The Effects of Enterprise Risk Management on Firm Performance

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Abstract

We study the effect of adoption of enterprise risk management (ERM) principles on firms' long-term performance by examining how financial, asset and market characteristics change around the time of ERM adoption. Using a sample of 106 firms that announce the hiring of a Chief Risk Officer (an event frequently accompanied by adoption of Enterprise Risk Management) we find that some firms adopting ERM experience a reduction in earnings volatility. In general however, we find little impact from ERM adoption on a wide range of firm variables. While our results could be due to lower power tests, they also raise the question of whether ERM is achieving its stated goals. Overall, our results fail to find support for the proposition that ERM is value creating, although further study is called for, in particular the study of how ERM success can be measured.

1. Introduction

Enterprise risk management (ERM) is an increasingly popular strategy that attempts to holistically evaluate and manage all of the risks faced by the firm. In doing so, ERM uses the firm's risk appetite to determine which risks should be accepted and which should be mitigated or avoided. While there has been a considerable increase in practitioner attention on ERM in recent years, little academic research exists about ERM, and in particular about the consequences of ERM on firm performance. This is true even though the Conference Board has found that a large number of companies are now starting to use ERM as a strategic management tool (The Conference Board, July 2005). In addition, Standard and Poor's has introduced enterprise risk management analysis into its global corporate credit rating process starting in the third quarter of 2008 (Standard and Poors, May 2008).

This purpose of this paper is to examine the effect of ERM implementation, and to establish whether firms adopting ERM actually achieve observable results consistent with the claimed benefits of ERM. We believe that our work is important and timely because although many surveys have stated the benefits of adopting ERM (Marsh and McLennan, 2005), there has been little empirical evidence on how ERM affects firms. We argue that the primary goal of ERM is to reduce the probability of financial distress and allow firms to continue their investment strategies by reducing the effect lower tail outcomes, whether earnings or cash flow, caused by unexpected events. Having smoother, steadier earnings and cash flow performance allows the firm to increase leverage, pursue more growth options and perhaps be more profitable.

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Our research focuses on the following questions. First, do firms' experience a change in earnings volatility around ERM adoption? This research question examines the proactive nature of ERM and whether companies adopting ERM are able to protect themselves from severe earnings events and generate smoothed earnings. The COSO ERM framework states that ERM aids in reducing operational surprises and losses by allowing managers to better identify potential events that cause such surprises. Firms can then establish responses to reduce the effects of these surprises (COSO, 2004).

Second, do firms' adopting ERM improve financial performance relative to past performance and after controlling for industry performance? This research question provides evidence on the view that ERM has value creating ability; captured in the following statement: "There is clearly a heightened awareness of the need to manage risks more strategically in order to achieve expected shareholder value (The Conference Board, July 2005)". Under this view ERM creates value by identifying and proactively addressing risks.

Third, do firms' financial characteristics, such as leverage, growth and asset opacity change after ERM implementation? This research question examines the effect that ERM has on the firm and whether ERM processes change critical risk interdependencies. Proponents argue that an additional benefit of initiating ERM is that it allows firms to seize opportunities by allowing managers to better identify and more effectively assess capital needs and improve capital allocation (COSO, 2004).

Understanding whether or not ERM is achieving its stated goals is an important question. First, significant resources, both corporate and governmental are being expended on understanding, developing and implementing ERM programs. Second, even

if ERM provides a consistent process for risk identification it is possible that the benefits

are not significant enough to become evident in the firm's financial performance. ERM

is not a costless activity, and as such, if it fails to deliver observable benefits, its

implementation may be called into question.

As a preview of our results we find little evidence that adoption of ERM results in

significant changes in our sample firms. However, when we examine a subset of firms

for whom the market perceived ERM adoption as most beneficial, we find some evidence

of risk reduction.

This paper proceeds as follows; section 2 develops hypotheses and provides a

review of the literature, section 3 discusses data and method, section 4 presents our

results and analysis and section 5 presents conclusions and limitations.

