Executive Compensation and Hedge Accounting: An Investigation of the Reporting and Risk Incentives Associated with the Corporate Use of Derivatives

M. Martin Boyer
HEC Montreal (Université de Montréal)
Montreal (Quebec), H3T 2A7
514-340-6704
martin.boyer@hec.ca

Elicia P. Cowins
Washington and Lee University
The Williams School of Commerce, Economics and Politics
Lexington, VA 24450
540-458-8442
cowinse@wlu.edu

Willie D. Reddic
DePaul University
Driehaus College of Business
Chicago, IL 60604
312-362-5847
wreddic@depaul.edu

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ABSTRACT

In this study, we use executive compensation contracts to investigate whether the cross-sectional variation in the degree of accounting hedge designation is a function of reporting choice or indicative of the underlying economics of the derivative position. We first use principal component analysis to categorize firms based on their degree of exposure to business risks. We then test a series of hypotheses developed to examine whether the prevalence of derivatives designated as accounting hedges is attributable to reporting or behavioral incentives created by the structure of managers' compensation contracts. We find no evidence of managers making opportunistic reporting choices, either in the context of earnings-based or market-based performance measures. We consistently find evidence, however, that the prevalence of undesignated derivatives varies with the overall risk environment of the firm. In addition, we find that, under certain circumstances, undesignated derivatives appear to reduce the firm's overall risk as opposed to creating exposures.

1. INTRODUCTION

What does the hedge accounting designation tell us about the underlying economics of a firm's derivative positions? To the casual observer, and even some in the financial press, it is obvious. Derivatives that are designated as hedges for accounting purposes are used to manage risk exposures that naturally arise because firms operate in the context of a broader macroeconomic environment. By construction, those that are left undesignated are used for purposes other than risk management. This is an appealing interpretation of the reporting model; however, it fails to acknowledge several aspects of the hedge accounting standard.

- First, the underlying objective of the hedge accounting standard is to address an unintended side-effect of the mixed-attribute reporting model, as opposed to an explicit attempt to provide information about the economic intent behind a firm's derivative positions (Statement of Financial Accounting Standards No. 133, paragraphs 320 and 327).
- Second, there is no requirement that a derivative hedge reduce a firm's overall exposure to risk in order to be reported under the hedge accounting standard, only that it effectively hedge a single specifically identified exposure (Statement of Financial Accounting Standards No. 133, paragraph 357).
- Third, some would argue the criteria that must be met before a derivative position can be designated as an accounting hedge are restrictive and that the ongoing effectiveness testing and subsequent reporting requirements are costly (Comisky and Mulford 2008; Cowins and Reddic 2015).
- Finally, the hedge accounting standard is applied voluntarily so it is debatable whether the hedge designation, or lack thereof, provides any incremental information about a firm's derivative use.

In this study, we posit that the decision to seek the accounting hedge designation, regardless of the economic intent behind initiating the contract, is in part a function of the perceived costs and benefits weighed by the manager. We therefore investigate whether the structure of the manager's compensation contract provides a mechanism for interpreting cross-sectional variation in hedge accounting reporting outcomes. Executive compensation contracts consist of both fixed (base salary, perquisites and other forms of non-performance-based pay) and variable (restricted stock grants, stock option grants and other forms of performance-based pay) components. Variable or "performance-based" components can be further disaggregated into compensation that is either driven by earnings-based or market-based measures of performance. Given that managers know the shape of their compensation contract, we examine the reporting and risk incentives contained therein to glean incremental information about the aggregated effects of a firm's unsettled derivative positions.

We first consider reporting incentives in the context of prior research, which suggests earnings is incrementally informative about a firm's performance, and therefore a useful basis for determining compensation when it is less noisy, more persistent, and more informative than stock price returns (Lambert and Larcker 1987; Sloan 1993; Barber et al. 1998). This empirical result may lead to the conclusion that fair value accounting for derivative instruments degrades the quality of the earnings signal for the purposes of evaluating the manager's performance, particularly when those derivatives are held for risk management purposes, as it increases the variance in earnings. Specifically, when unrealized gains and losses from the derivative are not recognized in the same period as the economic gains and losses from the exposure, the resulting volatility is not reflective of risk. Although articulated critiques of the standard may lead some to decide the incremental benefit of the designation is immaterial or nonexistent, we posit that managers of firms using derivatives to hedge risk AND whose compensation is more sensitive to earnings-based measures should be more likely to use the hedge accounting designation.

Second, because earnings volatility is associated with equity volatility, as we will demonstrate in our sample, we consider that earnings have a role to play in market-based performance measures. This "correlation in volatilities" is important since option pricing models assign a fair value to options based on the underlying stock price, the option's strike price, the time to expiry, the risk-free rate of return and the volatility of the stock. Since fair value reporting for derivatives mandates the recognition of unrealized gains and losses in earnings, failing to designate a derivative as an accounting hedge results in incremental earnings volatility, regardless of the underlying economic purpose for holding the derivative. We therefore posit that there are circumstances under which a manager would be more likely to forgo hedge accounting thereby increasing the value of his/her options.

Finally, compensation contracts provide incentives for managers to either increase or decrease a firm's exposure to risk by altering the sensitivity of equity-based compensation to changes in equity volatility. We therefore posit that the more sensitive the manager's wealth to stock price volatility, the more likely undesignated derivatives are being used for purposes other than risk management.

To test our predictions, we first develop a model of the overall business risk environment for our sample firms using principal component analysis. Our analysis yielded five factors that capture different aspects of a firm's exposure to risk including liquidity, operational efficiency, the ability to self-insure, market expansion, and leverage. We classify firms into five categories based on their estimated factor scores and employ ordinary least squares regression analyses to investigate whether there are cross-sectional differences in reporting outcomes that are associated with variation in the shape of the executive's compensation contract as well as the firm's business environment.

In the aggregate, we find evidence in support of the following:

1) Derivatives not designated as accounting hedges exhibit a significant relation to a firm's residual exposure to commodities prices while exhibiting no relation to a firm's residual exposure to interest and foreign exchange rates;
2) The association between derivatives not designated as accounting hedges and residual exposure to foreign exchange rates and commodities prices varies as a function of the firm's general business environment;
3) Firms operating in riskier environments have more derivatives which are not designated as accounting hedges;
4) For a subset of firms, the personal wealth consequences of failing to obtain the accounting hedge designation are sufficient to provide a reporting incentive; and
5) Managers whose personal wealth is most sensitive to stock price volatility are less likely to opt to forgo hedge accounting.

The second result suggests that financial statement preparers are making reporting choices that are a function of their risk environment. The third result provides evidence that for some, the decision to enter a derivative risk management strategy is more economically beneficial, even if that derivative does not meet the criteria for hedge accounting designation. Together, results 2 and 3 suggest that the costs associated with the standard, and the managers' perceived risk environment, create distortions in reporting outcomes (i.e., outcomes that deviate from the economics of the position). Results 4 and 5 suggest that some managers respond to the reporting incentives provided by the hedge accounting election, but do not appear to respond to the economic incentive to manipulate stock prices for the purposes of maximizing the value of their stock options. We interpret this set of results to suggest that reporting outcomes do not reflect the underlying economics of the derivative positions of a reporting entity, at least across the three types of derivative examined in this study.

This study represents a contribution to the literature on managerial incentives and risk (e.g Gray and Cannella, 1997; Rajgopal and Shevlin, 2002; Coles et al., 2006; Low, 2009) as well as a small but growing literature that exploits the recent availability of highly detailed disclosures regarding a firm's derivative activities to investigate how such disclosures have contributed to the previously available information set (e.g., Panaretou et al., 2013; Cowins, 2014; Manchiraju et al., 2014; Chang et al., 2015). Finally, policy makers could make use of our results as they are working to address issues with the hedge accounting standard to increase compliance and consistency in reporting.

The remainder of the paper is as follows: Section 2 provides the background and development of the hypotheses; Section 3 contains a description of the data, sample selection and research design; Section 4 offers our results and Section 5 concludes.

2. BACKGROUND AND HYPOTHESES

The optionality of the hedge accounting standard and its effect on the type of information provided to the capital markets about a firm's derivatives activity is an important issue. Let us assume that it is economically optimal for firms to hedge regardless of accounting hedge designation, as most sample firms assert in their qualitative disclosures. It then follows that the amount of information provided under the no hedge accounting regime is suboptimal because external financial statement users cannot observe the value change in the hedged position. Conversely, this information is observable or obtainable when hedge accounting is implemented.

In our empirical analysis of the reporting choice associated with hedge accounting, we consider both the reporting AND risk incentives provided by executive compensation contracts. Specifically, given the structure of compensation contracts offered to managers, we test first whether firms which designate a relatively high percentage of derivatives as accounting hedges do so because the costs to their managers of failing to obtain the accounting hedge designation are more salient, i.e., the reporting incentive. Evidence that hedge designation is, in part, attributable to the desire for specific reporting outcomes could weaken the case for an economic interpretation of the designation. We follow with an examination of the relation between a firm's use of derivatives not designated as accounting hedges and incentives built into the firm managers' compensation contract. If firms with a relatively high percentage of undesignated derivatives are more likely to incentivize risk taking, this could provide some evidence that the derivatives are held for purposes other than risk management, i.e., the risk incentive.

There is a reasonable expectation that, given the strict reporting requirements, derivatives designated as accounting hedges should be held for risk management. That said, the criteria require that the derivative hedge be "highly effective" in offsetting the underlying exposure. In practice, the effectiveness standard is generally considered to be met if the derivative is expected to offset somewhere between 80% and 125% of the risk. In other words, an imperfect hedge that is either insufficient to offset the full exposure or creates excess exposure can still be designated an accounting hedge, within certain limits. Our view, however, is that derivatives held for risk management should not create statistically significant exposures, on average. We therefore expect to observe an unambiguous negative association between a firm's residual risk and its use of accounting hedges (i.e., firms with lower residual risk exposure have more accounting hedges).

