDGEGL|}{|NI|}$ is greater than or equal to 0.005 (i.e., $|HEDGEGL|$ is greater than or equal to 0.5% of $|NI|$) and zero otherwise. Thus, $ACCHINEFF$ separates our sample firms into those with large accounting hedge ineffectiveness ($ACCHINEFF = 1$) and those with small accounting hedge ineffectiveness ($ACCHINEFF = 0$).\(^{13}\)

\(^{12}\) The distribution of $\frac{|HEDGEGL|}{|NI|}$ for our preliminary sample of 6,964 firm-year observations is as follows: 0 (1 percentile), 0 (5 percentile), 0 (10 percentile), 0 (lower quartile), 0 (median), 0 (upper quartile), 0.0040 (90 percentile), 0.0206 (95 percentile), 0.1722 (99 percentile).

\(^{13}\) We also used alternative thresholds (0.25% of $|NI|$ and 1% of $|NI|$) to define $ACCHINEFF$ (large versus small accounting hedge ineffectiveness) and none of the results reported in the paper is qualitatively changed.
We examine whether the accounting hedge ineffectiveness measure reported under SFAS 133 captures the economic ineffectiveness of a firm’s hedging activities using three sets of risk measures. Following prior literature (Rajgopal 1999; Guay 1999; Wong 2000; Zhang 2009), our first set of risk measures are interest rate, foreign exchange rate, and commodity price risk exposures defined below:

\[ R_{it} = a_{0it} + a_{1it} R_{Mt} + a_{2it} R_{INTt} + \epsilon_{it}^1, \]  
\[ R_{it} = b_{0it} + b_{1it} R_{Mt} + b_{2it} R_{FXt} + \epsilon_{it}^2, \]  
\[ R_{it} = c_{0it} + c_{1it} R_{Mt} + c_{2it} R_{COMt} + \epsilon_{it}^3, \]  

where \( R_{it} \) is the monthly stock return for firm \( i \) in a month in year \( t \);\(^{14} \) \( R_{Mt} \) is the monthly value-weighted market return; \( R_{INTt} \) is the monthly percentage change in LIBOR; \( R_{FXt} \) is the monthly percentage change in the Federal Reserve Board’s trade-weighted US dollar index; and \( R_{COMt} \) is the monthly percentage change in the Dow Jones-UBS commodity price index.

We estimate equations (1) to (3) for each firm \( i \) using 12 monthly returns in fiscal year \( t \) (requiring a minimum of 7 monthly returns). The coefficients on \( R_{INTt} \), \( R_{FXt} \), and \( R_{COMt} \) reflect the fluctuation in a firm’s market value in response to the fluctuation in interest rate, foreign exchange rate, and commodity price, respectively. The larger the coefficients, the greater the risk exposures that the firm faces with respect to the fluctuation in interest rate, foreign exchange rate, and commodity price. Following Guay (1999) and Zhang (2009), we define a firm’s interest rate risk exposure \( (INT\_EXP_{it}) \), foreign exchange rate risk exposure \( (FX\_EXP_{it}) \), and commodity price risk exposure \( (COM\_EXP_{it}) \) as the absolute values of estimated coefficients on \( R_{INTt} \), \( R_{FXt} \), and \( R_{COMt} \), respectively. That is, \( INT\_EXP_{it} = |a_{2it}| \), \( FX\_EXP_{it} = |b_{2it}| \), and \( COM\_EXP_{it} = |c_{2it}| \).

\(^{14}\) The month subscript is omitted for convenience.
Our second risk measure is the default likelihood indicator \(DL_{IDCT,i}\), which is the market-implied default risk calculated using the Merton (1974) model as implemented by Vassalou and Xing (2004) and Bharath and Shumway (2008). In the Merton (1974) model under certain assumptions, a firm’s equity can be viewed as a call option with a strike price set at the book value of the firm’s total liabilities. Therefore, the market value of a firm’s equity is determined by an option pricing equation for a European call option following Black and Scholes (1973). The recent literature argues that this estimated measure of default risk is more accurate in predicting default than the traditional alternatives using accounting ratios such as Altman’s (1968) Z-score or Ohlson’s (1980) O-score (e.g., Hillegeist et al., 2004; Campbell, Hilscher, and Szilagyi, 2008). In addition, the estimated default likelihood contains forward-looking information and is timelier in capturing the change of default risk than credit ratings (Vassalou and Xing 2004). Part A of Appendix D presents the details of the estimation of this measure \(DL_{IDCT,i}\).

Our third and last set of risk measures is the cost of equity capital implied in stock prices and analyst earnings forecasts. Following the extant literature, we use three different models to estimate the implied cost of equity capital: (1) Gebhardt, Lee, and Swaminathan (2001) (hereafter GLS model), (2) Ohlson and Juettner-Nauroth (2005) as implemented by Gode and Mohanram (2003) (hereafter OJN model), and (3) Easton (2004) (hereafter MPEG model). These models are all based on the dividend discount model of Ohlson (1995) and differ primarily in their assumptions about future growth patterns and forecasting horizons. The implied cost of equity capital in each model is the discount rate that equates the current stock price to the present value of discounted future payoffs (i.e., the internal rate of return). The implied cost of equity estimated by these three models is labeled as \(R_{GLS}\), \(R_{OJN}\), and \(R_{MPEG}\), respectively. Since each
model may contain its model-specific measurement errors and there is no consensus in the literature about which model produces more reliable cost of equity measure, we also use the average of these three measures, $R_{AVG}$, as a measure of the implied cost of equity capital. Part B of Appendix D contains the details of these three models and the estimation procedure.

### 3.3 Regression Model

To investigate our first hypotheses (H1a and H1b) whether the accounting hedge ineffectiveness measure is positively associated or not associated with interest rate, foreign exchange rate, and commodity price risk exposure, we follow Zhang (2009) and estimate the following regression models using our hedge sample:

\[
INT\_EXP_{it} = \alpha_0 + \alpha_1 ACCHINEFF_{it} + \alpha_2 IND\_EXP^{INT}_{it} + \alpha_3 RET\_VOL_{it} + \alpha_4 LOGMTB_{it} + \alpha_5 LOGMVE_{it} + \alpha_6 NOL_{it} + \alpha_7 ROA_{it} + \alpha_8 INT\_COV_{it} + \alpha_9 ST\_INVEST_{it} + \alpha_{10} LEV_{it} + \eta_{it},
\]  
\[FX\_EXP_{it} = \beta_0 + \beta_1 ACCHINEFF_{it} + \beta_2 IND\_EXP^{FX}_{it} + \beta_3 RET\_VOL_{it} + \beta_4 LOGMTB_{it} + \beta_5 LOGMVE_{it} + \beta_6 NOL_{it} + \beta_7 ROA_{it} + \beta_8 INT\_COV_{it} + \beta_9 F\_SALES_{it} + \eta_{it}^2,
\]  
\[COM\_EXP_{it} = \gamma_0 + \gamma_1 ACCHINEFF_{it} + \gamma_2 IND\_EXP^{COM}_{it} + \gamma_3 RET\_VOL_{it} + \gamma_4 LOGMTB_{it} + \gamma_5 LOGMVE_{it} + \gamma_6 NOL_{it} + \gamma_7 ROA_{it} + \gamma_8 INT\_COV_{it} + \gamma_9 CASH_{it} + \gamma_{10} INV_{it} + \eta_{it}^3,
\]

where $INT\_EXP$ (interest rate risk exposure), $FX\_EXP$ (foreign exchange rate risk exposure), $COM\_EXP$ (commodity price risk exposure) and $ACCHINEFF$ (a dummy for large and small hedge ineffectiveness gains/losses) are defined previously and other variables are defined below.\(^{15}\)

\(^{15}\) Our examination of the association between the accounting hedge ineffectiveness measure and the concurrent risk exposures in equations (4)-(6) is consistent with Rajgopal (1999) who examines the association between SEC-required commodity price risk measures and the concurrent commodity price risk exposure. Our approach differs from Rajgopal’s in that we follow a two-stage process as in Zhang (2009). First, we estimate a firm’s interest rate risk exposure, foreign exchange rate risk exposure, and commodity price risk exposure in each year using equations...
\[ IND_{EXPI}^{INT} = \text{median } INT_{EXPI} \text{ of the nonhedge sample in the same 3-digit SIC code industry and year.} \]

\[ IND_{EXPI}^{FX} = \text{median } FX_{EXPI} \text{ of the nonhedge sample in the same 3-digit SIC code industry and year.} \]

\[ IND_{EXPI}^{COM} = \text{median } COM_{EXPI} \text{ of the nonhedge sample in the same 3-digit SIC code industry and year.} \]

\[ RET\_VOL_{it} = \text{standard deviation of daily stock returns in fiscal year } t \text{ for firm } i \text{ (requiring a minimum of 180 daily returns).} \]

\[ LOGBTM_{it} = \text{natural logarithm of the book-to-market ratio } = \log(CEQ)/(CSHO \times PRCC_F)) \]

\[ LOGMVE_{it} = \text{natural logarithm of market value of equity } = \log(CSHO \times PRCC_F). \]

\[ NOL_{it} = \text{a dummy variable for operating loss carryforward, set to 1 if firm } i \text{ in year } t \text{ has positive net income and positive net operating loss carry forward; and 0 otherwise.} \]

\[ ROA_{it} = \text{return on assets, defined as income before extraordinary items (IB) divided by the average total assets (AT).} \]

\[ INT\_COV_{it} = \text{pre-tax interest coverage ratio } = \frac{(\text{operating income before depreciation + interest expense})}{\text{interest expense}} = \frac{OIBDP + XINT}{XINT}. \text{ If interest expense (XINT) is missing and interest expense for financial service (TIE) is not missing, we substitute XINT with TIE. Following Blume et al. (1998), we set negative INT\_COV to 0 and INT\_COV great than 100 to 100.} \]

(1)-(3). Second, we examine the association between the accounting hedge ineffectiveness measure and these estimated risk exposures in equations (4)-(6). In contrast, Rajgopal (1999) jointly estimates the two stages in one specification (p. 259).
**ST\_INVST}_{it} =** short-term investments (IVST) deflated by total assets (AT).