2. Hypothesis Development

In a frictionless capital market with no asymmetric information, risk management

at the firm level should be a negative NPV project. However, Stulz (1996, 2003) and

Nocco and Stulz (2006) present arguments under which risk management activities could

be value increasing for shareholders when agency costs, market imperfections and

information asymmetries interfere with the operation of perfect capital markets.[1]

Although risk is generally considered to be the possibility of outcomes that

deviate from what was expected, it is primarily negative outcomes that are of most

concern to firms. Stulz (1996, 2003) argues that any potential value creation role for risk

management is in the reduction or elimination of "costly lower-tail outcomes." Lower

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[1]   See Tufano, (1996), Smith and Stulz (1985) for additional motivations, such as the convexity of
the tax schedule, for corporate risk management.

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tail outcomes are primarily negative earnings and cash flow shocks and can have both direct and indirect costs. Direct costs are incurred in events such as bankruptcy and financial distress when the firm must make outlays to creditors, lawyers and courts. Indirect costs of associated with negative earnings and cash flow shocks, include the loss of reputation that may affect customer and vendor relationships.

In addition, indirect costs hamper the ability to pursue profitable growth options, and the ability to realize the full value of intangible assets upon liquidation. A decline in debt ratings and the resulting increase in borrowing costs can also be costly for shareholders in that previously positive NPV projects may now have to be foregone. Direct costs also include the costs associated with missing earnings targets and violating debt covenants.[2] Stulz (1996, 2003) argues that risk management can be value creating if it is able to reduce the likelihood of these negative earnings shocks and in turn, help the firm avoid the direct and indirect costs associated with financial distress.

Risk management in the traditional sense usually implies offsetting known risks by purchasing insurance or engaging in financial engineering using derivatives.[3] Enterprise risk management (ERM) takes a holistic view of risk management and attempts to reduce the probability of large negative earnings and cash flows by coordinating and controlling offsetting risks across the enterprise. For example, The COSO framework defines ERM as follows:

> "*Enterprise risk management is a process, effected by an entity's board of*
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> *directors, management and other personnel, applied in strategy setting and*

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[2]   Smith and Stulz (1985) argue that reducing earnings volatility in the presence of a convex income tax schedule would also provide a motivation for risk management.

[3]   While our study focuses on the costs associated with financial distress and costly external financing, taxes and managerial risk aversion also are areas in which risk management are value increasing activities.

across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives."[4]

COSO summarizes ERM as

"help(ing) an entity get to where it wants to go and avoid pitfalls and surprises along the way."[5]

Although there are many variations in the definition of ERM, the basic theme is that ERM is primarily a way of measuring understanding and controlling the risks facing the firm. In some cases ERM is also viewed as a management tool that can identify profitable opportunities to enhance shareholder wealth. Risk management in this manner can ensure that no single project risk has an adverse effect on the overall firm. Thus ERM provides the potential benefit of reducing the direct and indirect costs associated with financial distress.[6] ERM will have its greatest effect on earnings by reducing variability through controls on the risk of cost centers and revenue sources.

Consistent with this view of ERM Standard and Poor's states that evaluations of firms' enterprise risk management structures will focus on ensuring that firms are addressing all of their risks, setting proper expectations about which risks are and are not taken and setting methods that ensures that firms' avoid losses outside tolerance levels.[7] Standard and Poor's also states that ERM is not a process to ensure that a firm eliminates all risks or a guarantee that losses will be avoided or a replacement for internal controls. ERM analysis by Standard and Poor's will be incorporated into regular credit reviews

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4   COSO (2004) page 2.
5   COSO (2004) Page 1.
6   See Liebenberg and Hoyt, (2003); Beasley et. al. (2005); and Slywotzky and Dzik (2005) for discussions of the development and adoption of ERM.
7   Standard and Poor's Ratings Direct (2008).

and will be part of the analysis of risk management culture, which will also include governance, accounting policies and issues and derivatives.