The more interesting question is whether the pool of derivatives that lack hedge accounting designation are associated with greater exposure to risk. A pure economic interpretation of the accounting designation would require an unambiguous positive relation between residual firm risk and undesignated derivatives. However, given what we understand about the nuances associated with the hedge accounting standard, derivatives that are not designated as accounting hedges could fall into any one of three categories: (1) derivative positions that are held for risk management but fail to meet one or more of the criteria for hedge accounting, (2) derivative positions that are held for risk management for which the entity *chooses* not to report using the hedge accounting standard, or (3) derivative positions that are held for other than risk management. An unambiguous positive relation is only predicted in the third case. If, on average, undesignated derivatives are held for risk management but fail to meet the reporting criteria, e.g. the derivative position offsets the underlying exposure to a degree outside the 80-125% corridor, we could observe a positive, negative, or no relation between risk and undesignated derivatives. Conversely, if undesignated derivates are held for risk management but the preparer opts to forgo hedge designation, we could observe a negative relation. Our inability to predict which is more likely to occur leads to our first hypothesis, expressed in null form:

H1: Undesignated derivatives are unrelated to risk.

If observed reporting outcomes serve as a useful proxy for economic reality, directional predictions should be possible. However, given the range of activities aggregated in the undesignated derivatives classification, we explore alternative methods for drawing inferences with respect to the use of derivatives by the reporting entity by focusing on incentives. First, we posit that in deciding whether to hedge risk with a derivative, firms must consider several types of offsetting outcomes. Economically, the firm must determine ex ante whether the derivative will have positive cash flow effects, e.g., whether the net effect of the derivative and the underlying exposure yields a stream of cash flows that is more predictable.

Simultaneously, the firm must consider the consequences of entering into a derivative contract for the purposes of risk management. Among them are the perceptions of market participants that may be informed by the reporting outcomes associated with derivatives. Specifically, the default fair value reporting mandate for derivative financial instruments results in incremental earnings volatility, which investors may interpret as risk and therefore impose a greater discount rate. Conversely, the hedge accounting designation, which could alleviate some if not all the earnings volatility associated with fair value reporting, is not costless. In exchange for a reduction in earnings volatility, firms must assume a set of compliance costs associated with the designation, which include: ongoing monitoring and documentation costs, potentially greater audit fees and/or a derivative position that conforms to the accounting criteria but is economically suboptimal along some other dimension.

Figure 1 provides a representation of the costs and benefits weighed by the manager, assuming shareholder wealth maximization is the priority. In this basic illustration, we collapse all of the economic considerations associated with the decision to hedge operational risk with a derivative into the net economic benefit on the left side of the equation. Specifically, we are assuming if a manager decides to hedge with a derivative, it is because the benefit of the position, e.g., the stabilizing effect on cash flows, is greater than the risks associated with holding derivatives, e.g., counterparty credit risk, market risk and liquidity risk. Once it is determined the offsetting economic effects yield a net benefit, then the reporting consequences are considered. We posit that, from the perspective of the firm, the reporting costs are represented by the costs associated with complying with the standard to achieve and maintain the hedge designation as well as the incremental earnings volatility associated with measurement.

[Insert Figure 1 about here]

Our expectation is that firms exposed to greater amounts of underlying business risk (High Risk Firms) are more likely to benefit from risk management activities, irrespective of their ability to report under the hedge exception, i.e., the expected economic benefit from risk management with derivatives exceeds the cost of reporting the derivative. Conversely, for low risk firms, it is more likely that in weighing the costs and benefits of a derivative hedge results in the determination that the hedge designation is necessary to yield an overall net benefit. Therefore, we expect the undesignated derivatives of firms exposed to greater business risk likely represent risk management derivatives that either fail to meet the exception standard or for which the hedge accounting designation was not sought. This leads to our second hypothesis:

H2: The undesignated derivatives of firms exposed to greater business risks are held for risk management and should therefore be negatively associated with residual exposure.

H2 is an indirect test of the idea that the economic benefit of the derivative position more consistently outweighs the costs associated with failing to identify the position as an accounting hedge under particular circumstances. A more direct test follows as our third hypothesis:

H3: Firms operating with greater business risk have more derivatives that lack the accounting hedge designation.

The default fair value reporting of derivatives rule, which mandates the recognition of unrealized gains and losses in net income, yields an incrementally volatile earnings stream because the offsetting economic gains and losses on the exposure tend to be realized in subsequent periods. Absent the hedge designation, the earnings volatility attributable to fair value reporting is artificial, i.e., not reflective of risk, for companies that are holding derivatives exclusively or primarily for risk management purposes. This renders the earnings signal less useful for either evaluating the effectiveness of the derivative position in offsetting risk or measuring the gains/losses of derivatives held for reasons other than risk management.[1] In other words, the earnings signal is noisy and the ability to use earnings-based performance measures as a basis for incentive compensation is diminished.

This outcome is counter to the manager's self-interest since, depending on how the contract is constructed, performance-based pay may already be affected by issues outside of his/her control. This risk is compounded by the lack of precision in the chosen performance metric. Consequently, we expect managers of firms with high exposure to business risk ***and*** whose cash compensation is more sensitive to earnings-based performance measures have greater incentive to opt for the hedge accounting designation for their risk management derivatives. Figure 2 extends our basic analysis from Figure 1 by considering the managers reporting incentive associated with the shape of his/her compensation contract. Again, the left side of the equation collapses the economic considerations associated with

[1] Sloan (1993) finds that executive salary and bonus are more sensitive to earnings when there is a greater association between equity values and market-wide movements, there is a greater association between earnings and firm-specific changes in value and there is a less positive (more negative) association between earnings and market-wide movements in equity. Baber et al. (1998) predict and find that sensitivity of CEO salary and bonus to earnings performance is greater when current period earnings innovations persist into the future. Lambert and Larcker (1987) predict and find that firms weigh market-based measures of performance relatively more heavily when the variance of the accounting-based performance measure is high relative to the variance of the market measure.

hedging risk with a derivative. We extend the reporting costs on the right by including the loss of precision in the earnings signal when hedge accounting is not applied to a derivative hedge. The result suggests the hedge designation will be more prevalent amongst firms who rely on accounting-based performance metrics when developing compensation contracts. This leads to our fourth hypothesis, expressed in the alternative form:

H4: Managers of firms that are exposed to greater underlying business risk AND whose cash compensation is more sensitive to a measure of earnings performance, are more likely to opt for the accounting hedge designation.

[Insert Figure 2 about here]

In our final set of tests, we examine both reporting and risk incentives of performance pay awarded as a function of market-based performance measures. Specifically, we consider the incentives created by stock option grants. With respect to reporting incentives, we posit that fair value reporting of derivatives provide an opportunity for managers to increase the value of their options. The option pricing model estimates the fair value of an option as a function of the underlying stock price, the option's strike price, the time to expiry, the risk-free rate of return and the volatility of the stock. As previously stated, unless a derivative position is designated as an accounting hedge, fair value reporting mandates the recognition of unrealized gains and losses in earnings. Failing to designate a derivative as an accounting hedge would thus result in incremental earnings volatility, which translates into equity volatility, as we will demonstrate in our tests. We therefore posit as our fifth hypothesis that a manager could be incentivized to forgo the hedge accounting designation to increase the value of his/her stock options by increasing the volatility of his/her firm's share through an increase in earnings volatility.

H5: Managers whose personal wealth is more sensitive to return volatility report more undesignated derivatives.

Equity compensation is designed to incentivize managers to select risky, positive NPV projects for the purposes of shareholder wealth maximization. It is possible, however, that the same tools used to encourage investment in risky projects entice risky behavior with respect to derivative activity. The line between risk incentives designed to encourage managers to take advantage of positive NPV projects and speculating with derivatives is admittedly not a straight and clear one. Prior literature suggests that managers make a distinction between risk taking and gambling within the context of the firms they operate (March and Shapira 1987). However, we assume there is actually a continuum of derivative activities that extends from plain vanilla hedging to outright speculation. By allowing for behaviors that fall short of gambling but require managers to take a view on the direction of various macroeconomic indicators such as interest rates, foreign exchange rates and commodities prices, it is reasonable to expect that altering a manager's risk incentives could affect the degree to which he/she allows his/her beliefs to affect the hedge decision. We assume that understanding the firm's risk environment allows us to draw inferences about the derivative activity of the reporting entity. Our expectation is that shareholders of firms with riskier operations are more likely to incentivize management to hedge risk, while shareholders of firms operating with fewer business risks are more likely to incentivize management to take greater risks. In our final analysis, we use this information to draw inferences about the nature of a firm's undesignated derivative activity. This leads to our sixth and final hypothesis:

H6: The personal wealth of managers of firms facing more business risk is less sensitive to return volatility.

3. DATA, SAMPLE SELECTION

The data come from several publicly available sources. We manually collected footnote data related to a firm's derivative activity from the first fiscal quarter of 2009 through the last calendar quarter of 2016. This information was used to estimate the percentage of derivatives reported under the hedge accounting exception as well as those reported without the designation. We acquire compensation data from ExecuComp to estimate the change in the chief executive's cash compensation used in our reporting incentive analysis, the sensitivity of the chief executive's wealth to changes in return volatility (Vega) used in our risk incentive analysis as well a few other controls. All remaining variables are estimated using data from one or a combination of Compustat and CRSP.

4. RESEARCH DESIGN

4.1. Employing a principal component analysis

The primary challenge we faced in this study was the development of a rigorous construct that would allow us to sort firms based on their risk exposure in a manner that is minimally affected by the firm's operational or financial hedging activity. This construct is necessary because the beginning of the sample period coincides with the first period expanded disclosures regarding firms' derivatives activities are mandated. Therefore, we cannot observe the level of risk to which firms are exposed before entering into derivative positions. In other words, we are unable to distinguish directly firms whose overall risk exposure declined with their use of derivatives from firms whose exposure increased.