**LEV}_{it} =** financial leverage = long-term debt (DLTT) divided by total assets (AT).

**F\_SALES}_{it} =** foreign sales divided by total revenue (SALE), where foreign sales = sum of sales (SALES) in non-domestic market segments from Compustat segment database.

**CASH}_{it} =** cash and short-term investments (CHE) divided by total assets (AT).

**INV}_{it} =** inventory (INVT) deflated by total assets (AT) times a dichotomous variable that equals 1 if firm i’s commodity price risk exposure in fiscal year t is positive and -1 if firm i’s commodity price risk exposure in fiscal year is negative.

Our experimental variable in equations (4)-(6) is **ACCHINEFF**. A positive coefficient on **ACCHINEFF** (i.e., $\alpha > 0$, $\beta > 0$, and $\gamma > 0$) supports our H1a and an insignificant coefficient is consistent with H1b. Following Zhang (2009), we include many control variables in equations (4)-(6), which can be divided into two categories: common control variables for all three risk exposures and individual control variables for specific risk exposures. We first discuss common control variables. The median risk exposure of our nonhedge sample in the same 3-digit SIC code industry and year (IND\_EXP) is included to control for cross-industry differences in the three risk exposures and we expect a positive coefficient on IND\_EXP. Return volatility (RET\_VOL), the book-to-market ratio (LOGBTM), and firm size (SIZE) are firm-level risk measures. The dummy variable for net operating loss carry forward (NOL), return on assets
(ROA), and interest coverage ratio (INT_COV) measure a firm’s incentives to hedge resulting from the convex tax function and the probability of financial distress.\textsuperscript{16}

We now discuss individual control variables for specific risk exposures. For interest rate risk exposure (equation (4)), we also control for short-term investment (ST_INVST) and financial leverage (LEV) with no predicted signs. For foreign exchange rate risk exposure (equation (5)), we control for the percentage of foreign sales (F_SALES) and expect a positive coefficient on it. For commodity price risk (equation (6)), we control for the amount of cash (CASH) and the inventory level (INV). As in Zhang (2009), we make no prediction for the coefficient on CASH and expect a positive coefficient on LEV.

To test our second hypotheses (H2a and H2b) whether the accounting hedge ineffectiveness measure is positively associated or not associated with default risk, we estimate the following regression model:

$$ DL_{IDCT_{it}} = \rho_0 + \rho_1 ACCHINEFF_{it} + \rho_2 IND_{DLS_{it}} + \rho_3 LEV_{it} $$
$$ + \rho_4 ROA_{it} + \rho_5 LOSS_{it} + \rho_6 INT_COV_{it} + \rho_7 LOGMVE_{it} + \rho_8 SUBORD_{it} $$
$$ + \rho_9 CAP_{INTEN}_{it} + \varphi_{it}, \quad (7) $$

where default likelihood indicators (DL_IDCT), the accounting hedge ineffectiveness measure (ACCHINEFF), and capital intensity (CAP_INTEN) are defined as before. IND_DLS is the median default likelihood indicator (DL_IDCT) of the nonhedge sample in the same 3-digit SIC code industry and year; LOSS is a loss dummy set to one if income before extraordinary items (IB) is negative in the current and prior year, and zero otherwise; SUBORD is a subordinated debt dummy set to one if the firm’s subordinated debt (DS) or subordinated convertible debt (DCVSUB) is greater than zero, and zero otherwise.

\textsuperscript{16} According to Zhang (2009), we expect a positive (negative) coefficient on RET_VOL (SIZE) but offer no prediction for the coefficient on LOGBTM. Following Zhang (2009), we expect a negative (positive) coefficient on NOL (INT_COV) while offering no prediction for the coefficient on ROA.
Our variable of primary interest is \textit{ACCHINEFF}. A significantly positive coefficient on \textit{ACCHINEFF} supports our H2a and an insignificant coefficient is consistent with H2b. The control variables in equation (7), except \textit{IND_DLI}, follow the baseline model (Model 2 in Table 6) of Ashbaugh-Skaife et al. (2006) who examine the effects of corporate governance on firms’ credit ratings. We include \textit{IND_DLI} to control for the cross-industry variation in the default likelihood indicator (\textit{DL_IDCT}) and expect a positive coefficient on \textit{IND_DLI}. For the rest of the control variables, we expect a positive coefficient on financial leverage (\textit{LEV}), loss indicator (\textit{LOSS}), and subordinated debt indicator (\textit{SUBORD}). In contrast, we predict a negative coefficient on return on assets (\textit{ROA}), interest coverage ratio (\textit{INT_COV}), firm size (\textit{LOGMVE}), and capital intensity (\textit{CAP_INTEN}).\footnote{The dependent variable in Ashbaugh-Skaife et al. (2006) is the credit rating with a larger value indicating a better rating. Our dependent variable in equation (11) is the default likelihood indicator with a larger value indicating greater likelihood of default, which is opposite to the credit rating. Our predicted signs are therefore opposite to those in Ashbaugh-Skaife et al. (2009).}

To test our last hypotheses (H3a and H3b) whether the accounting hedge ineffectiveness measure is positively associated or not associated with the cost of equity capital, we estimate the following regression model:

\[
\text{COEC}_{it} = \sigma_0 + \sigma_1 \text{ACCHINEFF}_{it} + \sigma_2 \text{IND_COEC}_{it} + \sigma_3 \text{FERR}_{it} + \sigma_4 \text{GRW}_{it} \\
+ \sigma_5 \text{LEV}_{it} + \sigma_6 \text{BETA}_{it} + \sigma_7 \text{LOGMVE}_{it} + \sigma_8 \text{LOGBTM}_{it} + \sigma_9 \text{RF}_{it} + \omega_{it},
\]

where \text{COEC} = \text{R}_{AVG}, \text{R}_{GLS}, \text{R}_{OJN}, \text{R}_{MPEG} and \text{IND_COEC} is the median cost of capital (\text{COEC}) of the nonhedge sample in the same 3-digit SIC industry code and year. \text{FERR} is analyst forecast errors = mean earnings per share forecasts for year \(t + 1\), made in June of year \(t\) from I/B/E/S, minus I/B/E/S reported actual earnings for that year, scaled by year \(t\) stock price from I/B/E/S. When I/B/E/S reported actual earnings are missing, we use actual earnings from Compustat. \text{GRW} is long-term growth rate = the analyst consensus long-term earnings growth rate from
I/B/E/S. If that rate is missing, we calculate the earnings growth rate implied from year $t + 2$ and $t + 3$ earnings per share forecasts if year $t + 3$ earnings per share forecasts are available or from year $t + 1$ and year $t + 2$ earnings per share forecasts if year $t + 3$ earnings per share forecasts are missing. $BETA$ is the CAPM estimated beta for firm $i$ in year $t$, estimated using monthly returns over a 10-year rolling window ending three months after the fiscal year end. As in Francis et al. (2004), we require at least 24 months of nonmissing returns. Other variables are defined earlier.

Again, our experimental variable is $ACCHINEFF$. A positive coefficient on $ACCHINEFF$ ($\sigma > 0$) supports our H3a whereas an insignificant coefficient is consistent with H3b. $IND\_COEC$ is included to control for cross-industry variation in the cost of capital. We expect a positive coefficient on $IND\_COEC$. We include several additional control variables in Equation (8) following prior literature. $FERR$ is included to control for a positive bias in estimated cost of capital due to analyst forecast optimism. $GRW$ is included to control for a positive relation between estimated cost of capital and long-term growth rate documented in Gebhardt et al. (2001). $LEV$ is included to control for the effect of financial leverage on the cost of equity capital. We expect a positive coefficient on $LEV$. Following Francis et al. (2004), we include $BETA$, $LOGMVE$, and $LOGBTM$ to control for the three common risk factors (the market, size, and the book-to-market ratio) in Fama and French (1993). We expect a positive coefficient on $BETA$ and $LOGBTM$, respectively, and a negative coefficient on $LOGMVE$. Finally, we control for the risk free rate in a year and expect a positive coefficient.