Previous research has sought to understand the benefits of ERM by examining the stock market reaction to ERM adoption, as proxied by the appointment of a Chief Risk Officer or equivalent. Examining a sample of 120 companies appointing CROs Beasley, Pagach and Warr (2007) find no significant stock price reaction (positive or negative) to announcements of ERM adoption. However, a cross-sectional analysis finds that firms in non-financial industries that are more likely to experience costly lower tail outcomes have a positive stock price reaction around the adoption of ERM. These results are consistent with Stulz (1996, 2003) who points out that it is only firms that face these lower tail outcomes that will benefit from ERM, while other firms will see no benefit and could destroy value by spending corporate resources on risk management.[8]

In this paper, we seek to examine whether ERM adoption has a material change on a range of observable financial measures. We fully recognize that ERM may be working very effectively, but observable financial measures are unaffected. This unobservability could be a result of ERM working properly and mitigating problems such that the firm's performance is better than if it had not used ERM. In addition, we may not be able to observe changes in financial performance because the firm has not had any earnings or operating shocks in the recent past and has none after ERM adoption. This is analogous to a firm having insurance, but not needing to draw on it. However, in both cases even though we may not observe a direct reduction in risk, through smoother earnings, we might expect changes in capital structure, profitability and asset composition, consistent with the firm being more confident in its management of risks.

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[8]   In related work, Pagach and Warr (2007) examine the determinants of firms that adopt ERM.

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To specifically examine the effect of ERM on the firm, we look at a range of characteristics. We group these characteristics in four broad categories: risk characteristics, financial characteristics, asset characteristics and market characteristics. . We compare changes in a sample of ERM adopters to a carefully selected control group. In addition, because the adoption of ERM is more advanced in the financial industry we examine a sub-sample of banks using industry-specific characteristics.

Risk Characteristics

As a goal of ERM is to reduce operational surprises, we expect ERM adopting firms to see a reduction in earnings and stock price volatility. This reduced volatility is the expected result of a successful implementation of ERM which should lead to smoother earnings and a reduced probability of experiencing a lower tail outcome.

Financial Characteristics

The financial characteristics we examine are related to the likelihood of the firm experiencing a costly lower tail outcome. The first financial characteristic is leverage. Firms with higher leverage are more likely to suffer financial distress. Excessive leverage may also limit a firm's flexibility when pursuing additional profitable investment projects. The effect of ERM adoption on leverage is dependent upon whether the firm decides that it needs to lower its risk exposure in these areas, or whether the firm decides that because of ERM, it can afford to bear more financial risk. Thus the impact of ERM adoption on leverage is unclear, however, for firms that were previously at their target leverage level, greater control of operational risks would suggest that the firm could increase its debt capacity.

Cash availability or financial slack provides a measure of a company's ability to persist during a period of operating cash short fall. Financial slack measures the amount of highly liquid assets that the firm has on hand that could be used to make up a short fall in operating cash flows. Firms adopting ERM may decide to increase financial slack to provide a greater cushion against financial distress, or like leverage, may feel less financial slack is needed given that they are managing risks more thoroughly.

We examine various profitability measures as some argue that ERM adoption results in a better overall management of the firm. Alternatively, profitability could suffer, if ERM results in increased operational costs. As with leverage, the effect of ERM adoption on profitability is ambiguous. More coordinated management and loss avoidance may boost profits by reducing avoidable losses. However, greater emphasis on risk management may lead to a reduction in upper tail outcomes. Profitability may also be endogenously determined with ERM adoption. For example, ERM may be adopted it the firm has experienced a decline in profitability due to some losses, and ERM is implemented to prevent a future re-occurrence.

Asset Characteristics

The asset characteristics used provide information about the degree to which a firm's assets are likely to be impaired in financial distress. The first asset characteristic we examine is opacity. In a period of financial distress brought on by a operating shortfall, firms that derive much of their operating income from opaque assets may have difficulty quickly liquidating these assets at fair market value in order to raise capital to avert financial distress. This is due to the information asymmetries normally associated with opaque assets and the relative lack of marketability for such assets.

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The second asset characteristic we examine is growth options. Firms with growth options have much of the firm's value tied to future, and as yet, unrealized cash flows. Because of the uncertain nature of the payoff from such assets, the value of these investments is unlikely to be fully realized in bankruptcy. If, after adopting ERM, the firm considers financial distress to be less likely (through a reduction in lower tail outcomes), we expect to observe greater investment in opaque assets and assets with growth options.