To address this problem, we propose to employ a principal component analysis (PCA) technique. Using PCA, we are able to group firms into high or low business risk categories based on a series of instrumental variables which capture various forms of operational risks. Several approaches are possible with PCA. We opted to use the principal axis method, which focuses on the variance shared by instrumental variables, followed by a varimax rotation, which maximizes the variance of a column of the factor pattern matrix, to yield uncorrelated components.[2] A priori, the number of components that is needed is not known. Only the first five components were retained because their eigenvalues were greater than 1 and information criterion tests suggested they were the only components that were demonstrably meaningful. These five principle components accounted for 72% of the sample variance.

In selecting our instruments, we made every attempt to select proxies that were generally unaffected, or only minimally affected, by risk management. We identified thirteen such instruments: size, revenue growth, gross margin percentage, free cash flows, inventory turnover, accounts payable turnover, asset turnover, current ratio, quick ratio, cash ratio, debt to assets, debt to capital, and operating margin percentage. Of these thirteen variables, ten appropriately loaded on one of five components that were ultimately used to generate a factor score upon which we categorized firms (Appendix A defines all the variables we are using).

The five components we identified are liquidity (Component/Factor 1), operating efficiency (Component/Factor 2), the ability to self-insure (Component/Factor 3), market expansion (Component/Factor 4), and leverage (Component/Factor 5). All variables are constructed so that higher values mean the company is operating with less risk. The result is a classification scheme that identifies 5

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[2] "Factor analysis is a method of data reduction. It does this by seeking underlying unobservable (latent) variables that are reflected in the observed variables (manifest variables). There are many different methods that can be used to conduct a factor analysis (such as **principal axis factor**, maximum likelihood, generalized least squares, unweighted least squares). There are also many different types of rotations that can be done after the initial extraction of factors, including orthogonal rotations, such as **varimax** and equimax, which impose the restriction that the factors cannot be correlated" (our emphasis). UCLA: Statistical Consulting Group https://stats.idre.ucla.edu/spss/output/factor-analysis/.

groups of firm-quarter observations that are ranked on the basis of risk, with 0 (resp. 4) being associated with firms which have high (resp. low) business risk exposures.

[Insert Table 1 about here]

4.2. Main variable construction and correlation

In addition to the five principal components/factors, the main variables we will be using to test our six hypotheses are presented in Chart 2A of Table 2. We are particularly interested in the variables named AcctHgs and Undesig. AcctHgs (resp. Undesig) is the sum of the fair values of all derivative assets and liabilities outstanding at the end of each quarter that are designated (resp. undesignated) as accounting hedges, expressed as a percent of all outstanding derivatives. *PCA SCORE* is calculated as the sum of the firm-specific factor scores presented in Table 1. Finally, IRexp, FXexp, and COMMexp are each firm's residual exposure to interest rate, foreign exchange, and commodities price risk respectively as estimated via ordinary least squares using the equation $R_{i,t} = \lambda_{0,i} + \lambda_{1,i}RM_t + \lambda_{2,i}Risk_t + \varepsilon_{i,t}$, where $R_{i,t}$ is the firm's total stock return in month t and RM_t is the value-weighted market portfolio return in month t. The variable of interest, $Risk_t$ is one of three macroeconomic risk variables that serve as proxies for changes in interest rates, foreign exchange rates and commodities prices. Residual exposure is extracted as the absolute value of coefficient $\lambda_{2,i}$ in the regression.

[Insert Table 2 about here]

The interest rate proxy is the monthly percentage change in LIBOR. The foreign currency risk proxy is the monthly percentage change in the Federal Reserve Board trade-weighted index, which measures the strength of the U.S. dollar relative to other currencies of the index. The commodity price risk proxy is the monthly percentage change in the consumer price index of all commodities. The exposure variable is a firm-specific variable estimated using returns from month t- 23 to month t.

As we see in Chart 2B, the correlation between the different principal component factors is zero, which is what it should be by construction. Also, by construction, we note that the correlation between AcctHgs and Undesig is -1 since $AcctHgs_{i,t} = 1 - Undesig_{i,t}$. With respect to the correlations across other variables of interest, we note the relatively high correlation between $PCA\ SCORE$ and the five principal component factors, which is normal given that $PCA\ SCORE = Factor\ 1 + Factor\ 2 + \cdots + Factor\ 5$.

Methodological approach to tests

In our first set of tests, we examine the relation between residual exposures to macroeconomic risk and the percentage of derivatives not designated as accounting hedges (Hypothesis 1). To that end, we estimate the following equation:

$$(1)\ Exposure_{i,t} = \delta_0^u + \delta_1^u Undesig_{i,t} + \delta_2^u Factor1_{i,t} + \delta_3^u Factor2_{i,t} + \delta_4^u Factor3_{i,t} + \delta_5^u Factor4_{i,t} + \delta_6^u Factor5_{i,t} + \varepsilon_{i,t}.$$

Exposure is one of three alternative proxies for a firm-specific measure of macroeconomic risk exposure. $Undesig$ (which is equal to $1 - AcctHgs$) is the sum of the fair values of all derivative assets and liabilities outstanding at the end of each quarter that are not designated as accounting hedges expressed as a percent of all outstanding derivatives. Factors 1 through 5 are firm-specific factor scores.[3] A non-zero coefficient on $Undesig$ (δ_1^u) would provide preliminary evidence that the null hypothesis does not hold for sample firms.

In our second set of tests, we examine the relation between our proxy for the overall risk environment of a firm and the residual exposure to macroeconomic risk as well as the interactive effect between a firm's business environment and the prevalence of derivatives not designated as accounting hedges. To that end we estimate the following equation:

$$(2)\ Exposure_{i,t} = \varphi_0^u + \varphi_1^u Undesig_{i,t} + \varphi_2^u PCAScore_{i,t} + \varphi_3^u \left(Undesig_{i,t} * PCAScore_{i,t}\right) + \varepsilon_{i,t}.$$

$PCAScore$ is a scalar calculated as the sum of the firm-specific factor scores, i.e., Factors 1 through 5. All other variables are as previously defined (see also Appendix A). A negative coefficient on $Undesig * PCAScore$ (i.e, $\varphi_3^u < 0$) would provide evidence in support of Hypothesis 2.

Next, we directly test the underlying premise of Hypothesis 3 (i.e., whether firms exposed to greater business risk report more derivatives that are not designated as accounting hedges) with the following equation:

$$(3)\ Undesig_{i,t} = \psi_0 + \psi_1 PCAScore_{i,t} + \psi_2 IRDeriv_{i,t} + \psi_3 FXDeriv_{i,t} + \psi_4 CommDeriv_{i,t} + \psi_5 IRExp_{i,t} + \psi_6 FXExp_{i,t} + \psi_7 CommExp_{i,t} + \varepsilon_{i,t}.$$

$IRDeriv$, $FXDeriv$, and $CommDeriv$ represent the fair value of interest rate, foreign exchange, or commodities derivatives expressed as a percent of all outstanding derivatives. All other variables are as

[3] They are linear composites of the optimally-weighted observed variables, found by multiplying the optimal regression weights by the firm specific value of each of the instrumental variables and summing the products.

previously defined. A statistically significant, negative coefficient on $PCAScore$ (i.e., ψ_1<0) would provide evidence in support of our hypothesis.

Next, we estimate the following equation to test Hypothesis 4:

$$(4)\quad \Delta CashComp_{i,t} = \theta_0 + \theta_1\, Undesignated_{i,t} + \theta_2 EarnPerf_{i,t} + \theta_3 (EarnPerf{*}Undesignated)_{i,t} + \theta_4 \Delta ROA_{i,t} + \theta_5 (\Delta ROA{*}Undesignated_{i,t}) + \theta_6 RevGrwth + \varepsilon_{i,t}$$

$\Delta CashComp$ is the yearly change in the natural log of CEO cash compensation (salary, bonus and non-equity performance-based pay). $\Delta EarnPerf$ is the yearly change in operating income per share scaled by lagged price. All other variables are as previously defined or are defined in Appendix A. A non-zero coefficient on $EarnPerfi,t * Undesignatedi,t$ (i.e., $\theta_3 \neq 0$) or a non-zero coefficient on $\Delta ROAi,t * Undesignatedi,t$ (i.e., $\theta_5 \neq 0$) would provide evidence that we can reject the null hypothesis for sample firms. This would allow us to conclude that the sensitivity of a manager's cash compensation to earnings-based performance measures creates a reporting incentive to elect for hedge accounting when possible.

To test our final two hypotheses, we estimate the following equation, where the dependent variable, $Vega_{i,t}$, is the natural log of a dollar change in the CEO's option holdings for a 1% change in stock return volatility:

$$(5)\quad Vega_{i,t} = \sigma_0 + \sigma_1 Undesig_{i,t} + \sigma_2 PCAScore_{i,t} + \sigma_3 Undesig_{i,t}{*}PCAScore_{i,t} + \sigma_4 Size_{i,t} + \sigma_5 Age_{i,t} + \sigma_6 Beta_{i,t} + \sigma_7 Ownership_{i,t} + \sigma_8 Option\%_{i,t} + \varepsilon_{i,t}.$$

All other variables are as previously defined or are defined in Appendix A. A positive coefficient on $Undesig$ (σ_1) would provide evidence in support of Hypothesis 5: Managers whose wealth is more sensitive to return volatility report more undesignated derivatives. A positive coefficient on $PCA\ Score$ (i.e., $\sigma_2 > 0$) would provide evidence in support of Hypothesis 6: The wealth of managers operating in business environments with inherently more (less) risk is less (more) sensitive to return volatility. This would suggest that managers are being incentivized differently, based on their general business environment.