**IV. EMPIRICAL RESULTS**

**4.1 Descriptive Statistics and Univariate Tests**
Table 1 reports sample distribution of our preliminary hedge sample. As discussed earlier, our variable of primary interest, $ACCHINEFF$, separates our sample observations into those with large accounting hedge ineffectiveness ($|HEDGEGL| \geq 0.5\%$ of $|NI|$) and those with small accounting hedge ineffectiveness ($|HEDGEGL| < 0.5\%$ of $|NI|$). Using this rather conservative cutoff, there are only 557 observations reporting large hedge gains or losses and 477 ($= 244 + 233$) observations reporting non-zero small hedge gains or losses in our preliminary hedge sample of 5,964 observations. In contrast, there are 901 observations reporting zero hedge gains/losses and 4,029 observations reporting missing hedge gains/losses. Overall, only a small percentage ($32.44\% = 1,935/5,964$) of our sample hedge accounting users discloses non-missing $HEDGEGL$ (i.e., gain, loss, and zero). A large percentage of our preliminary sample ($67.56\% = 4,029/5,964$) reports missing $HEDGEGL$. This is surprising as SFAS 133 (as originally issued) and related subsequent statements require disclosure of “the amount of the hedges’ ineffectiveness” for both fair value hedges and cash flow hedges, and provide ample guidance on how to measure hedge ineffectiveness. One possible explanation of the observed large percentage of nondisclosure is that the amount of $HEDGEGL$ is so small that firms choose not to separately disclose them. We thus assume that the observed nondisclosure (missing $HEDGEGL$) is due to an immaterial value of $HEDGEGL$. We therefore set missing values of $HEDGEGL$ to zero. That is, we classify the observations with missing $HEDGEGL$ as those with small accounting hedge ineffectiveness. Panel A of Table 1 presents the distribution of our preliminary hedge sample by fiscal year and across large and small accounting hedge ineffectiveness categories. Overall, there is no clustering of large and small accounting hedge ineffectiveness over sample years.

[Insert Table 1 about here]
We also report the industry distribution of our preliminary hedge sample based on the two-digit SIC code. Unlike Zhang (2009), we include the sector of financial institutions and insurance providers. The use of derivatives is an integral part of the daily operation of financial institutions and insurance providers and risk management is critical to the survival and success of these entities. We therefore include the finance and insurance sector in our hedge sample to obtain a more complete picture of the risk relevance of hedge ineffectiveness disclosures under SFAS 133. As mentioned earlier, none of the results reported in the paper is qualitatively changed if we exclude financial institutions and insurance providers.

Panel B of Table 1 shows the industry distribution of our preliminary hedge sample. The following industries have the highest frequencies of large hedge ineffectiveness gains/losses (ACCHINEFF = 1): finance and insurance (141), transportation, communication, and utilities (127), mining, quarrying, and oil and gas extraction (107). Firms in these industry sectors face significant risk from the volatility in foreign currency exchanges, interest rates, or commodity prices. The distribution of large hedge ineffective gains/losses by industry is hence consistent with the nature of the underlying business risk. The distribution also seems to suggest that financial expertise in risk management helps firms reduce hedge ineffectiveness. Only 10.02% of the observations in the finance and insurance sector (141 out of 1,407 observations) report large accounting hedge ineffectiveness while 27.51% of the observations in the mining, quarrying, and oil and gas extraction sector (107 out of 389 observations) and 16.30% of the observations in the transportation, communication, and utility sector (127 out of 779 observations) report large accounting hedge ineffectiveness.

The actual sample used to test our three sets of hypotheses varies in size due to requiring different variables in each test. For each test, we start with the preliminary hedge sample (5,964
firm-year observations during 2005-2008) and then require the availability of all variables needed for that test. For example, after requiring availability of all variables in Equations (4) to (6), the test sample for H1a/H1b contains 4,461 firm-years with 421 (4,040) observations classified as large (small) accounting hedge ineffectiveness.\footnote{After requiring the availability of all variables in Equations (7) and (8), respectively, the sample size for H2a/H2b and H3a/H3b are 4,519 and 3,300, respectively.} Table 2 reports descriptive statistics and univariate tests of the difference in the means and medians of main variables between the large and small accounting hedge ineffectiveness subsamples. We start with our three sets of risk measures (or the dependent variables in equations (4)-(8)). The mean and median interest rate risk exposure ($\text{INT\_EXP}$) for the large accounting hedge ineffectiveness subsample are 0.578 and 0.387, respectively, with lower (upper) quartile being equal to 0.149 (0.745). On the other hand, the mean and median $\text{INT\_EXP}$ for the small accounting hedge ineffectiveness subsample are 0.538 and 0.336, respectively, with lower (upper) quartile being equal to 0.141 (0.734). Thus, the distribution of $\text{INT\_EXP}$ for the large accounting hedge ineffectiveness subsample is shifted slightly to right as compared to that for the small accounting hedge ineffectiveness subsample. However, the univariate tests of the difference in the means and medians between the two subsamples are both insignificant ($p$-value = 0.20 and 0.25, respectively, for the difference in the means and in medians). Similar to $\text{INT\_EXP}$, the univariate tests of the difference in the means and medians of the foreign exchange risk exposure ($\text{FX\_EXP}$) between the large and small accounting hedge ineffectiveness subsamples are both insignificant. However, the mean and median $\text{COM\_EXP}$ for the large accounting hedge ineffectiveness subsample (0.657 and 0.483) are both significantly larger than their counterparts (0.505 and 0.364) for the small accounting hedge ineffectiveness subsample. To summarize, our univariate tests reveal that the commodity price risk exposure is higher for the large accounting
hedge ineffectiveness subsample than for the small accounting hedge ineffectiveness subsample but there are no differences in interest rate risk exposure and foreign exchange risk exposure between the large and small accounting hedge ineffectiveness subsamples. Thus, our univariate test results are mixed with respect to our H1a/H1b.

[Insert Table 2 about here]

The remaining risk measures are the market-implied default risk ($DL_IDCT$) and four cost of equity capital measures ($R_{AVG}$, $R_{GLS}$, $R_{QIN}$, and $R_{MPEG}$). For each of these five variables, the distribution for the large accounting hedge ineffectiveness subsample is shifted to right relative to the distribution for the small accounting hedge ineffectiveness subsample. More importantly, univariate tests show that the mean and median of these five variables for the large accounting hedge ineffectiveness subsample are both significantly larger than their respective counterparts for the small accounting hedge ineffectiveness subsample. The univariate test results, thus, are inconsistent with H2b and H3b but support H2a and H3a.

We now discuss the control variables in Table 2. The mean and median return volatility ($RET_{VOL}$), book-to-market ratio ($LOGBTM$), firm size ($LOGMVE$), financial leverage ($LEV$), and capital intensity ($CAP_{INTEN}$) are both significantly larger for the large accounting hedge ineffectiveness subsample than for the small accounting hedge ineffective subsample. In contrast, the mean and median operating loss carry forward dummy ($NOL$), return-on-assets ($ROA$), interest coverage ratio ($INT_{COV}$), percent of foreign sales ($F_{SALES}$), and cash ($CASH$) are both significantly larger for the small accounting hedge ineffectiveness subsample than for the large accounting hedge ineffectiveness subsample. For the remaining variables, the differences in mean and median between the large and small accounting hedge ineffectiveness subsamples are mostly insignificant. Taken together, the means and medians of most control
variables are significantly different between the large and small accounting hedge ineffectiveness subsamples.

To summarize, our univariate tests are mixed for H1a/H1b and strongly support H2a and H3a. In addition, the univariate tests suggest that there are significant differences in factors that affect our risk measures between the large and small accounting hedge ineffectiveness subsamples. This highlights the importance to control for these factors when examining the relation between the risk measures and our accounting hedge ineffectiveness variable.

4.2 Regression Results

To test H1a/H1b, we estimate equations (4)-(6) using a sample of 4,461 observations that results from the preliminary hedge sample after requiring the availability of variables in equations (4)-(6). Our hedge sample consists of panel data that vary across firms and over time. It is well known that observations in financial panel data like ours are likely correlated across firms and over time, which can bias the standard errors of the OLS coefficient estimates. To overcome this problem, we calculate the standard errors for all our regression results using the two-way clustering method as suggested by Petersen (2009) and Gow, Ormazabad, and Taylor (2010).

We report our findings from estimating equation (4), (5), and (6), respectively, in the INT_EXP, FX_EXP, and COM_EXP columns of Table 3. The coefficient on ACCHINEFF is significantly positive in the INT_EXP column (0.0729, p-value = 0.01) and the COM_EXP column (0.1212, p-value = 0.02). These findings support H1a and are inconsistent with H1b. However, the coefficient on ACCHINEFF is insignificant (0.1423, p-value = 0.23) in the FX_EXP column, consistent with H1b and failing to support H1a. Overall, our multivariate evidence is largely consistent with our alternative hypothesis (H1a) that firms with larger
accounting hedge ineffectiveness measures have higher interest rate risk exposure and commodity price risk exposure (but failing to support the prediction that these firms are associated with higher foreign exchange rate risk exposure).