Market Characteristics

Market characteristics provide information about the degree to which a firm's equity benefits from a reduction in the expected costs associated with financial distress. Previous work has examined the market reaction to ERM adoption, and consequently, we do not include an event study style analysis in the current paper.[9] However, we examine the stock price return volatility to see if ERM reduces operational surprises and subsequently stock price volatility. If ERM reduces the likelihood of lower tail outcomes, we should see a more stable stock price as the firm's idiosyncratic risk is reduced. The firm's market risk (or non-diversifiable) cannot be affected by ERM unless the firm changes its fundamental business lines. We also examine the valuation of the firm to see whether ERM adoption has an effect on firm value (either positive or negative).

Bank Characteristics

The unique financial characteristics of banks limits the usefulness of traditional financial measures and therefore we compute specific measures for these firms, specifically Tier 1 capital level, loan loss reserve and duration gap. The effect of ERM

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[9]   See Beasley, Pagach and Warr (2008).

on these measures is potentially ambiguous as they each measure, in some ways, the risk tolerance of the firm. For example, greater risk management may allow the firm to increase leverage or risk weighted assets and thus reduce its' Tier 1 capital. Conversely, the firm may determine that given its' level of operational risk, a greater amount of capital would be prudent. Loan loss reserves measure the extent to which the bank has or is engaged in risky lending activities. Duration gap measures the sensitivity of the bank's earnings to adverse fluctuations in interest rates – again another form of risk exposure.

3. Data and Method

The primary objective of our study is to examine the changes in financial characteristics around firms' adoption of ERM. Unfortunately, firms do not, in general, publicly announce the adoption of ERM, and in addition tend to disclose only minimal details of their risk management programs (Tufano, 1996). We therefore focus on hiring announcements of enterprise-level or chief risk officers (CRO) as a signal of a firm's adoption of an enterprise risk management process. There are good reasons to believe that CRO hiring coincides with the decision to follow an ERM program. For example, The Economist Intelligence Unit, (2005) reports that many organizations appoint a member of the senior executive team, often referred to as the chief risk officer or CRO, to oversee the enterprise's risk management process. Walker, et. al. (2002) note that because of its scope and impact, ERM requires strong support from senior management. Beasley et al. (2005) show that the presence of a CRO is associated with a greater stage of ERM adoption. Finally, Liebenberg and Hoyt (2003) argue that the CRO appointment

signals the initiation of ERM because CROs are generally appointed to implement and manage ERM programs.

We therefore start our study with 138 announcements of senior risk officer appointments made from 1992-2004 for which we are able to obtain all the necessary data for our tests. Announcements are obtained by searching the business library of LEXIS-NEXIS for announcements containing the words "announced", "named", or "appointed", in conjunction with position descriptions such as "chief risk officer" or "director of risk management".[10] Only announcements for publicly traded companies are retained and in the case of multiple announcements for the same company we select only the first announcement on the assumption that this represented the initiation of the enterprise risk management program. By starting our search in 1992, we hope to capture the first appointment of a Chief Risk Officer; however, it is possible that some appointments, although being the first announcements, are not actually the first appointments. These announcements will add noise to our sample and reduce the power of our tests. We require that firms have five years of continuous data in order to be in our tests (two years prior to and two years after the appointment year). After imposing this restriction, our sample is reduced to 106 firms.

We collect data for all firms listed in Compustat and we supplement the data with stock price data from CRSP. Table 1 presents the distribution of the announcements through time as well as the distribution across industries. Most CRO hires tend to be in the later part of the sample period, clustered from 1999 through 2002. A substantial portion of the appointments are located in the financial and utility industries. These are

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[10]   In our initial sample search we included the following "title" terms in order to capture firms engaging in ERM: Chief, Director, Vice President, President, Head, Managing Director, Manager, General Manager.

defined in our sample as having SIC codes in the 6000s for financial firms and in the 4900s for utilities.

To test whether CRO appointments are associated with changes in key financial variables, our basic approach is to measure changes in these variables in the years after a CRO appointment relative to the years before. In multivariate tests, we employ a matched sample and logit model to determine if there are differences between the CRO sample and the industry matched sample (which has no CRO appointments). The following are the variables used in the analysis (Compustat data item numbers d# are reported where available). The motivation for using these variables is discussed in more detail in the earlier hypothesis section.