The summary statistics for all the variables we are using is displayed in Table 3. [Need to populate this table and examine for notable stats]

[Insert Table 3 about here]

5. RESULTS

Figure 3 shows the average proportion of interest rate, foreign exchange rate, and commodities derivatives outstanding by industry (Chart 1A) and business risk category (Chart 1B). In Chart 1A, we see that the most commonly held derivative in Mining & Construction (SIC 1) and Transportation & Utility (SIC 4) industries, are the commodity derivatives. With respect to SIC 1, this is likely to reduce the price volatility of the output, whereas for SIC 4, this is likely to reduce the price volatility of the input. The services (SIC 8) industry only holds interest rate derivatives. In every other industry, foreign exchange derivatives are the most common. Turning our focus to Chart 1B, we see that the use of interest rate and commodities derivatives generally declines as we move from high business risk firms (PCA0) to low business risk firms (PCA4). And because proportional usage of derivative must sum to 1, the decline in the proportion of interest rate and commodity derivatives is met by an increase in the use foreign exchange derivatives.

[Insert Figure 1 about here]

Figure 4 shows the average residual exposure to interest rates, foreign exchange rates, and commodities prices (that is, the risk after derivative and operational hedging strategies have been implemented) by industry (Chart 2A) and business risk category (Chart 2B). To calculate the residual exposure to interest rate, foreign exchange, and commodities price risks used in the two charts, we first estimated via ordinary least squares equation $R_{i,t} = \lambda_{0,i} + \lambda_{1,i}RM_t + \lambda_{2,i}Risk_t + \varepsilon_{i,t}$, where $R_{i,t}$ is the firm's total stock return in month t and RM_t is the value-weighted market portfolio return in month t. The variable of interest, $Risk_t$ is one of three macroeconomic risk variables that serve as proxies for changes in interest rates, foreign exchange rates and commodities prices. Residual exposure is extracted as the absolute value of coefficient $\lambda_{2,i}$ in the OLS regression.

[Insert Figure 2 about here]

We see in Chart 2A, with respect to commodities prices, that residual exposure is the highest for all industrial sectors. And in unison with Chart 1A, it is firms in SIC1 and SIC4 which exhibit the highest residual exposure to commodity price risk. In Chart 2B, we observe an overall decrease in risk exposure as we move from the group of firms which have a high level of business risk to the group of firms which have low business risk. These results provide a level of comfort in that the principal component analysis has done an acceptable job of identifying which firms are operating in relatively high or low risk environments.

Table 4 provides the results of our tests of Hypothesis 1 where we relate residual risk exposure to the relative use of undesignated derivatives.

[Insert Table 4 about here]

We are unable to reject the null hypothesis in the sense that the relative use of undesignated derivatives exhibits no relation to residual exposure to risks either for interest rate or for foreign exchange derivatives. With respect to the commodities exposure regressions, we observe a positive association between undesignated derivatives and residual risk exposure. This result provides preliminary evidence of the existence of minimal distortion between the economic reality of a firm's commodity derivatives and its reporting outcomes.

Table 5 provides the results of our tests of Hypothesis 2. It shows that with respect to all exposures, our PCA Score exhibits a significant negative relation to exposure. Since our score is decreasing in risk, this result confirms our observations in Figure 2, which was that exposure to macroeconomic risk is higher for firms identified as operating in high risk environments. Perhaps the most interesting information in this table is the counterintuitive result that for foreign exchange and commodities exposures, the relation between undesignated derivatives and risk exposure changes when one considers the broader business environment.

The coefficients on the interactive term ($Undesig * PCA\ Score$) suggest that firms operating in low risk business environments with a high percentage of derivatives not designated as accounting hedges actually have lower residual exposure to foreign exchange and commodity risk. The impact on interest rate exposure does not seem to matter statistically. These results suggest the accounting is insufficient to determine the economic substance of a firm's derivative activity.

[Insert Table 5 about here]

Table 6 provides the results of our tests of Hypothesis 3. We directly test whether business environment is associated with the prevalence of undesignated derivative positions on a firm's balance sheet. We observe a negative relation between $PCA\ Score$ and undesignated derivatives that provides some evidence that the economic benefit of the derivative hedges of firms operating in high business risk environments are sufficient to cover whatever costs are associated with failing to designate the position as an accounting hedge.

[Insert Tables 6 about here]

Table 7 provides the results of our tests of hypothesis 4. Using the entire sample, we find no evidence to support our hypothesis that managers are considering the personal wealth consequences of the hedge accounting designation, or lack thereof. However, when we partition the data, what we observe is that the personal wealth of the managers of sample firms classified in the average risk category (PCA Rank = 2) is most sensitive to earnings performance. However, the pay performance sensitivity of such firms' compensation contracts is lower for those with greater amounts of undesignated derivatives. This suggests that for a subset of firms, our hypothesis holds and managers are considering how the reporting consequences of fair value reporting affect the precision of the performance metric employed to determine the amount of variable compensation.

[Insert Tables 7 about here]

Tables 8, 9 and 10 provide the results of our tests of hypotheses 5 and 6. Tables 8 and 9 confirm the logical flow of the reporting incentives created by stock option grants. Specifically, it must hold that undesignated derivatives increase earnings volatility and that earnings volatility increases equity volatility to ultimately arrive at a conclusion that managers may purposely fail to report derivatives as accounting hedges to increase the value of their options. However, we find no evidence of opportunistic reporting. On the contrary, the relation we observe between undesignated derivatives and $vega$ is negative. This suggests that managers whose wealth varies more with stock return volatility report fewer undesignated derivatives.

[Insert Tables 8, 9, and 10 about here]

Turning to our risk incentives, we observe a positive association between $PCA\ Score$ and $vega$. This suggests that mangers of firms operating in lower business risk environments have wealth that is more sensitive to return volatility. In other words, the managers of firms in lower risk environments are being incentivized to take risks while those in higher risk environments are being incentivized to hedge risks. Perhaps more interesting is the interaction between PCA Score and Undesignated derivatives. The coefficient on the interactive term is negative, significant and of a magnitude sufficient to reverse the sign on the main PCA Score variable. We interpret this result as evidence that the managers of firms operating in lower risk business environments who also report more undesignated derivatives have wealth that is less sensitive to volatility. This suggests that it is more likely that the derivatives are being held for risk management purposes and that the reporting is distorted from economic reality.

6. CONCLUSION

In this study, we examine the reporting and risk incentives of executive compensation contracts to directly investigate whether cross-sectional variation in the degree of accounting hedge designation is on average a function of reporting choice or indicative of the underlying economics of the derivative position. We do not find evidence in support of opportunistic reporting choices, either in the context of earnings-based performance measures or market based performance measures. However, we consistently find evidence that the prevalence of undesignated derivatives varies with the overall risk environment of the firm and that under certain circumstances; undesignated derivatives appear to be hedging risk as opposed to creating exposures. We interpret this result as evidence that for firms exposed to greater amounts of business risk, i.e., those that stand to reap the greatest economic benefit from hedging, the decision to enter a derivative hedge position is less likely to be affected by whether that derivative meets the criteria for accounting hedge designation. This result is positive in the sense that firms do not appear to make poor economic decisions to achieve desired accounting outcomes. It does suggest, however, that there is a difference between the underlying economics of firms' derivative positions and their reporting outcomes. This may be of interest to standard setters who are considering changes to the hedge accounting standard.

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Appendix A

Variable Definitions

Variable		Definition
SIZE	=	Natural log of total assets;
REVENUE GROWTH	=	Percentage change in total revenue calculated over the previous 4 quarters;
GROSS MARGIN %	=	Gross margin, calculated as total revenue less cost of goods sold, divided by total revenue;
OPERATING MARGIN %	=	Operating income before depreciation divided by total revenue;
FREE CASH FLOWS	=	Net cash flow from operating activities less capital expenditures;
INVENTORY TURNOVER	=	Cost of goods sold divided by average inventory;
ACCOUNTS PAYABLE TURNOVER	=	Purchases, calculated as cost of goods sold plus quarterly change in inventory, all divided by average accounts payable;
ASSET TURNOVER	=	Total revenue divided by average total assets;
CURRENT RATIO	=	Total current assets divided by total current liabilities;
QUICK RATIO	=	Total current assets plus short term investments plus total trade receivables, all divided by total current liabilities;
CASH RATIO	=	Cash and equivalents plus short term investments, all divided by total current liabilities;

Appendix A

Variable Definitions

Variable		Definition
DEBT TO ASSET RATIO	=	Total debt in current liabilities plus total debt in long term liabilities, all divided by total assets;
DEBT TO CAPITAL RATIO	=	Total debt in current liabilities plus total debt in long term liabilities, all divided by total shareholders' equity;
OPERATING MARGIN PERCENTAGE	=	Operating income before depreciation divided by total revenue;
FACTORS (1-5)	=	Firm-specific factor scores, i.e., linear composites of the optimally-weighted observed variables, found by multiplying the optimal regression weights by the firm specific value of each of the instrumental variables and summing the products;
PCA SCORE	=	A scalar calculated as the sum of the firm-specific factor scores, i.e., Factors 1 through 5;

Appendix A

Variable Definitions

Variable		Definition
IR EXPOSURE, FX EXPOSURE, COMM EXPOSURE	=	Exposure to interest rate, foreign exchange and commodities price risk is estimated for each firm-quarter observation by estimating the following regression via ordinary least squares: $R_{i,t} = \lambda_{0i} + \lambda_{1i}R_{mt} + \lambda_{2i}Macro_t + \varepsilon_{i,t}$ where $R_{i,t}$ is the cumulative raw return for firm i in month t; $R_{m,t}$ is the value-weighted market portfolio return in month t; and $Macro_t$ is one of three macroeconomic variables with serve as proxies for interest rate risk, foreign currency risk and commodity price risk. The interest rate proxy is the monthly percentage change in LIBOR. The foreign currency risk proxy is the monthly percentage change in the Federal Reserve Board trade-weighted index which measures the strength of the U.S. dollar relative to other currencies of the index. The commodity price risk proxy is the monthly percentage change in the consumer price index of all commodities. The absolute value of the coefficient λ_{2i} captures the firm exposure to the risk factor in each period. The exposure variable is a firm-specific variable estimated using month t-23 to month t returns.
ACCTHDGS	=	Total fair value of derivatives designated as accounting hedges expressed as a percentage of all derivatives held by the firm at period t;
UNDESIG	=	Total fair value of derivatives not designated as accounting hedges expressed as a percentage of all derivatives held by the firm at period t;
IR DERIV, FX DERIV, COMM DERIV	=	Total fair value of interest rate, foreign exchange and commodities derivatives divided by total outstanding derivatives;
AGE	=	The number of fiscal years accounting data is available in Compustat;