[Insert Table 3 about here]

The coefficients on control variables are largely consistent with Zhang (2009). For example, the coefficient on $IND\_EXP$ is significantly positive whereas that on $LOGMVE$ is significantly negative in all three regressions. In addition, our coefficients on $NOL$ and on $INT\_COV$ are all insignificant and the coefficient on $INV$ is significantly positive ($0.0475$, $p$-value = 0.10), consistent with Zhang (2009). However, some of our results are not entirely consistent with Zhang (2009). For example, our coefficient on $RET\_VOL$ is significantly positive in the $FX\_EXP$ column ($0.2445$, $p$-value = 0.07) but is insignificantly positive in other two columns whereas Zhang (2009) finds a significantly positive coefficient in all three regressions. Moreover, our coefficient on $F\_SALES$ is insignificantly positive whereas it is significantly positive in Zhang (2009).

To test H2a/H2b, we estimate equation (7) using a sample of 4,519 observations. As shown in Table 4, the coefficient on $ACCHINEFF$ is significantly positive ($0.0667$, $p$-value = 0.01). This finding supports our H2a that default risk is higher for firms with large accounting hedge ineffectiveness than for firms with small accounting hedge ineffectiveness and is inconsistent with the null (H2b). Except for $LOSS$, the coefficients on all other control variables are significant and carry the expected sign. The coefficient on $LOSS$ is positive but not significant.

[Insert Table 4 about here]
Finally, we estimate equation (8) to test H3a/H3b using a sample of 3,300 observations. We have four measures of the implied cost of capital (\(R_{AVG}, R_{GLS}, R_{OJN},\) and \(R_{MPEG}\)) and present the results using each measure in the \(R_{AVG}, R_{GLS}, R_{OJN},\) and \(R_{MPEG}\) columns, respectively, in Table 5. The coefficient on \(ACCHINEFF\) is significantly positive for three measures of the cost of capital (\(R_{AVG}, R_{OJN},\) and \(R_{MPEG}\)) but is insignificantly different from zero for one measure of the cost of capital (\(R_{GLS}\)). In particular, the coefficient on \(ACCHINEFF\) is 0.0079 (\(p\)-value = 0.02) when the average cost of capital (\(R_{AVG}\)) is our cost of capital measure, suggesting that the average implied cost of equity capital is 79 basis points higher for firms reporting large accounting hedge ineffectiveness than those reporting small accounting hedge ineffectiveness. The coefficient on \(ACCHINEFF\) is 0.0118 (\(p\)-value = 0.02) and 0.0112 (\(p\)-value = 0.02), respectively, when the cost of capital measure is \(R_{OJN}\) and \(R_{MPEG}\). However, the coefficient on \(ACCHINEFF\) is insignificant when \(R_{GLS}\) is the cost of capital measure. Since the coefficient on \(ACCHINEFF\) is significantly positive in three out of four cost of capital measures, our multivariate results are mostly consistent with our H3a that firms reporting large accounting hedge ineffectiveness are associated with higher costs of equity capital than firms reporting small accounting hedge ineffectiveness.

We now discuss the coefficients on control variables. As expected, the coefficient on \(IND\_COEC\) is highly significantly positive in all four specifications. The coefficients on \(FERR\) and \(GRW\) are also highly significantly positive in all four specifications, consistent with prior literature. The coefficient on \(LEV\), however, is significantly positive only for \(R_{AVG}\). This suggests that the incremental effect of financial leverage on the cost of capital after controlling for \(BETA\), \(LOGMVE\), and \(LOGBTM\) is mostly insignificant. In contrast, the coefficients on \(BETA\), \(LOGMVE\), and \(LOGBTM\) are all significant and in the expected directions except the coefficient
on $LOGMVE$ when $R_{GLS}$ is the cost of capital measure (-0.0002, $p$-value = 0.43). Specifically, we find that coefficients on $BETA$ and $LOGBTM$ are significantly positive and that on $LOGMVE$ is significantly negative (except in one specification), consistent with Francis et al. (2004) and many other studies. Finally, the coefficient on risk free rate ($RF$) is insignificant in all four specifications.

[Insert Table 5 about here]

To summarize, we find that the accounting measure of hedge ineffectiveness mandated by SFAS 133 is positively associated with interest rate risk exposure ($INT\_EXP$), commodity price risk exposure ($COM\_EXP$), market-implied default risk ($DL\_IDCT$), and three measures of the cost of equity capital ($R_{AVG}$, $R_{OIN}$, and $R_{MPEG}$). These findings support the view that the SFAS 133-mandated accounting hedge ineffectiveness measure captures the economic ineffectiveness of a firm’s hedging activities and thus provides useful information to financial statement users for evaluating the effectiveness of a firm’s risk-management effort.

V. CONCLUSION

A decade after the adoption of SFAS 133, the extant accounting literature provides little evidence on whether the SFAS 133-mandated accounting hedge ineffectiveness measure captures the economic effectiveness of a firm’s hedging activities. We fill this void by examining the association between the reported accounting hedge ineffectiveness measure and the economic ineffectiveness of firms’ hedging effort as measured by three sets of market-based risk measures. The first set of risk measures includes three market-based risk exposures to fluctuations in interest rates (interest rate risk exposure), foreign exchange rates (foreign exchange rate risk exposure), and commodity prices (commodity price risk exposure). The second risk measure is
the market-implied default risk and the third is the implied cost of equity capital. The accounting hedge ineffectiveness measure under SFAS 133 is the reported hedge ineffectiveness gains/losses.

We find that firms reporting large hedge ineffectiveness gains/losses are associated with greater risk exposure to changes in interest rate and commodity price than those reporting small hedge ineffectiveness gains/losses, after controlling for other factors that affect these risk exposures. We do not find robust evidence that large hedge ineffectiveness gains/losses are positively associated with foreign exchange rate risk exposure. In addition, we find that firms reporting large hedge ineffectiveness gains/losses are associated with higher implied default risk and higher implied cost of equity capital than those reporting small hedge ineffectiveness gains/losses, after controlling for other factors that affect default risk and cost of equity capital.

Taken together, our findings suggest that firms reporting large accounting hedge ineffectiveness have significantly higher risk compared to firms reporting small accounting hedge ineffectiveness. We thus conclude that the accounting hedge ineffectiveness measure reported under SFAS 133 is informative about and therefore useful for assessing the economic effectiveness of firms’ risk management activities. Our findings support FASB’s requirement for retrospective examination and disclosure of hedge effectiveness.
Reference:


FASB. 2008. Exposure draft: Accounting for hedging activities, an amendment of FASB statement No. 133.


Appendix A. Assessing and Measuring Hedge Ineffectiveness

(Reproduced from SFAS 133)

Qualitative assessment of hedge ineffectiveness

Scenario. Company B manufactures tires. The production of those tires incorporates a variety of physical components, of which rubber and steel are the most significant, as well as labor and overhead. The company hedges its exposure to changes in the fair value of its inventory of 8,000 steel-belted radial tires by entering into a forward contract to sell rubber at a fixed price.

Define hedge effectiveness. Company B decides to assess the effectiveness of this hedge based on whether changes in the fair value of the forward contract attributable to changes in the spot price of rubber offset changes in the market price of steel-belted radial tires. The correlation between historical changes in the spot prices of rubber and tires should also be considered.

Measuring hedge effectiveness. Assume Company B expects the hedge to be highly effective and uses hedge accounting. Based on Company B’s method to assess of hedge effectiveness, the hedge ineffectiveness is determined by the extent that the actual changes in (a) the fair value of the forward contract attributable to the change in the spot price of rubber and (b) the market price of the steel-belted radial tires in inventory did not offset.

Quantitative measurement of hedge ineffectiveness

ABC Company decides to hedge the risk of changes during the period in the overall fair value of its entire inventory of Commodity A by entering into a derivative contract, Derivative Z. On the first day of period 1, ABC enters into Derivative Z and neither receives nor pays a premium (that is, the fair value at inception is zero). However, the terms of Derivative Z did not perfectly match the inventory.

ABC designates the derivative as a hedge and uses fair value hedge accounting. ABC assesses hedge effectiveness by comparing the entire change in fair value of Derivative Z with the change in the market price of the hedged commodity inventory.

At inception of the hedge, Derivative Z has a fair value of zero and the hedged inventory has a carrying amount of $1,000,000 and a fair value of $1,100,000. The fair value of Derivative Z is $22,500 at the settlement date which is one week before the end of Period 1. The inventory is sold on the last day of period 1 for $975,000 (decreased by $25,000).