Risk Characteristics

We measure earnings volatility (SD(E)) as the standard deviation of the error term from a regression of the firm's quarterly earnings on the prior quarter's earnings. We use Compustat quarterly data item 19 – basic EPS excluding extraordinary items as a measure of quarterly earnings. This regression is run for eight quarters. Stock price volatility (SD(RET)) is the standard deviation of the firm's daily returns over the year prior to the hiring of the CRO.

Financial Characteristics

We measure leverage as total liabilities to assets:

$$Leverage = Total\ liabilities/Total\ Assets = (d6 - d60)/d6 \qquad\qquad (1)$$

To measure accounting return we use return on equity:

$$ROE = Net\ Income\ /\ Book\ Equity = d18/d60 \tag{2}$$

We measure financial slack as the proportion of the firm's assets that are cash or cash equivalents:

$$Slack = Cash\ and\ marketable\ securities/Total\ Assets = d1/d6 \tag{3}$$

Asset Characteristics

Opacity is the ratio of intangibles to total assets:

$$Opacity = Intangibles/\ Total\ Assets = d33/d6 \tag{4}$$

We proxy for growth options using the market-to-book (MB) ratio and Research and Development expense. These variables are computed as:

$$MB = Market\ Value\ of\ Equity/\ Book\ Value\ of\ Equity = (d199*d25)/d60 \tag{5}$$

$$RD = Research\ and\ Development\ Expense\ /\ Total\ Assets = d46/d6 \tag{6}$$

Market-to-book also proxies for firm valuation, as higher market-to-book indicates that the investors perceive that the firm is more valuable.

Bank Variables

To measure the unique financial risks faced by banks we include three measures of risk commonly used in the banking industry. Our measurement of these measures is simplified to accommodate the use of Compustat data.

Duration Ratio = [Change in interest income-change in interest expense]/Total Assets

$$= [(d321_t - d321_{t-1})-(d339_t-d339_{t-1})]/d6 \qquad (7)$$

Loan Loss Provision = Provision for Loan &Asset Losses / Total Assets

$$= d342/d6 \qquad (8)$$

Tier 1 Risk Adjusted Capital Ratio = d337 $\qquad (9)$

4. Results and Analysis

Table 2 presents summary statistics for the sample of ERM adopting firms. The average firm is quite highly levered, consistent with the large number of financial and utility firms in the sample. Most carry some slack on their balance sheet, with the average of cash and marketable securities being 7.72% of total assets. The average firm has a market value of nearly $8.6 billion, but the distribution of firm size is quite skewed. The average firm in the sample is moderately profitable with an average ROE of 7.24%.

The sample firms have an average of 5% opaque assets. Panel B of table 2 provides

industry specific data for our sample of banks. Tier 1 capital is the core measure of a

bank's financial stability from a regulator's perspective and is measured as a percentage

of weighted risk assets. The FDIC requires a minimum level of 3.6% Tier 1 capital to

weighted risk assets.

In table 3 we examine whether there are any changes in the key variables before

and after the CRO appointment. For each variable of interest we test that the change in

the two year average before the CRO appointment compared to the two year average after

the CRO appointment is equal to zero. The only exception to this approach is for the

earnings volatility, SD(E), variable and for the Duration Ratio variable which are

computed over eight quarters. For these variables we measure the change from the eight

quarters prior to the CRO appointment to the eight quarters after the CRO appointment.

Looking first at the risk measures in Panel A, we find a significant decline in the

standard deviation of stock returns, SD(RET), for the CRO firms. This decline is

consistent with the firm becoming less risky, following the appointment of the CRO and

the adoption of ERM. Of course, we cannot rule out market wide effects as well. We do

not observe any significant change in the earnings volatility SD(E).

We do not find a significant leverage increase after the CRO appointment relative

to the period prior to the appointment, although the change is positive. Unsurprisingly,

size increases, but we believe that this is more a function of the rising stock market

during the period, rather than any direct effect of ERM. No other variables show a

significant change.