Appendix A

Variable Definitions

Variable		Definition
ΔCASHCOMP_CEO	=	Yearly change in natural log of CEO cash compensation (salary, bonus and non-equity based performance pay);
ΔEARNPERF	=	Yearly change in operating income per share scaled by lagged price;
ΔROA	=	Yearly change in return on assets where ROA is calculated as net income divided by total assets;
FAIR VALUE ASSETS (FVA)	=	The total fair value of all assets reported at fair value expressed as a percent of total assets;
FAIR VALUE LIABILITIES (FVL)	=	The total fair value of all liabilities reported at fair value expressed as a percent of total liabilities;
SALES GROWTH VOLATILITY	=	The standard deviation of the quarterly percentage change in total revenue where standard deviations are calculated using 5 years, 20 quarters, of data;
REVENUE VOLATILITY	=	The standard deviation of total revenue scaled by average total assets where standard deviations are calculated using 5 years, 20 quarters, of data;
EQUITY VOLATILITY	=	The standard deviation of firm returns estimated using daily returns over quarters t-7 to t;
EARNINGS VOLATILITY	=	The standard deviation of earnings before extraordinary items scaled by average total assets where standard deviations are calculated using 5 years, 20 quarters, of data;
BETA	=	The market model beta estimated using daily returns over quarters t-7 to t;

Appendix A

Variable Definitions

Variable		**Definition**
VEGA	=	The natural log of dollar change in CEO, CFO, and the average of the top executives for option holdings for a 1% change in return volatility;
OWNERSHIP	=	Percentage of total shares owned by the CEO;
OPTION %	=	Stock options as a percentage of total compensation for the CEO.

FIGURE 1: COST VS. BENEFIT (SHAREHOLDER WEALTH)

Firm's Perspective:

		Net Economic Benefit	Prediction	Reporting Costs	
Firm Type	*Reporting Choice*	*Operating Cash Flow Effects*		*Compliance Costs*	*Earnings Volatility (Cost of Capital)*
High Risk Firms	No Hedge Accounting	Positive	>	Zero	Positive
High Risk Firms	Hedge Accounting	Same as No Hedge Accounting	>	Positive	Zero or Slightly Positive
Low Risk Firms	No Hedge Accounting	Positive, but lower than High Risk Firms	>, =, <	Zero	Positive, but lower
Low Risk Firms	Hedge Accounting	Same as No Hedge Accounting	>	Positive	Zero or Slightly Positive

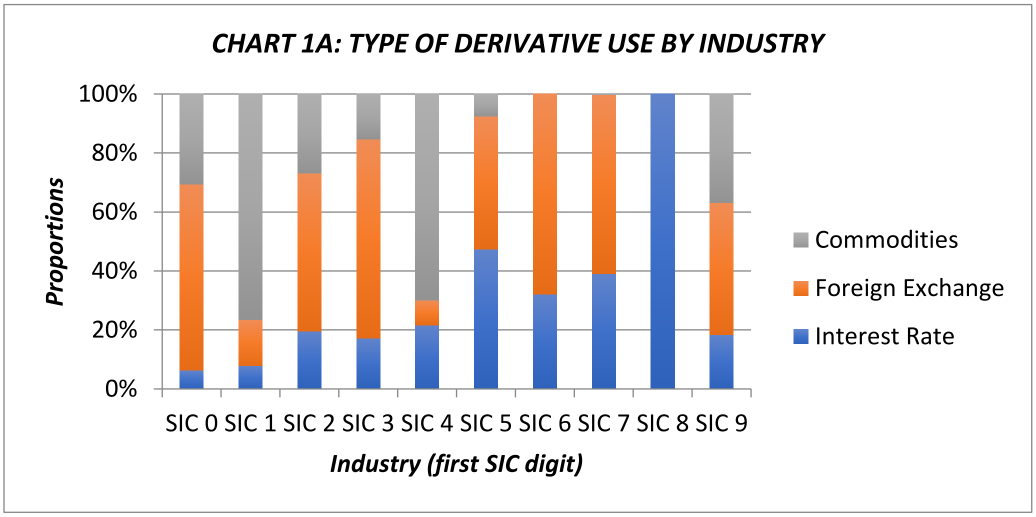
FIGURE 2: COST VS. BENEFIT (MANAGER)

Manager's Perspective:

		Net Economic Benefit	Prediction		Reporting Costs	
Firm Type	*Reporting Choice*	*Operating Cash Flow Effects*		*Compliance Costs*	*Earnings Volatility (Cost of Capital)*	*Earnings Volatility (Precision of Signal)*
High Pay-Performance Sensitivity:						
High Risk Firms	No Hedge Accounting	Positive	>, =, <	Zero	Positive	Positive
High Risk Firms	Hedge Accounting	Same as No Hedge Accounting	>	Positive	Zero or Slightly Positive	Zero or Slightly Positive
Low Pay-Performance Sensitivity:						
High Risk Firms	No Hedge Accounting	Positive	>	Zero	Positive	Relatively Low
High Risk Firms	Hedge Accounting	Same as No Hedge	>	Positive	Zero or Slightly Positive	Zero or Very Low

FIGURE 3: TYPE OF DERIVATIVE BY INDUSTRY AND PCA RANK

These two charts show the average proportion of interest rate, foreign exchange, and commodities derivatives outstanding by industry (in Chart 2A) and PCA rank (in Chart 2B). Industries are coded according to the first SIC digit: 0 = agriculture, forestry and fishing, 1 = Mining and Construction, 2 and 3 = Manufacturing, 4 = Transportation, Communications, Electric, Gas and Sanitary Services, 5 = Wholesale and Retail Trade, 6 = Finance, Insurance and Real Estate, 7, 8 = Services, and 9 = Public Administration. PCA ranks are increasing in business risk, with PCA0 (resp. PCA4) representing firms exposed to greater (resp. lesser) amounts of business risk.



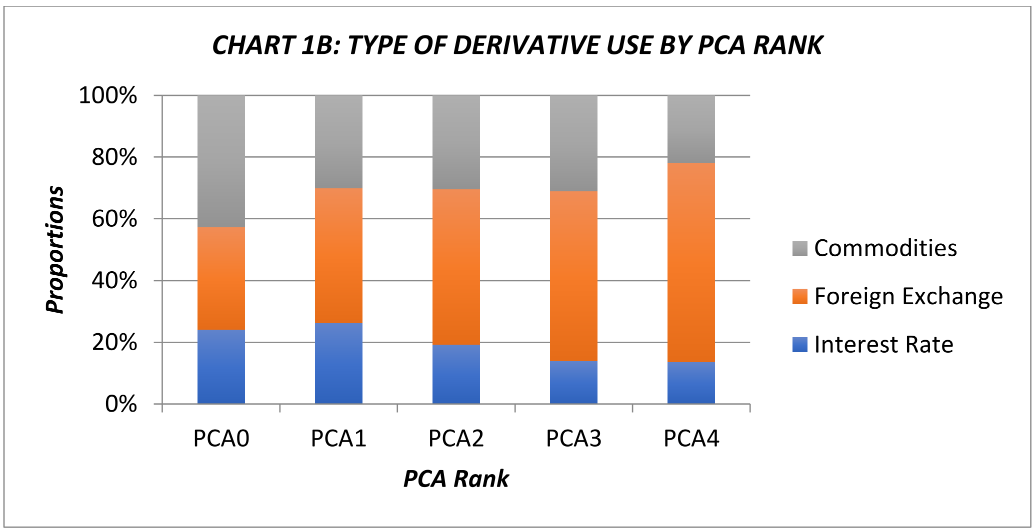
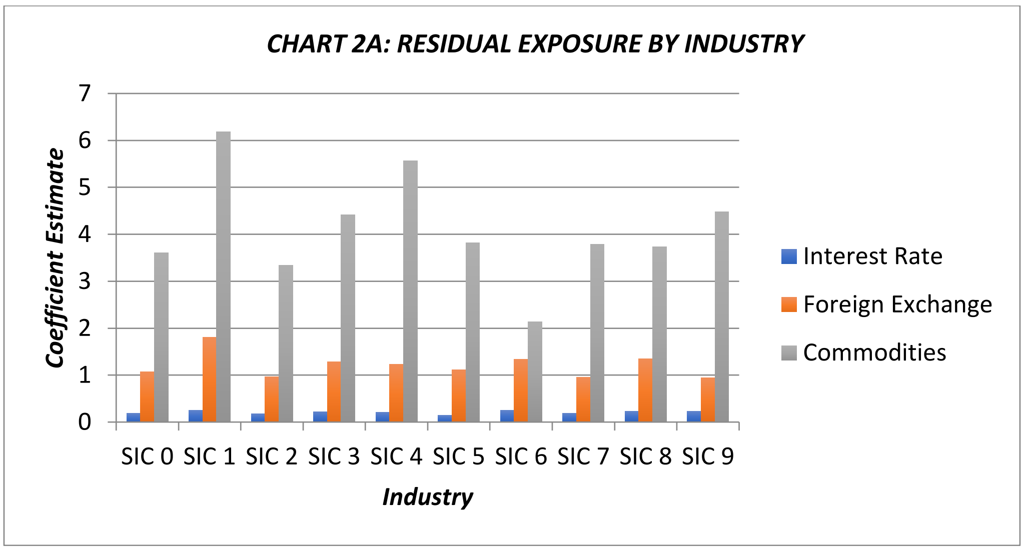


FIGURE 4: RESIDUAL EXPOSURE BY INDUSTRY AND PCA RANK

These two charts show the average residual exposure to various risks (that is, the risk which remains after operational and derivative hedges were implemented), by industry (in Chart 2A) and PCA rank (in Chart 2B). Industries are coded according to the first SIC digit: 0 = agriculture, forestry and fishing, 1 = Mining and Construction, 2 and 3 = Manufacturing, 4 = Transportation, Communications, Electric, Gas and Sanitary Services, 5 = Wholesale and Retail Trade, 6 = Finance, Insurance and Real Estate, 7, 8 = Services, and 9 = Public Administration. PCA ranks are increasing in business risk, with PCA0 (resp. PCA4) representing firms exposed to greater (resp. lesser) amounts of business risk.