Hedge ineffectiveness therefore is $25,000 – $22,500 = 2,500, which is recognized in earnings.
### Appendix B. Definitions of Variables Used in Sample Selection

<table>
<thead>
<tr>
<th>Mnemonic:</th>
<th>HEDGEGL</th>
<th>AOCIDERGL</th>
<th>CIDERGL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data name:</td>
<td>Gain/loss on ineffective hedges</td>
<td>Accumulated other comprehensive income – derivative unrealized gain/loss</td>
<td>Comprehensive income – derivative gains/losses</td>
</tr>
<tr>
<td>Statement:</td>
<td>Income Statement</td>
<td>Balance sheet</td>
<td>Income Statement</td>
</tr>
<tr>
<td>Definition:</td>
<td>The amount of gain or loss on the ineffective portion of hedge transactions.</td>
<td>The after-tax amount of unrealized gains or losses on derivative transactions or cash flow hedges.</td>
<td>Gains and losses of derivatives reported after net income in the other comprehensive incomes.</td>
</tr>
</tbody>
</table>
| Included: | (1) Fair value hedge ineffectiveness.  
(2) Cash flow hedge ineffectiveness. | (1) Unrealized gains and losses on derivatives.  
(2) Unrealized gains and losses on cash flow hedges.  
(3) FX hedges of forecasted transactions.  
(4) Reclassification effect of derivatives.  
(5) Cumulative effect of the adoption of FAS No. 133. | (1) Interest rate swaps.  
(2) Unrealized gains and losses on derivatives.  
(3) Hedging gains and losses.  
(4) Net investment hedges.  
(5) Reclassification effect of derivatives.  
(6) FX derivative adjustments.  
(7) Other derivative adjustments. |
| Excluded: | (1) Ineffectiveness of non-hedge designated derivatives. | (1) Unrealized gains or losses on marketable securities or available-for-sale securities.  
(2) FX hedges of net investments in foreign operations.  
(3) Reclassification effect of non-derivatives | (1) Gains and losses of derivatives recognized in pre-tax income.  
(2) Accumulated derivative gains or losses.  
(3) Pension liability adjustment.  
(4) Unrealized gains in investment securities.  
(5) Separate line tax adjustment of derivatives. |
| Availability: | Since 2005 (annual) and 2006 (quarterly). | Since 2001 (annual) and 2006 (quarterly). | |

### Appendix C. Definitions of Variables Used in Statistical Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>( INT_{\text{Exp}}_{it} )</td>
<td>interest rate risk exposure = (</td>
</tr>
<tr>
<td>( FX_{\text{Exp}}_{it} )</td>
<td>foreign exchange rate risk exposure = (</td>
</tr>
<tr>
<td>( COM_{\text{Exp}}_{it} )</td>
<td>commodity price risk exposure = (</td>
</tr>
<tr>
<td>( ACCHINEFF_{it} )</td>
<td>a dummy variable for reporting a large magnitude of accounting hedge ineffectiveness, set to 1 if the absolute value of hedge gains/losses (( HEDGEGL )) is greater than or equal to 0.5% of the absolute value of net income (( NI )); and 0 otherwise.</td>
</tr>
<tr>
<td>( IND_{\text{Exp}INT_{it}} )</td>
<td>median ( INT_{\text{Exp}}_{it} ) of the nonhedge sample in the same 3-digit SIC industry code and year. Our classification is based on the historical SIC industry code (SICH) from Compustat. For missing SICHs, we use non-missing and more recent SICH to fill missing SICHs in earlier years.</td>
</tr>
<tr>
<td>( IND_{\text{Exp}FX_{it}} )</td>
<td>median ( FX_{\text{Exp}}_{it} ) of the nonhedge sample in the same 3-digit SIC industry code and year.</td>
</tr>
<tr>
<td>( IND_{\text{Exp}COM_{it}} )</td>
<td>median ( COM_{\text{Exp}}_{it} ) of the nonhedge sample in the same 3-digit SIC industry code and year.</td>
</tr>
<tr>
<td>( RET_{\text{Vol}}_{it} )</td>
<td>standard deviation of daily stock returns in fiscal year ( t ) for firm ( i ) (requiring a minimum of 180 daily returns).</td>
</tr>
<tr>
<td>( LOGBTM_{it} )</td>
<td>natural logarithm of the book-to-market ratio = ( \log(C/EQ/(CSHO \times PRCC_F)) ).</td>
</tr>
<tr>
<td>( LOGMVE_{it} )</td>
<td>natural logarithm of market value of equity = ( \log(CSHO \times PRCC_F) ).</td>
</tr>
<tr>
<td>( NOL_{it} )</td>
<td>a dummy variable for operating loss carry forward, set to 1 if firm ( i ) in year ( t ) has positive net income and positive net operating loss carry forward; and 0 otherwise.</td>
</tr>
<tr>
<td>( ROA_{it} )</td>
<td>return on assets = income before extraordinary items (( IB )) divided by the average total assets (( AT )).</td>
</tr>
<tr>
<td>( INT_{\text{COV}}_{it} )</td>
<td>pre-tax interest coverage ratio = (operating income before depreciation + interest expense)/interest expense = ( (OIBDP + XINT)/XINT ). If interest expense (( XINT )) is missing and interest expense for financial service (( TIE )) is not missing, we substitute ( XINT ) with ( TIE ). Following Blume et al. (1998), we set negative ( INT_{\text{COV}} ) to 0 and ( INT_{\text{COV}} ) great than 100 to 100.</td>
</tr>
<tr>
<td>( ST_{\text{INVST}}_{it} )</td>
<td>short-term investments (( JVS )) deflated by total assets (( AT )).</td>
</tr>
<tr>
<td>( LEV_{it} )</td>
<td>financial leverage = long-term debt (( DLTT )) divided by total assets (( AT )).</td>
</tr>
<tr>
<td>( F_{SALES_{it}} )</td>
<td>foreign sales divided by total revenue (( SALE )), where foreign sales = sum of sales (( SALES )) in non-domestic market segments from Compustat segment database.</td>
</tr>
<tr>
<td>( CASH_{it} )</td>
<td>cash and short-term investments (( CHE )) divided by total assets (( AT )).</td>
</tr>
<tr>
<td>( INV_{it} )</td>
<td>inventory (( INV )) deflated by total assets (( AT )) times a dichotomous variable that equals 1 if firm ( i )'s commodity price risk exposure in fiscal year ( t ) is positive and -1 if firm ( i )'s commodity price risk exposure in fiscal year is negative.</td>
</tr>
<tr>
<td>( DL_{IDCT_{it}} )</td>
<td>Market-implied default likelihood indicator = the average of the 12 monthly market-implied default likelihood indicators in year ( t ) for firm ( i ) computed following Bharath and Shumway (2008) and the Vassalou and Xing (2004) method, which is based on the Merton (1974) model.</td>
</tr>
<tr>
<td>( IND_{DLI}i_{it} )</td>
<td>median ( DL_{IDCT_{it}} ) of the nonhedge sample in the same 3-digit SIC code industry and year.</td>
</tr>
</tbody>
</table>
| \( LOSS_{it} \) | a dummy variable for losses, set to 1 if income before extraordinary items (\( IB \)) is negative in
the current and prior year; and 0 otherwise.

\( \text{SUBORD}_{it} \) = a dummy variable for subordinated debt, set to 1 if the firm’s subordinated debt (DS) or subordinated convertible debt (DCVSUB) is greater than zero; and 0 otherwise.

\( \text{CAP}_{INTEN}_{it} \) = capital intensity = gross property, plant, and equipment (PPEGT) divided by total assets (AT). If PPEGT is missing and net property, plant, and equipment (PPENT) is not missing, we substitute PPEGT with PPENT.

\( R_{GLS_{it}} \) = implied cost of equity capital for firm \( i \) in year \( t \), estimated using the Gebhardt, Lee, and Swaminathan (2001) model.

\( R_{OJN_{it}} \) = implied cost of equity capital for firm \( i \) in year \( t \), estimated using the Ohlson and Juettner-Nauroth (2005) model as implemented in Gode and Mohanram (2003).

\( R_{MPEG_{it}} \) = implied cost of equity capital for firm \( i \) in year \( t \), estimated using the Easton (2004) model.

\( R_{AVG_{it}} \) = The average of \( R_{GLS_{it}} \), \( R_{OJN_{it}} \), and \( R_{MPEG_{it}} \).

\( \text{IND}_{COEC}^{GLS}_{it} \) = median \( R_{GLS_{it}} \) of the nonhedge sample in the same 3-digit SIC industry code and year.

\( \text{IND}_{COEC}^{OJN}_{it} \) = median \( R_{OJN_{it}} \) of the nonhedge sample in the same 3-digit SIC industry code and year.

\( \text{IND}_{COEC}^{MPEG}_{it} \) = median \( R_{MPEG_{it}} \) of the nonhedge sample in the same 3-digit SIC industry code and year.

\( \text{IND}_{COEC}^{AVG}_{it} \) = median \( R_{AVG_{it}} \) of the nonhedge sample in the same 3-digit SIC industry code and year.

\( \text{FERR}_{it} \) = analyst forecast errors = mean earnings per share forecasts for year \( t + 1 \), made in June of year \( t \) from I/B/E/S, minus I/B/E/S reported actual earnings for that year, scaled by year \( t \) stock price from I/B/E/S. When I/B/E/S reported actual earnings are missing, we use actual earnings from Compustat.