In Panel B we observe no significant changes in the bank specific variables. We do observe a decrease in the duration ratio, which is consistent with a bank reducing its interest rate exposure, but this decrease is not significant in a two sided test.

It is possible that market or industry wide changes are adding noise to the tests and reducing our ability to find firm specific changes. To attempt to control for this possibility, we scale each variable by the three digit SIC industry average for the variable for that specific year. We then repeat the analysis from Table 3 using these industry adjusted variables. These results are presented in Table 4. Looking first at Panel A, we observe a statistically significant increase in the relative leverage of the sample firms, compared to the industry as a whole. However, the magnitude of this change is not very large and it would be reaching to try and assign some economic significance to this result. For the remainder of Table 4, all the changes are insignificant, consistent with the results from Table 3.[11]

At this stage in our analysis we have found essentially no effect on firm characteristics from ERM adoption. A possible explanation for the lack of significant change is that out of the firms adopting ERM, not all of them are positioned to actually benefit from adoption. Beasley, Pagach and Warr (2007) find that while the overall stock market response to the announcement of a CRO appointment is close to zero, there is significant cross-sectional variation in the announcement returns. Further, the variations in the announcement returns are correlated with variables that Beasley et al. hypothesize would be indicators of the potential benefit of an integrated risk management program. To incorporate Beasley et al's finding in to our tests, we bifurcate the sample

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[11]   In unreported tests we also scale the firm variables using a matched sample matched on SICC, market value and market-to-book. The results are qualitatively the same as the industry adjusted results.

based on the 1 day abnormal stock return recorded on the CRO announcement date. If firms that received positive announcements are viewed as being potential beneficiaries of ERM, we may expect to see some changes in these firm's characteristics once they adopt the program. The results for these tests are presented in Table 5 where we re-run the prior tests on the subset of firms that had a positive announcement returns.

In the Table 5, Panel A we observe a statistically significant increase in ROE and statistically significant decrease in the standard deviation of earnings. We also observe a statistically significant increase in leverage. It is very possible that the increase in ROE is related to the increase in leverage. An increase in leverage is consistent with a firm bearing more financial risk once it has a better understanding of operating risks. The decline in the standard deviation of earnings is perhaps the only evidence so far that firms are managing risk in a manner in which earnings volatility is targetted.

In Panel B we also observe an increase in Tier 1 capital, which actually goes against the leverage result in Panel A, but is consistent with banks increasing equity capital and reducing financial risk. The decline in the duration is still insignificant but closer to the 10% level than before.

5. Conclusion and Discussion

To our knowledge this is the first study to examine the change in financial performance as a result of adopting ERM. We find little evidence in our sample of ERM adopters for any significant changes in various key firm variables. When we look at firms that might be expected to benefit more from ERM (as proxied for by a positive CRO abnormal announcement return) we find limited evidence of risk reduction in the firm's earnings.

Our results could be due to attributed to a variety of causes. First, our data may be too noisy or our tests too weak for us to pick up the changes. In this case failing to find a result does not mean that the adoption of ERM is not beneficial.   Second, it could be that ERM takes an extended period of time to implement and reap benefits from. While this is possible, constructing a balanced sample that tracks firms relatively unaffected by mergers, divestitures and other corporate events is quite difficult. Furthermore, with many of the adoptions occurring in recent years, we just do not have the time series of data to study the long run effects of ERM adoption. The third, and perhaps most disconcerting cause for our lack of results is that ERM is not having any significant effect on firm performance, or at least no effect that can be measured from a financial statement users perspective.   If this is the case, then the efficacy of ERM is in question. The burden on ERM proponents must therefore be to not only provide systems for implementing the program, but also provide key metrics against which the program's performance can be measured.

The recent mandates from both public and private entities for ERM means that more and more firms are adopting ERM and expending corporate resources on implementation. There must be a way of establishing whether or not ERM is working for a particular firm in order for outsiders to establish whether that firm is actually doing ERM correctly, and more broadly, whether ERM is providing benefits.

We consider this work a first step in the important area of examining the effects of ERM adoption. Given the widespread adoption of ERM, and the non-trivial cost of implementing a fully functioning ERM program, the question of whether it is worthwhile is of great importance. Our results here suggest that for the sample we study, there are

still important questions as to the long term value creation of ERM. Additional research

is needed on enterprise risk management.