Letting $R_{i,t}$ be a firm's total stock return in month t and RM_t be the value-weighted market portfolio return in month t, Residual Exposure is given by the absolute value of coefficient $\lambda_{2,i}$ in the following OLS regression: $R_{i,t} = \lambda_{0,i} + \lambda_{1,i}RM_t + \lambda_{2,i}Risk_t + \varepsilon_{i,t}$. The variable of interest, $Risk_t$ is one of three macroeconomic risk variables that serve as proxies for changes in interest rates, foreign exchange rates and commodities prices in month t.



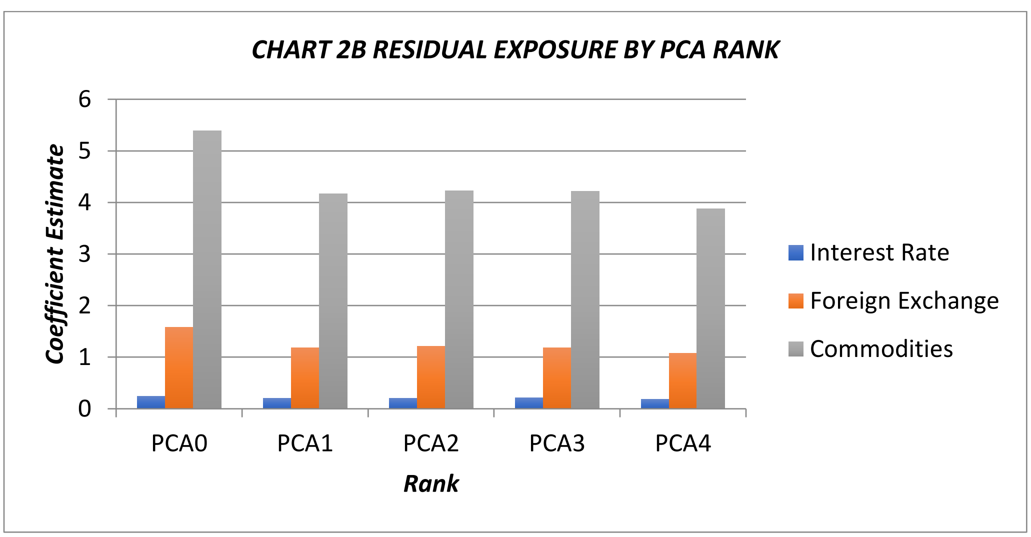


TABLE 1: Principal Component Analysis (Output)

Several proxies intended to capture a firm's exposure to various forms of business risk were subjected to principal component analysis. We used the principal axis method, which focuses on the variance shared by instrumental variables, followed by a varimax rotation, which maximizes the variance of a column of the factor pattern matrix, to yield uncorrelated components. Using the close to 5000 observations[4] of our sample, the first five components displayed eigenvalues greater than 1 and subsequent tests suggest that only these five variables were meaningful; therefore, the first five were the only retained components. Components 1 through 5 accounted for 72% of the sample variance.

In interpreting the factor pattern, we determined a variable loaded on a component when the factor loading was greater than .40. Using these criteria, a minimum of three variables loaded on each component. Any variables that loaded on more than one component were ignored for the purposes of interpreting the results and were therefore omitted from the output presented below. The three variables included in the analysis, but excluded below are: inventory turnover, accounts payable turnover and asset turnover.

Based on the factor loadings, we interpret Components 1 through 5 as the following: 1 – Liquidity, 2 – Operating Efficiency, 3 – The ability to self-insure, 4 – Market Expansion and 5 – Leverage.

	Factor					
Variables	1	2	3	4	5	FCEs
Size	-0.06	0.13	0.82	-0.04	0.09	0.70
Revenue Growth	0.00	0.23	0.08	0.81	-0.02	0.72
Gross Margin %	0.19	0.91	0.13	-0.06	-0.03	0.89
Free Cash Flows	0.09	0.10	0.77	0.02	0.15	0.63
Current Ratio	0.95	0.06	-0.12	0.01	0.09	0.94
Quick Ratio	0.98	0.08	-0.03	0.02	0.07	0.98
Cash Ratio	0.91	0.12	0.21	-0.03	0.01	0.89
Debt to Assets	0.18	0.09	0.11	0.00	0.80	0.68
Debt to Capital	0.01	-0.01	0.07	-0.06	0.45	0.21
Operating Margin %	0.06	0.90	0.14	0.05	-0.06	0.83

All variables are defined in Appendix A

[4] "Factor analysis is a technique that requires a large sample size. Factor analysis is based on the correlation matrix of the variables involved, and correlations usually need a large sample size before they stabilize. (This has led to the following rule of thumb) regarding sample size: 50 cases is very poor, 100 is poor, 200 is fair, 300 is good, 500 is very good, and 1000 or more is excellent." UCLA: Statistical Consulting Group (*op.cit*).

Chart 2B. Correlations											
	Pearson Correlation Coefficients										
	Accthdg	Undesig	Factor1	Factor2	Factor3	Factor4	Factor5	PCA	IRExp	FXExp	CommExp
Accthdg	1.00										
Undesig	**-1.00**	1.00									
Factor1	**0.15**	**-0.15**	1.00								
Factor2	**0.07**	**-0.07**	0.00	1.00							
Factor3	**-0.04**	**-0.04**	0.00	0.00	1.00						
Factor4	**0.10**	**0.10**	0.00	0.00	0.00	1.00					
Factor5	**0.06**	**0.06**	0.00	0.00	0.00	0.00	1.00				
PCA	**0.15**	**0.15**	**0.45**	**0.45**	**0.45**	**0.45**	**0.45**	1.00			
IRExp	**-0.06**	**-0.06**	-0.03	**-0.06**	**-0.04**	-0.01	**-0.05**	**-0.08**	1.00		
FXExp	**-0.10**	**-0.10**	**-0.04**	**-0.16**	**-0.07**	**-0.07**	**-0.06**	**-0.18**	**0.34**	1.00	
CommExp	**-0.12**	**-0.12**	**-0.06**	**-0.16**	**-0.07**	-0.01	-0.02	**-0.45**	**0.13**	**0.36**	1.00

All variables are defined in Appendix A. Correlations at the 5% level appear in bold.

TABLE 4

Hypothesis 1 – Is a firm's residual exposure to risk related to its use of undesignated derivative?

This table presents coefficient estimates obtained from an OLS regression analysis with year and industry fixed effect using equation:

$$Exposure_{i,t} = \delta_0^u + \delta_1^u Undesig_{i,t} + \delta_2^u Factor1_{i,t} + \delta_3^u Factor2_{i,t} + \delta_4^u Factor3_{i,t} + \delta_5^u Factor4_{i,t} + \delta_6^u Factor5_{i,t} + \varepsilon_{i,t}.$$

Factors 1 through 5 are firm-specific factor scores, which are linear composites of the optimally-weighted observed variables, found by multiplying the optimal regression weights by the firm specific value of each of the instrumental variables and summing the products. Exposure is one of three alternative proxies for a firm-specific measure of risk exposure: Interest Rate, Foreign Exchange, and Commodity. Undesig is the sum of the fair values of all derivative assets and liabilities outstanding at the end of each quarter that are not designated as accounting hedges expressed as a percent of all outstanding derivatives.

The main coefficient of interest is $\boldsymbol{\delta_1^u}$**Undesig**$_{i,t}$. Statistical significance at the 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

	Interest Rate Exposure			Foreign Exchange Exposure			Commodities Exposure		
Variable	Estimate		T-Stat	Estimate		T-Stat	Estimate		T-Stat
Intercept	0.1393	**	2.16	0.6088	*	1.86	4.5510	***	3.98
Undesignated	**-0.0026**		**-0.32**	**0.0219**		**0.54**	**0.3540**	*****	**2.47**
Factor1	-0.0086	***	-3.00	-0.0249	*	-1.71	-0.1311	***	-2.57
Factor2	-0.0134	***	-4.71	-0.1488	***	-10.35	-0.5344	***	-10.60
Factor3	-0.0161	***	-5.42	-0.0822	***	-5.46	-0.3506	***	-6.64
Factor4	-0.0010		0.35	-0.0299	**	-1.98	-0.0633		-1.20
Factor5	-0.0022		-0.73	-0.0180		-1.17	0.0909	*	1.68
Industry Fixed Effect?	Yes			Yes			Yes		
Year Fixed Effect?	Yes			Yes			Yes		
Prob > F	<.0001			<.0001			<.0001		
R-Square	0.33			0.13			0.14		
Observations	4978			4978			4978		

TABLE 5:

Hypothesis 2 – Is a firm's residual exposure to risk related to its use of undesignated derivative when it faces greater operational risk?