\( \text{GRW}_{it} \) = long-term growth rate = the analyst consensus long-term earnings growth rate from I/B/E/S. If that rate is missing, we calculate the earnings growth rate implied from year \( t + 2 \) and \( t + 3 \) earnings per share forecasts if year \( t + 3 \) earnings per share forecasts are available or from year \( t + 1 \) and year \( t + 2 \) earnings per share forecasts if year \( t + 3 \) earnings per share forecasts are missing.

\( BETA_{it} \) = the CAPM estimated beta for firm \( i \) in year \( t \), estimated using monthly returns over a 10-year rolling window ending three months after the fiscal year end.

\( RF_{t} \) = risk-free rate in year \( t \) = the yield on the 10-year US Treasury bonds in year \( t \).
Appendix D. Estimation of the Implied Default Risk and Cost of Equity Capital

Panel A. Estimation of default likelihood indicator ($DL_{IDCT}$)

We estimate a firm’s default risk for each month in our sample period based on the Merton (1974) framework using stock return information. In the Merton (1974) model under certain assumptions, a firm’s equity can be viewed as a call option with a strike price set at the book value of the firm’s total liabilities. Therefore, the market value of a firm’s equity ($V_E$) is determined by the following option pricing equation for a European call option (Black and Scholes 1973):

$$V_E = V_A N(d_1) - X e^{-rT} N(d_2),$$  \hspace{1cm} (E1)

where

$$d_1 = \frac{\ln(V_A/X) + (r + 0.5\sigma_A^2)T}{\sigma_A\sqrt{T}}, \quad d_2 = d_1 - \sigma_A\sqrt{T},$$  \hspace{1cm} (E2)

$V_A$ is the firm’s assets value, $N(\cdot)$ is the cumulative standard normal distribution function, $X$ is the book value of debt (computed as the sum of the current portion of long-term debt ($DLCQ$) and half of long-term debt ($DLTTQ$) from the most recent quarterly Compustat data), $r$ is the risk-free rate (1-year Treasury Constant Maturity Rate), $\sigma_A$ is the volatility of the firm’s assets, and $T$ is the maturity of debt (assumed to be 1 year). \(^{19}\)

Because a firm’s assets value ($V_A$) and volatility ($\sigma_A$) are not directly observed, we use an iterative numerical procedure to estimate them following Vassalou and Xing (2004) and Bharath and Shumway (2008). Specifically, at the end of every month in our sample period, we use the daily CRSP data from the previous 12 months to estimate the volatility of equity ($\sigma_E$), which is then used as an initial value for the volatility of total assets ($\sigma_A$). Using Equation (E1), we can back out assets value ($V_A$) for each day in the previous 12 months using the market value of equity of that day as $V_E$. We then obtain daily $V_A$ for the previous 12 months. We then calculate the standard deviation of the daily $V_A$ in the previous 12 months and use that as the value of $\sigma_A$ for the next iteration. We iterate this process until $\sigma_A$ converges, that is, the absolute difference in $\sigma_A$ from two consecutive iterations is less than 0.001. After we obtain the converged $\sigma_A$, we plug it back to Equation (E1) to derive $V_A$.

The estimated default likelihood at the end of each month is the probability that the value of a firm’s total assets will be less than the book value of the firm’s total liabilities and is given by the following cumulative normal distribution function:

\(^{19}\) See Vassalou and Xing (2004) and Bharath and Shumway (2008) for more details.
\[ DL_{IDCT} = N \left( -\ln(V_A/X) + (\mu - 0.5\sigma_A^2)T \right) / \sigma_A \sqrt{T} \]

where \( \mu \) is the return to total assets computed using daily implied log return on assets. Our default likelihood indicator \( (DL_{IDCT_i}) \) is the average of the 12 monthly indicators during year \( t \) for firm \( i \).

Panel B. Estimate the implied cost of equity capital.

We first define the following variables used by all three models.

\[
\begin{align*}
P_t &= \text{share price of a firm’s common stock in June of year } t \text{ from I/B/E/S}. \\
B_t &= \text{book value of equity at the beginning of year } t \text{ from Compustat divided by the number of common shares outstanding in June of year } t. \\
DPS_t &= \text{dividends per share paid in year } t - 1, \text{ calculated as common dividends from Compustat divided by the number of common shares outstanding in June of year } t. \\
LTG_t &= \text{mean long-term growth forecasts made in June of year } t \text{ from I/B/E/S}. \\
FEPS_{t+i} &= \text{mean earnings per share (EPS) forecasts for year } t + i, \text{ made in June of year } t \text{ from I/B/E/S}. \\
PT &= \text{dividends payout ratio, calculated as common dividends in year } t - 1 \text{ (from Compustat) divided by net income where net income is the product of I/B/E/S actual earnings per share and I/B/E/S common shares outstanding. When net income is negative, we re-set net income to 6% of total assets at the beginning of year } t \text{ (from Compustat)}. \\
\end{align*}
\]

1. \text{Gebhardt, Lee, and Swaminathan (2001)}

\[
P_t = B_t + \frac{FROE_{t+1} - R_{GLS}}{(1 + R_{GLS})} B_t + \frac{FROE_{t+2} - R_{GLS}}{(1 + R_{GLS})^2} B_{t+1} + TV
\]

\[
TV = \sum_{\tau=3}^{11} \frac{FROE_{t+\tau}}{(1 + R_{GLS})^\tau} B_{t+\tau-1} + \frac{FROE_{t+12} - R_{GLS}}{R_{GLS}(1 + R_{GLS})^T} B_{t+11}
\]

where

\[
FROE_{t+\tau} = \frac{FEPS_{t+\tau}}{B_{t+\tau-1}} \text{ for } \tau = 1, 2, \text{ or } 3. \text{ Beyond year three, we first set } FROE_{t+3} \text{ to the industry median ROE where industry median ROE is calculated in a moving 10 year window ending in the current year. Firms with negative net income or negative book value of equity (from Compustat) are excluded in calculating industry median ROE. For } \tau \text{ between 4 to 11, } FROE_{t+\tau} \text{ is a linear interpolation between } FROE_{t+3} \text{ and } FROE_{t+12}. \text{ We classify firms into Fama and French’s 48 industries each year using firms’ historical SIC industry code (SICH). If SICs are missing in certain years, we use the more recent non-missing SICH to fill missing SICs in earlier years.}
\]

\[
B_{t+\tau} = B_{t+\tau-1} + FEPS_{t+\tau} \times (1 - POUT) \text{ for } \tau = 1, \ldots, 11, \text{ where } FEPS_{t+\tau} = FROE_{t+\tau} \times B_{t+\tau-1} \text{ for } \tau = 4, \ldots, 11.
\]

2. \text{Ohlson and Juettner-Nauroth (2005) as implemented by Gode and Mohanram (2003)}
\[ R_{OJ/N} = A_t + \sqrt{A_t^2 + \frac{FEPS_{t+1}}{P_t} \left( \frac{FEPS_{t+2} - FEPS_{t+1}}{FEPS_{t+1}} - (R_{Pt} - 0.03) \right)} \]

where

\[ A_t \equiv \frac{1}{2} ((R_{Pt} - 0.03) + \frac{DPS_{t+1}}{P_t}) \]

\[ DPS_{t+1} = EPS_{t+1} \times POUT \]

As in Ohlson and Juettner-Nauroth (2005), we require \( FEPS_{t+1} > 0 \) and \( FEPS_{t+2} > 0 \). In addition, if \( DPS_{t+1} < 0 \), we set \( DPS_{t+1} = 0 \).


\[ R_{MPF\text{EG}} = \frac{DPS_{t+1} + \sqrt{DPS_{t+1}^2 + 4P_t (FEPS_{t+2} - FEPS_{t+1})}}{2P_t} \]

where

\[ DPS_{t+1} = EPS_{t+1} \times POUT. \text{ If } DPS_{t+1} < 0 \text{ then } DPS_{t+1} = 0. \]

As in Easton (2004), we require \( FEPS_{t+2} \geq FEPS_{t+1} > 0 \). In addition, if \( DPS_{t+1} < 0 \), we set \( DPS_{t+1} = 0 \).
### Table 1. Sample Distribution

**Panel A. Distribution of sample by years and hedge ineffectiveness categories**

<table>
<thead>
<tr>
<th>Year</th>
<th>Gain</th>
<th>Loss</th>
<th>Total</th>
<th>Gain</th>
<th>Loss</th>
<th>Zero</th>
<th>Missing</th>
<th>Total</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>75</td>
<td>76</td>
<td>151</td>
<td>60</td>
<td>45</td>
<td>210</td>
<td>1,012</td>
<td>1,327</td>
<td>1,478</td>
</tr>
<tr>
<td>2006</td>
<td>69</td>
<td>51</td>
<td>120</td>
<td>67</td>
<td>60</td>
<td>235</td>
<td>964</td>
<td>1,326</td>
<td>1,446</td>
</tr>
<tr>
<td>2007</td>
<td>60</td>
<td>69</td>
<td>129</td>
<td>61</td>
<td>59</td>
<td>217</td>
<td>1,011</td>
<td>1,348</td>
<td>1,477</td>
</tr>
<tr>
<td>2008</td>
<td>72</td>
<td>85</td>
<td>157</td>
<td>56</td>
<td>69</td>
<td>239</td>
<td>1,042</td>
<td>1,406</td>
<td>1,563</td>
</tr>
<tr>
<td>Total</td>
<td>276</td>
<td>281</td>
<td>557</td>
<td>244</td>
<td>233</td>
<td>901</td>
<td>4,029</td>
<td>5,407</td>
<td>5,964</td>
</tr>
</tbody>
</table>