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Table 1
Sample firms by year

Sample firms are firms with CRO announcements reported in Lexis Nexis. Firms have to have 5 years of continuous data, two years before the announcement and two years after to be in the sample. The totals are broken out by financial firms (SICC: 6000-6999) and utilities (SICC: 4900 -4999).

Year	All Firms	Financial Firms	Utilities
1992	5	3	0
1993	5	1	0
1994	4	0	0
1995	9	3	1
1996	9	5	3
1997	4	2	1
1998	5	3	0
1999	7	4	0
2000	9	4	1
2001	20	12	5
2002	10	5	3
2003	12	9	1
2004	7	5	0
	106	56	15

Table 2
Summary statistics for CRO firms

Panel A presents data for all CRO appointing firms. Panel B presents data for Banks only (SICC 6000-6099). Leverage = Total liabilities/Total Assets = (data6 – data60)/data6, Slack = Cash and marketable securities/Total Assets = data1/data6.   Size is market value of equity.   Opacity = Intangibles/ Total Assets = data33/data6. R&D = Research and Development Expense / Total Assets = data46/data6.   Market to Book = Market Value of Equity/ Book Value of Equity = (data199*data25)/data60. ROE is Net Income divided by equity (data12/data60). SD(RET) is the standard deviation of the firm's daily returns over the year prior to the hiring of the CRO. SD(E) is the standard deviation of the error term from a regression of the firm's quarterly earnings on the prior quarter's earnings. This regression is run for eight quarters. Duration ratio is the annual change in interest income (data321) - the annual change interest expense (data33) divided by assets (data6). Loan loss provision is data342/data6. Tier 1 Capital is data337.

Panel A. All Firms [n=104]	Mean	Median	Std. Dev
Leverage [%]	77.35	83.2	19.83
Slack [%]	7.72	4.66	9.32
Size [$ Millions]	8637	4225	10946
Opacity [%]	5.11	1.31	9.99
R&D [%]	0.22	0.00	0.88
Market to Book	2.25	1.90	2.95
ROE [%]	7.24	12.65	21.93
SD(RET) [%]	2.38	2.00	1.45
SD(E)	0.88	0.30	1.33

Panel B. Banks [n=37]	Mean	Median	Std. Dev
Duration ratio [%]	0.4	0.24	0.42
Loan Loss Provision [%]	0.42	0.27	0.42
Tier1 Capital [%]	9.5	8.8	3.3

Table 3
Before and after CRO appointment t-tests

Variables are measured as averages over the two years prior to and the two years after the CRO appointment. The exception is the SD(E) and Duration Ratio which are the ratios of the value in the second year after the CRO appointment to the year prior to the CRO appointment. Panel A presents data for all CRO appointing firms. Panel B presents data for Banks only (SICC 6000-6099). Leverage = Total liabilities/Total Assets = (data6 – data60)/data6, Slack = Cash and marketable securities/Total Assets = data1/data6. Size is market value of equity. Opacity = Intangibles/ Total Assets = data33/data6. R&D = Research and Development Expense / Total Assets = data46/data6. Market to Book = Market Value of Equity/ Book Value of Equity = (data199*data25)/data60. ROE is Net Income divided by equity (data12/data60). SD(RET) is the standard deviation of the firm's daily returns over the year prior to the hiring of the CRO. SD(E) is the standard deviation of the error term from a regression of the firm's quarterly earnings on the prior quarter's earnings. This regression is run for eight quarters. Duration ratio is the annual change in interest income (data321) - the annual change interest expense (data33) divided by assets (data6). Loan loss provision is data342/data6. Tier 1 Capital is data337. *, **, *** indicates significance at the 10%, 5%, and 1% levels respectively.