This table presents coefficient estimates obtained from OLS regression analysis with year and industry fixed effect using equations:

$$Exposure_{i,t} = \varphi_0^u + \varphi_1^u\, Undesig_{i,t} + \varphi_2^u\, PCA\ Score_{i,t} + \varphi_3^u\, (Undesig_{i,t} * PCA\ Score_{i,t}) + \varepsilon_{i,t}.$$

$PCAScore$ is a scalar calculated as the sum of the firm-specific factor scores, i.e., Factors 1 through 5. Exposure is one of three alternative proxies for a firm-specific measure of macroeconomic risk exposure. $Undesig$ is the sum of the fair values of all derivative assets and liabilities outstanding at the end of each quarter that are not designated as accounting hedges expressed as a percent of all outstanding derivatives.
The main coefficient of interest is $\boldsymbol{\varphi_3^u(Undesig_{i,t} * PCA\ Score_{i,t})}$. Statistical significance at the 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

	Interest Rate Exposure			Foreign Exchange Exposure			Commodities Exposure		
Variable	Estimate		T-Stat	Estimate		T-Stat	Estimate		T-Stat
Intercept	0.1536	**	2.38	0.7704	**	2.35	5.1541	***	4.72
Undesignated	-0.0029		-0.37	0.0233		0.57	-0.3821	***	-2.66
PCA Score	-0.0066	***	-3.51	-0.0449	***	-4.67	-0.1527	***	-7.08
Undesignated*PCA Score	**-0.0035**		**-1.13**	**-0.0389**	*******	**-2.49**	**-0.1205**	******	**-2.19**
Industry Fixed Effect?	Yes			Yes			Yes		
Year Fixed Effect?	Yes			Yes			Yes		
Prob > F	<.0001			<.0001			<.0001		
R-Square	0.32			0.12			0.13		
Observations	4978			4978			4978		

TABLE 6A: Correlation Coefficients
All variables are defined in Appendix A. Correlations at the 5% level appear in bold.

Pearson Correlation Coefficients								
	Undesig	PCA	IRDeriv	FXDeriv	CommDeriv	IRExp	FXExp	CommExp
Undesig	1.00							
PCA	**-0.15**	1.00						
IRDeriv	**-0.30**	**-0.09**	1.00					
FXDeriv	**-0.23**	**0.26**	**-0.38**	1.00				
Comm Deriv	**0.43**	**-0.19**	**-0.34**	**-0.71**	1.00			
IRExp	**0.06**	**-0.08**	**-0.05**	-0.03	**0.06**	1.00		
FXExp	**0.10**	**-0.18**	**-0.05**	**-0.17**	**0.20**	**0.34**	1.00	
CommExp	**0.12**	**-0.15**	**-0.05**	**-0.19**	**0.24**	**0.13**	**0.36**	1.00

TABLE 6
Hypothesis 3 – Is the importance of undesignated derivative related to the firm's operational risk?

This table presents coefficient estimates obtained from an OLS regression analysis with year and industry fixed effect using equation:

$$Undesig_{i,t} = \psi_0 + \psi_1 PCAScore_{i,t} + \psi_2 IRDeriv_{i,t} + \psi_3 FXDeriv_{i,t} + \psi_4 CommDeriv_{i,t} + \psi_5 IRExp_{i,t} + \psi_6 FXExp_{i,t} + \psi_7 CommExp_{i,t} + \varepsilon_{i,t}.$$

Undesig is the fair value of derivatives not designated as accounting hedges expressed as a percent of all outstanding derivatives; PCAScore is a scalar calculated as the sum of the firm-specific factor scores (i.e., Factors 1 through 5); IR/FX/CommDeriv is the fair value of interest rate/foreign exchange/commodities derivatives expressed as a percent of all outstanding derivatives; and, IRExp/FXExp/CommExp is one of three alternative proxies for a firm-specific measure of macroeconomic risk exposure.
The main coefficient of interest is **ψ_1PCAScore$_{i,t}$**. Statistical significance at the 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

Undesignated (Dependent Variable)				
Variable	Estimate		T-Stat	Pr > 0
Intercept	0.9453	***	10.57	<.0001
PCA Score	**-0.0168**	*******	**-7.51**	**<.0001**
Interest Rate Derivative	-0.6878	***	-13.50	<.0001
Foreign Exchange Derivative	-0.4619	***	-6.37	<.0001
Commodities Derivative	-0.1845	***	-3.78	0.0002
Interest Exposure	-0.0284		-1.13	0.2567
Foreign Exchange Exposure	-0.0077		-1.50	0.1328
Commodities Exposure	0.0008		0.61	0.5419
Prob > F	<.0001			
R-Square	0.28			
Observations	4978			

TABLE 7A: Correlation Coefficients
All variables are defined in Appendix A. Correlations at the 5% level appear in bold.

Pearson Correlation Coefficients					
	ΔCashComp	EarnPerf	PCA	ΔROA	RevGrwth
ΔCashComp	1.00				
EarnPerf	**0.18**	1.00			
Undesignated	-0.03	-0.02	1.00		
ΔROA	**0.19**	**0.42**	-0.01	1.00	
RevGrwth	**0.20**	**0.43**	-0.05	**0.20**	1.00

TABLE 7
Hypothesis 4 – Do Managers consider personal wealth consequences of reporting choice?

This table presents coefficient estimates obtained from an OLS regression analysis with year and industry fixed effect using equation:

$$\Delta CashComp_{i,t} = \vartheta_0 + \vartheta_1\, Undesignated_{\,i,t} + \vartheta_2 EarnPerf_{\,i,t} + \vartheta_3(EarnPerf{*}Undesignated_{i,t}) + \vartheta_4 \Delta ROA_{i,t} + \vartheta_5(\Delta ROA_{i,t}{*}Undesignated_{i,t}) + \vartheta_6 RevGrwth + \varepsilon_{i,t}$$

ΔCashComp is the yearly change in the natural log of CEO cash compensation (salary, bonus and non-equity performance-based pay) and Undesignated is the sum of the fair values of all derivative assets and liabilities outstanding at the end of each quarter that are not designated as accounting hedges expressed as a percent of all outstanding derivatives. EarnPerf is the yearly change in operating income per share scaled by lagged price, ΔROA is the yearly change in return on assets, *ΔROA* is the yearly change in return on assets where ROA is calculated as net income divided by total assets, and RevGrwth is the yearly change in gross revenue
The main coefficients of interest are **θ_3EarnPerf*Undesignated$_{i,t}$** and **θ_5ΔROA$_{i,t}$*Undesignated$_{i,t}$**. Statistical significance at the 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

ΔCash Compensation (Dependent Variable)								
Variable	Estimate		T-Stat	Pr > 0	Estimate		T-Stat	Pr > 0
Intercept	-0.7334	*	-1.65	0.10	-0.7331	*	-1.65	0.10
Undesignated	-0.0444		-1.24	0.21	-0.0355		-0.98	0.33
Earnings Performance	0.0335		1.42	0.16	0.0846	**	2.23	0.03
Earnings Performance*Undesignated					**-0.1127**		**-1.61**	**0.11**
ΔROA	2.6607	***	3.51	0.00	3.0124	***	2.47	0.01
ΔROA*Undesignated					**-0.8635**		**-0.31**	**0.76**
Revenue Growth	0.4140	***	4.16	<.0001	0.4118	***	4.14	<.0001
Industry Fixed Effect?	Yes				Yes			
Year Fixed Effect?	Yes				Yes			
Prob > F	<.0001				<.0001			
R-Square	0.09				0.09			
Observations	1106				1106			

TABLE 7 (Continued)

How does underlying business risk affect managers' considerations of the personal wealth consequences of reporting choice?

ΔCash Compensation (Dependent Variable)
PCA Rank = 0

Variable	Estimate		T-Stat	Pr > 0	Estimate		T-Stat	Pr > 0
Intercept	-0.2662		-1.05	0.29	-0.2625		-1.04	0.30
Undesignated	-0.0420		-0.41	0.68	-0.0698		-0.67	0.50
Earnings Performance	-0.0148		-0.28	0.78	0.0049		0.06	0.95
Earnings Performance*Undesignated					**-0.0164**		**-0.09**	**0.93**
ΔROA	4.0678	***	2.63	0.01	8.4414	***	3.17	0.00
ΔROA*Undesignated					**-12.1133**	**	**-2.00**	**0.05**
Revenue Growth	0.6361	**	2.21	0.03	0.6515	**	2.28	0.02
Industry Fixed Effect?	Yes				Yes			
Year Fixed Effect?	Yes				Yes			
Prob > F	0.18				0.11			
R-Square	0.13				0.15			
Observations	194				194			

ΔCash Compensation (Dependent Variable)
PCA Rank = 1

Variable	Estimate		T-Stat	P r> 0	Estimate		T-Stat	Pr > 0
Intercept	0.0024		0.01	0.99	0.0093		0.05	0.96
Undesignated	0.0046		0.05	0.96	-0.0024		-0.03	0.98
Earnings Performance	0.0034		0.05	0.96	0.1817		1.55	0.12
Earnings Performance*Undesignated					**-0.3979**	**	**-1.93**	**0.05**
ΔROA	3.0104		1.40	0.16	2.5154		0.71	0.48
ΔROA*Undesignated					**0.7163**		**0.09**	**0.93**
Revenue Growth	0.4640		1.40	0.16	0.4687		1.42	0.16
Industry Fixed Effect?	Yes				Yes			
Year Fixed Effect?	Yes				Yes			
Prob > F	0.80				0.66			
R-Square	0.07				0.10			
Observations	190				190			

TABLE 7 (Continued)

How does underlying business risk affect managers' considerations of the personal wealth consequences of reporting choice?