**Panel B. Distribution of sample by 2-digit SIC codes**

<table>
<thead>
<tr>
<th>Industry Classification</th>
<th>2-digit SIC code</th>
<th>ACCHINEFF = 1</th>
<th>ACCHINEFF = 0</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>01-09</td>
<td>2</td>
<td>22</td>
<td>24</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>10-14</td>
<td>107</td>
<td>282</td>
<td>389</td>
</tr>
<tr>
<td>Construction</td>
<td>15-17</td>
<td>3</td>
<td>39</td>
<td>42</td>
</tr>
<tr>
<td>Manufacturing except machinery and equipment</td>
<td>20-34, 37-39</td>
<td>91</td>
<td>1,518</td>
<td>1,609</td>
</tr>
<tr>
<td>Industrial machinery and equipment</td>
<td>35-36</td>
<td>19</td>
<td>562</td>
<td>581</td>
</tr>
<tr>
<td>Transportation, communications, and utilities</td>
<td>40-49</td>
<td>127</td>
<td>652</td>
<td>779</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>50-51</td>
<td>12</td>
<td>187</td>
<td>199</td>
</tr>
<tr>
<td>Retail trading</td>
<td>52-59</td>
<td>14</td>
<td>273</td>
<td>287</td>
</tr>
<tr>
<td>Finance and insurance</td>
<td>60-67</td>
<td>141</td>
<td>1,266</td>
<td>1,407</td>
</tr>
<tr>
<td>Services</td>
<td>70-89</td>
<td>38</td>
<td>594</td>
<td>632</td>
</tr>
<tr>
<td>Public administration</td>
<td>91-99</td>
<td>2</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>557</td>
<td>5,407</td>
<td>5,964</td>
</tr>
</tbody>
</table>

The preliminary hedge sample consists of 5,964 U.S. firm-year observations during 2005-2008 where (1) \(HEDGEGL\) is positive, (2) \(HEDGEGL\) is negative, (3) \(HEDGEGL\) is zero but \(AOCIDERGL\) is neither zero nor missing or \(CIDERGL\) is neither zero nor missing, or (4) \(HEDGEGL\) is missing but \(AOCIDERGL\) is neither zero nor missing or \(CIDERGL\) is neither zero nor missing.

See Appendix B and C for variable definition.
### Table 2. Descriptive Statistics and Univariate Tests

<table>
<thead>
<tr>
<th>Variable</th>
<th>Large accounting hedge ineffectiveness ($ACCHINEFF=1$)</th>
<th>Small accounting hedge ineffectiveness ($ACCHINEFF=0$)</th>
<th>Difference in Mean</th>
<th>Difference in Median</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N  Mean  Std.Dev Q1 Median Q3</td>
<td>N  Mean  Std.Dev Q1 Median Q3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependent variable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$INT_{EXPIt}$</td>
<td>421 0.578 0.620 0.149 0.387 0.745</td>
<td>4,040 0.538 0.576 0.141 0.336 0.734</td>
<td>(0.20)</td>
<td>(0.25)</td>
</tr>
<tr>
<td>$FX_{EXPIt}$</td>
<td>421 1.760 1.732 0.497 1.277 2.368</td>
<td>4,040 1.623 1.540 0.550 1.162 2.207</td>
<td>(0.12)</td>
<td>(0.40)</td>
</tr>
<tr>
<td>$COM_{EXPit}$</td>
<td>421 0.657 0.581 0.222 0.483 0.948</td>
<td>4,040 0.505 0.468 0.171 0.364 0.692</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>$DL_{IDCtit}$</td>
<td>432 0.194 0.346 0.000 0.000 0.000</td>
<td>4,087 0.139 0.286 0.000 0.000 0.000</td>
<td>(0.00)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>$R_{AVGIt}$</td>
<td>297 0.118 0.044 0.089 0.105 0.132</td>
<td>3,003 0.106 0.035 0.085 0.098 0.117</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>$R_{GLSI}$</td>
<td>297 0.091 0.030 0.075 0.087 0.102</td>
<td>3,003 0.086 0.025 0.084 0.094 0.099</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>$R_{ALPNI}$</td>
<td>297 0.133 0.056 0.097 0.118 0.156</td>
<td>3,003 0.118 0.045 0.091 0.107 0.132</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>$R_{MFPEGI}$</td>
<td>297 0.129 0.056 0.093 0.114 0.151</td>
<td>3,003 0.114 0.044 0.088 0.103 0.127</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Control variable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$RET_VOL_{It}$</td>
<td>421 2.843 1.731 1.629 2.316 3.441</td>
<td>4,040 2.674 1.592 1.594 2.200 3.222</td>
<td>(0.06)</td>
<td>(0.10)</td>
</tr>
<tr>
<td>$LOGBTM_{It}$</td>
<td>421 -0.614 0.701 -0.985 -0.605 -0.246</td>
<td>4,040 -0.691 0.766 -1.130 -0.658 -0.251</td>
<td>(0.03)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>$LOGMVE_{It}$</td>
<td>421 7.614 1.825 6.386 7.590 8.900</td>
<td>4,040 7.164 1.917 5.870 7.165 8.375</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>$NOL_{It}$</td>
<td>421 0.230 0.422 0.000 0.000 0.000</td>
<td>4,040 0.313 0.464 0.000 0.000 1.000</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>$ROA_{It}$</td>
<td>421 0.098 0.072 0.047 0.094 0.140</td>
<td>4,040 0.113 0.079 0.061 0.111 0.161</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>$INT_COV_{It}$</td>
<td>421 11.118 18.360 2.922 5.460 10.971</td>
<td>4,040 14.781 21.513 3.610 7.357 15.041</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>$ST_INVEST_{It}$</td>
<td>421 0.022 0.046 0.000 0.001 0.017</td>
<td>4,040 0.024 0.058 0.000 0.000 0.015</td>
<td>(0.37)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>$LEV_{It}$</td>
<td>421 0.259 0.176 0.122 0.240 0.374</td>
<td>4,040 0.226 0.170 0.090 0.202 0.332</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>$F_SALES_{It}$</td>
<td>421 0.129 0.230 0.000 0.000 0.151</td>
<td>4,040 0.186 0.250 0.000 0.000 0.344</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>$CASH_{It}$</td>
<td>421 0.077 0.102 0.015 0.039 0.087</td>
<td>4,040 0.092 0.112 0.020 0.046 0.120</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>$INV_{It}$</td>
<td>421 -0.008 0.113 -0.021 0.000 0.024</td>
<td>4,040 -0.008 0.152 -0.065 0.000 0.036</td>
<td>(0.93)</td>
<td>(0.13)</td>
</tr>
<tr>
<td>$LOSS_{It}$</td>
<td>432 0.037 0.189 0.000 0.000 0.000</td>
<td>4,087 0.044 0.206 0.000 0.000 0.000</td>
<td>(0.45)</td>
<td>(0.48)</td>
</tr>
<tr>
<td>$SUBORD_{It}$</td>
<td>432 0.181 0.385 0.000 0.000 0.000</td>
<td>4,087 0.172 0.377 0.000 0.000 0.000</td>
<td>(0.64)</td>
<td>(0.63)</td>
</tr>
<tr>
<td>$CAP_I_TEN_{It}$</td>
<td>432 0.614 0.446 0.171 0.653 0.933</td>
<td>4,087 0.482 0.400 0.123 0.397 0.782</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>$FERR_{It}$</td>
<td>297 0.014 0.066 -0.006 0.001 0.016</td>
<td>3,003 0.009 0.055 -0.004 0.000 0.008</td>
<td>(0.17)</td>
<td>(0.24)</td>
</tr>
<tr>
<td>$GRW_{It}$</td>
<td>297 0.136 0.105 0.078 0.108 0.150</td>
<td>3,003 0.137 0.087 0.089 0.120 0.159</td>
<td>(0.86)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>$BETA_{It}$</td>
<td>297 1.017 0.586 0.580 0.956 1.313</td>
<td>3,003 1.016 0.621 0.566 0.925 1.337</td>
<td>(0.97)</td>
<td>(0.68)</td>
</tr>
<tr>
<td>$RF_{t}$</td>
<td>297 0.045 0.005 0.040 0.041 0.051</td>
<td>3,003 0.046 0.005 0.040 0.051 0.051</td>
<td>(0.12)</td>
<td>(0.26)</td>
</tr>
</tbody>
</table>

**Note:**
Samples for testing H1a/H1b-H3a/H3b differ in size and are all constructed based on the preliminary hedge sample (5,964 firm-year observations during 2005-2008). Starting with the preliminary hedge sample, we require availability of all variables in Equations (4)-(6) and obtain 4,461 observations for the sample to test H1a/H1b. Requiring the availability of all variables in Equation (7), we obtain 4,519 observations to test H2a/H2b. Requiring the availability of all variables in Equation (8), we obtain 3,300 observations to test H3a/H3b.
See Appendix C for variable definition. Numbers in parenthesis are two-tailed $p$-values of the test of differences in mean (t-test) or median (Wilcoxon rank sum z-test) between the large and small accounting hedge ineffectiveness subsamples.
Table 3. Multivariate Analysis of Interest Rate/Foreign Exchange Rate/Commodity Price Risk Exposure and Accounting Hedge Ineffectiveness

<table>
<thead>
<tr>
<th>Variable</th>
<th>Predicted sign</th>
<th>INT_EXP</th>
<th>FX_EXP</th>
<th>COM_EXP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>?</td>
<td>0.5141</td>
<td>1.2957</td>
<td>0.2514</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.00)</td>
<td>(0.07)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>ACCHINEFF</td>
<td>+</td>
<td>0.0729</td>
<td>0.1423</td>
<td>0.1212</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.01)</td>
<td>(0.23)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>IND_EXP</td>
<td>+</td>
<td>0.5696</td>
<td>0.2141</td>
<td>0.3915</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.01)</td>
<td>(0.00)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>RET_VOL</td>
<td>+</td>
<td>0.033</td>
<td>0.2445</td>
<td>0.0719</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.49)</td>
<td>(0.07)</td>
<td>(0.13)</td>
</tr>
<tr>
<td>LOGBTM</td>
<td>?</td>
<td>-0.0791</td>
<td>-0.176</td>
<td>-0.0765</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.03)</td>
<td>(0.05)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>LOGMVE</td>
<td>-</td>
<td>-0.0539</td>
<td>-0.1141</td>
<td>-0.0216</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.00)</td>
<td>(0.04)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>NOL</td>
<td>-</td>
<td>-0.0189</td>
<td>0.0557</td>
<td>-0.0012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.18)</td>
<td>(0.15)</td>
<td>(0.96)</td>
</tr>
<tr>
<td>ROA</td>
<td>?</td>
<td>-0.5361</td>
<td>-0.2212</td>
<td>-0.347</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.20)</td>
<td>(0.81)</td>
<td>(0.32)</td>
</tr>
<tr>
<td>INT_COV</td>
<td>+</td>
<td>0.0006</td>
<td>0.0002</td>
<td>-0.0006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.18)</td>
<td>(0.77)</td>
<td>(0.29)</td>
</tr>
<tr>
<td>ST_INVST</td>
<td>?</td>
<td>-0.0143</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.93)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEV</td>
<td>?</td>
<td>0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.98)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F_SALES</td>
<td>+</td>
<td></td>
<td>0.0353</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.80)</td>
<td></td>
</tr>
<tr>
<td>CASH</td>
<td>?</td>
<td></td>
<td></td>
<td>0.0478</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.73)</td>
</tr>
<tr>
<td>INV</td>
<td>+</td>
<td></td>
<td></td>
<td>0.0475</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.10)</td>
</tr>
</tbody>
</table>

Obs. 4,461  4,461  4,461
Adj. R² (%) 16.58  11.43  14.95

The test sample consists of 4,461 firm-year observations during 2005-2008 with 421 (4,040) observations classified as large (small) accounting hedge ineffectiveness. The p-values in parenthesis are based on two-tailed tests with standard errors calculated using the two-way clustering procedure in Peterson (2008) and Gow, Ormazabal, and Taylor (2009). All variables are winsorized at the top and the bottom 1 percentile.

IND_EXP = IND_EXP^INTit, IND_EXP^FXit, and IND_EXP^COMit, respectively, in the INT_EXP, FX_EXP, and COM_EXP columns. See Appendix C for definitions of other variables.
### Table 4. Multivariate Analysis of Default Risk and Accounting Hedge Ineffectiveness

<table>
<thead>
<tr>
<th>Variable</th>
<th>Predicted sign</th>
<th>OLS with two-way clustered standard errors</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>?</td>
<td>0.3229</td>
<td>(0.00)</td>
</tr>
<tr>
<td>ACCHINEFF</td>
<td>+</td>
<td>0.0667</td>
<td>(0.01)</td>
</tr>
<tr>
<td>IND_DLI</td>
<td>+</td>
<td>0.5191</td>
<td>(0.01)</td>
</tr>
<tr>
<td>LEV</td>
<td>+</td>
<td>0.2827</td>
<td>(0.01)</td>
</tr>
<tr>
<td>ROA</td>
<td>-</td>
<td>-0.6456</td>
<td>(0.02)</td>
</tr>
<tr>
<td>LOSS</td>
<td>+</td>
<td>0.0423</td>
<td>(0.42)</td>
</tr>
<tr>
<td>INT_COV</td>
<td>-</td>
<td>-0.0007</td>
<td>(0.04)</td>
</tr>
<tr>
<td>LOGMVE</td>
<td>-</td>
<td>-0.0258</td>
<td>(0.04)</td>
</tr>
<tr>
<td>SUBORD</td>
<td>+</td>
<td>0.0407</td>
<td>(0.06)</td>
</tr>
<tr>
<td>CAP_INTEN</td>
<td>-</td>
<td>-0.1645</td>
<td>(0.00)</td>
</tr>
</tbody>
</table>

Obs. 4,519
Adj. R²(%) 33.75

The test sample consists of 4,519 firm-year observations during 2005-2008 with 432 (4,087) observations classified as large (small) accounting hedge ineffectiveness. The p-values in parenthesis are based on two-tailed tests with standard errors calculated using the two-way clustering procedure in Peterson (2008) and Gow, Ormazabal, and Taylor (2009). All variables are winsorized at the top and the bottom 1 percentile.

See Appendix C for variable definition.
Table 5. Multivariate Analysis of Implied Cost of Equity Capital and Accounting Hedge Ineffectiveness

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pred. sign</th>
<th>( R_{AVG} )</th>
<th>( R_{GLS} )</th>
<th>( R_{QIN} )</th>
<th>( R_{MPRE} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>?</td>
<td>0.1003</td>
<td>0.0662</td>
<td>0.1199</td>
<td>0.1157</td>
</tr>
<tr>
<td>( ACCHINEFF )</td>
<td>+</td>
<td>0.0079</td>
<td>0.001</td>
<td>0.0118</td>
<td>0.0112</td>
</tr>
<tr>
<td>( IND_COEC )</td>
<td>+</td>
<td>0.3214</td>
<td>0.4431</td>
<td>0.2548</td>
<td>0.2828</td>
</tr>
<tr>
<td>( FERR )</td>
<td>+</td>
<td>0.1992</td>
<td>0.1113</td>
<td>0.2428</td>
<td>0.2424</td>
</tr>
<tr>
<td>( GRW )</td>
<td>+</td>
<td>0.0517</td>
<td>0.0168</td>
<td>0.0735</td>
<td>0.0674</td>
</tr>
<tr>
<td>( LEV )</td>
<td>+</td>
<td>0.0091</td>
<td>0.0017</td>
<td>0.0129</td>
<td>0.0126</td>
</tr>
<tr>
<td>( BETA )</td>
<td>+</td>
<td>0.0056</td>
<td>0.0045</td>
<td>0.0064</td>
<td>0.0064</td>
</tr>
<tr>
<td>( LOGMVE )</td>
<td>-</td>
<td>-0.002</td>
<td>-0.0002</td>
<td>-0.0031</td>
<td>-0.0028</td>
</tr>
<tr>
<td>( LOGBTM )</td>
<td>+</td>
<td>0.0137</td>
<td>0.0157</td>
<td>0.0124</td>
<td>0.0130</td>
</tr>
<tr>
<td>( RF )</td>
<td>+</td>
<td>-0.3941</td>
<td>-0.2344</td>
<td>-0.4375</td>
<td>-0.4737</td>
</tr>
</tbody>
</table>

|                | Obs.       | 3,300          | 3,300          | 3,300          | 3,300          |
|                | Adj. \( R^2 \) (%) | 33.56         | 43.47          | 26.24          | 27.36          |

The test sample consists of 3,300 firm-year observations during 2005-2008 with 297 (3,003) observations classified as large (small) accounting hedge ineffectiveness. The \( p \)-values in parenthesis are based on two-tailed tests with standard errors calculated using the two-way clustering procedure in Peterson (2008) and Gow, Ormazabal, and Taylor (2009). All variables are winsorized at the top and the bottom 1 percentile.

\( IND\_COEC = INDCOECAV_{it}, INDCOECLGS_{it}, INDCOECQIN_{it}, \) and \( INDCOECMPRE_{it}, \) respectively, in the \( R_{AVG}, R_{GLS}, R_{QIN}, \) and \( R_{MPRE} \) columns. See Appendix C for variable definition.