ΔCash Compensation (Dependent Variable) PCA Rank = 2								
Variable	Estimate		T-Stat	Pr > 0	Estimate		T-Stat	Pr > 0
Intercept	0.1537		0.28	0.78	0.0915		0.17	0.87
Undesignated	-0.1095		-1.51	0.13	-0.0655		-0.89	0.38
Earnings Performance	0.0799	*	1.71	0.09	0.2324	***	3.13	0.00
Earnings Performance*Undesignated					**-0.3999**	*******	**-2.81**	**0.01**
ΔROA	-0.4908		-0.28	0.78	-3.9369		-1.42	0.16
ΔROA*Undesignated					**11.5551**	*****	**1.84**	**0.07**
Revenue Growth	0.1715		0.79	0.43	0.2962		1.35	0.18
Industry Fixed Effect?	Yes				Yes			
Year Fixed Effect?	Yes				Yes			
Prob > F	0.03				0.01			
R-Square	0.14				0.17			
Observations	238				238			

ΔCash Compensation (Dependent Variable) PCA Rank = 3								
Variable	Estimate		T-Stat	P r> 0	Estimate		T-Stat	Pr > 0
Intercept	-0.0189		-0.06	0.95	-0.0191		-0.06	0.95
Undesignated	-0.1172		-1.44	0.15	-0.1105		-1.30	0.19
Earnings Performance	0.1431	***	2.66	0.01	0.1712	*	1.64	0.10
Earnings Performance*Undesignated					**-0.0551**		**-0.31**	**0.76**
ΔROA	2.8543		1.44	0.15	2.7938		0.91	0.37
ΔROA*Undesignated					**0.0457**		**0.01**	**0.99**
Revenue Growth	0.2969		1.22	0.22	0.2932		1.20	0.23
Industry Fixed Effect?	Yes				Yes			
Year Fixed Effect?	Yes				Yes			
Prob > F	0.00				0.01			
R-Square	0.16				0.16			
Observations	240				240			

TABLE 7 (Continued)

How does underlying business risk affect managers' considerations of the personal wealth consequences of reporting choice?

ΔCash Compensation (Dependent Variable)

PCA Rank = 4

Variable	Estimate		T-Stat	Pr > 0	Estimate		T-Stat	Pr > 0
Intercept	-0.0456		-0.16	0.87	-0.0360		-0.13	0.90
Undesignated	-0.0365		-0.46	0.64	-0.0770		-0.88	0.38
Earnings Performance	-0.0026		-0.04	0.96	-0.0806		-0.95	0.34
Earnings Performance*Undesignated					**0.2341**		**1.30**	**0.19**
ΔROA	2.5744		1.45	0.15	3.9988		1.63	0.11
ΔROA*Undesignated					**-5.6627**		**-0.89**	**0.38**
Revenue Growth	0.6684	***	3.00	0.00	0.7037	***	3.13	0.00
Industry Fixed Effect?	Yes				Yes			
Year Fixed Effect?	Yes				Yes			
Prob > F	0.01				0.02			
R-Square	0.13				0.14			
Observations	244				244			

TABLE 8A: Correlation Coefficients

All variables are defined in Appendix A. Correlations at the 5% level appear in bold.

Pearson Correlation Coefficients									
	Earn_Vol	AcctHdg	Undesig	FVA	FVL	Sgr_Vol	Rev_Vol	Size	Age
Earn_Vol	1.00								
AcctHdg	**-0.16**	1.00							
Undesig	**0.16**	**-1.00**	1.00						
FVA	**0.09**	**0.12**	**-0.12**	1.00					
FVL	**0.04**	-0.00	0.00	-0.01	1.00				
Sgr_Vol	**0.33**	**-0.29**	**0.29**	**-0.09**	**0.06**	1.00			
Rev_Vol	**0.24**	**-0.15**	**0.15**	**-0.06**	0.03	**0.47**	1.00		
Size	**-0.08**	**-0.14**	**0.14**	**0.28**	**-0.04**	**-0.10**	**-0.07**	1.00	
Age	**-0.11**	-0.01	0.01	**-0.08**	**-0.11**	**-0.11**	-0.02	**0.15**	1.00

TABLE 8:

This table presents coefficient estimates obtained from an OLS regression analysis with year and industry fixed effect using equations:

$$Earn\_Vol_{i,t} = \pi_0 + \pi_1 Undesig_{i,t} + \pi_2 FVA_{i,t} + \pi_3 FVL_{i,t} + \pi_4 SGr\_Vol_{i,t} + \pi_5 Rev\_Vol_{i,t} + \varepsilon_{i,t}$$

Earm_Vol is the standard deviation of earnings before extraordinary items scaled by average total assets where standard deviations are calculated using 5 years, 20 quarters, of data; Undesig is the sum of the fair values of all derivative assets and liabilities outstanding at the end of each quarter that are not designated as accounting hedges expressed as a percent of all outstanding derivatives; FVA (resp. FVL) is the total fair value of all items reported at fair value expressed as a percent of total assets (resp. liabilities). All other variables are defined in Appendix A.

Statistical significance at the 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

Earnings Volatility (Dependent Variable)				
Variable	Estimate		T-Stat	Pr > 0
Intercept	0.0129	***	2.75	0.0013
Undesignated	0.0023	***	4.13	<.0001
Fair Value Assets	0.0177	***	10.68	<.0001
Fair Value Liabilities	0.0006		0.32	0.7491
Sales Growth Volatility	0.0240	***	11.57	<.0001
Revenue Volatility	0.0369	***	6.49	<.0001
Size	-0.0010	***	-5.21	<.0001
Age	0.0000	***	-3.19	0.0014
Prob > F	<.0001			
R-Square	0.2014			
Observations	4978			

TABLE 9A: Correlation Coefficients

All variables are defined in Appendix A. Correlations at the 5% level appear in bold.

Pearson Correlation Coefficients					
	Vole	Earn_Vol	Beta	Size	Age
Vole	1.00				
Earn_Vol	**0.44**	1.00			
Beta	**0.50**	**0.29**	1.00		
Size	**-0.28**	**-0.08**	-0.22	1.00	
Age	**-0.12**	**-0.11**	0.00	**0.15**	1.00

TABLE 9:

This table presents coefficient estimates obtained from an OLS regression analysis with year and industry fixed effect using equation:

$$Vole_{i,t} = \mu_0 + \mu_1 Earn\_Vol_{i,t} + \mu_2 Beta_{i,t} + \mu_3 Size_{i,t} + \mu_4 Age + \varepsilon_{i,t}$$

Vole is the standard deviation of firm stock returns estimated using daily returns over quarters t-7 to t and Earn_Vol is the standard deviation of earnings before extraordinary items scaled by average total assets where standard deviations are calculated using 5 years, 20 quarters, of data. All other variables are defined in Appendix A.

Statistical significance at the 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

Equity Volatility (Dependent Variable)				
Variable	Estimate		T-stat	Pr > 0
Intercept	0.3524	***	10.25	<.0001
Earnings Volatility	2.7486	***	27.11	<.0001
Beta	0.1087	***	42.99	<.0001
Size	-0.0220	***	-16.44	<.0001
Age	-0.0001	***	-0.87	0.3868
Industry FE?	Yes			
R-Square	0.70			
Observations	4978			

TABLE 10A: Correlation Coefficients

All variables are defined in Appendix A. Correlations at the 5% level appear in bold

Pearson Correlation Coefficients								
	Vega	Undesig	PCA	Size	Age	Beta	Ownership	Option %
Vega	1.00							
Undesig	-0.10	1.00						
PCA	0.28	-0.16	1.00					
Size	0.34	0.11	0.43	1.00				
Age	0.12	-0.00	0.00	0.24	1.00			
Beta	-0.14	0.12	-0.18	-0.26	-0.07	1.00		
Ownership	0.47	-0.06	0.01	-0.04	-0.10	0.02	1.00	
Option %	0.46	-0.08	0.10	0.07	0.06	-0.05	0.20	1.00

TABLE 10

Hypotheses 5 – Is the CEO's exposure to stock price volatility related to undesignated derivatives?

Hypotheses 6 – Is the CEO's exposure to stock price volatility related to the firm's operational risk?

This table presents coefficient estimates obtained from an OLS regression analysis with year and industry fixed effect using equation:

$$Vega_{i,t} = \sigma_0 + \sigma_1 Undesig_{i,t} + \sigma_2 PCAScore_{i,t} + \sigma_3 Undesig_{i,t} * PCAScore_{i,t} + \sigma_4 Size_{i,t} + \sigma_5 Age_{i,t} + \sigma_6 Beta_{i,t} + \sigma_7 Ownership_{i,t} + \sigma_8 Option\%_{i,t} + \varepsilon_{i,t}$$

Vega is the natural log of a dollar change in the CEO's option holdings for a 1% change in return volatility, Undesig is the fair value of derivatives not designated as accounting hedges expressed as a percent of all outstanding derivatives; PCAScore is a scalar calculated as the sum of the firm-specific factor scores, i.e., Factors 1 through 5. All other variables are defined in Appendix A.

The main coefficients of interest are **$\sigma_1 Undesig_{i,t}$** and **$\sigma_2 PCAScore_{i,t}$**. Statistical significance at the 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

Vega (Dependent Variable)								
Variable	Estimate		T-Stat	Pr > 0	Estimate		T-Stat	Pr > 0
Intercept	-1185.86	**	-2.30	0.0219	-918.49	*	-1.79	0.0741
Undesignated	**-113.40**	*********	**-2.82**	**0.0049**	**-80.59**	********	**-1.99**	**0.0464**
PCA Score					**60.51**	*********	**5.48**	**<.0001**
Undesignated*PCA Score					-69.70	***	-4.19	<.0001
Size	205.66	***	14.86	<.0001	169.82	***	10.7	<.0001
Age	0.10		0.13	0.8927	0.73		0.97	0.3327
Beta	-40.21		-1.58	0.1136	-25.95		-1.03	0.3033
CEO Ownership	125.76	***	18.96	<.0001	124.48	***	18.99	<.0001
Option Percentage	1390.83	***	15.51	<.0001	1385.38	***	15.31	<.0001
Prob > F	<.0001				<.0001			
R-Square	0.5526				0.5648			
Observations	1106				1106			