Panel A. All Firms	Before	After	Change	t-stat
Leverage	76.13	77.32	1.19	1.33
Slack	7.89	7.90	0.01	0.01
Size	7,806.08	9,567.48	1,761.42***	3.01
Opacity	5.16	5.74	0.58	1.25
R&D	0.21	0.19	-0.02	-1.59
Market to Book	2.41	2.50	0.93	0.32
ROE	6.21	12.04	5.83	0.96
SD(RET)	2.35	2.10	-0.25**	-2.14
SD(E)	0.82	0.72	-0.99	-0.84
Panel B: Banks	Before	After	Change	t-stat
Duration Ratio	0.41	0.31	-0.10	-1.40
Loan Loss Provision	0.42	0.29	-0.13	-1.23
Tier1 Capital	9.77	9.76	-0.01	-0.02

Table 4
Before and after CRO appointment t-tests – Industry adjusted.

Variables are measured as averages over the two years prior to and the two years after the CRO appointment. In addition, each variable is scaled by its 3-digit SIC average. The exception is the SD(E) and Duration Ratio which are the ratios of the value in the second year after the CRO appointment to the year prior to the CRO appointment. Panel A presents data for all CRO appointing firms. Panel B presents data for Banks only (SICC 6000-6099). Leverage = Total liabilities/Total Assets = (data6 – data60)/data6, Slack = Cash and marketable securities/Total Assets = data1/data6. Size is market value of equity. Opacity = Intangibles/ Total Assets = data33/data6. R&D = Research and Development Expense / Total Assets = data46/data6. Market to Book = Market Value of Equity/ Book Value of Equity = (data199*data25)/data60. ROE is Net Income divided by equity (data12/data60). SD(RET) is the standard deviation of the firm's daily returns over the year prior to the hiring of the CRO. SD(E) is the standard deviation of the error term from a regression of the firm's quarterly earnings on the prior quarter's earnings. This regression is run for eight quarters. Duration ratio is the annual change in interest income (data321) - the annual change interest expense (data33) divided by assets (data6). Loan loss provision is data342/data6. Tier 1 Capital is data337.. *, **, *** indicates significance at the 10%, 5%, and 1% levels respectively.

Panel A. All Firms	Before	After	Change	t-stat
Leverage	1.06	1.09	0.03*	1.97
Slack	0.89	0.83	-0.06	-0.52
Size	4.23	4.09	-0.15	-0.54
Opacity	1.42	1.36	-0.07	-0.37
R&D	0.78	0.99	0.21	1.02
Market to Book	1.13	1.11	-0.02	-0.14
ROE	4.1	1.04	-3.07	-1.29
SD(RET)	0.77	0.78	0	0.07
SD(E)	1.06	1.39	-0.21	-0.81
Panel B: Banks	Before	After	Change	t-stat
Duration Ratio	0.92	0.72	-0.2	1.24
Loan Loss Provision	1.19	1.15	-0.04	-0.2
Tier1 Capital	0.81	0.82	0	0.1

Table 5
Before and after CRO appointment t-tests – Positive Announcement CAR only.

This table repeats the tests in table 3 for the subset of firms that had positive cumulative abnormal returns around the announcement of the CRO appointment. Variables are measured as averages over the two years prior to and the two years after the CRO appointment. The exception is the SD(E) and Duration Ratio which are the ratios of the value in the second year after the CRO appointment to the year prior to the CRO appointment. Panel A presents data for all CRO appointing firms. Panel B presents data for Banks only (SICC 6000-6099). Leverage = Total liabilities/Total Assets = (data6 – data60)/data6, Slack = Cash and marketable securities/Total Assets = data1/data6. Size is market value of equity. Opacity = Intangibles/ Total Assets = data33/data6. R&D = Research and Development Expense / Total Assets = data46/data6. Market to Book = Market Value of Equity/ Book Value of Equity = (data199*data25)/data60. ROE is Net Income divided by equity (data12/data60). SD(RET) is the standard deviation of the firm's daily returns over the year prior to the hiring of the CRO. SD(E) is the standard deviation of the error term from a regression of the firm's quarterly earnings on the prior quarter's earnings. This regression is run for eight quarters. Duration ratio is the annual change in interest income (data321) - the annual change interest expense (data33) divided by assets (data6). Loan loss provision is data342/data6. Tier 1 Capital is data337.. *, **, *** indicates significance at the 10%, 5%, and 1% levels respectively.

Panel A. All Firms	Before	After	Change	t-stat
Leverage	77.35	77.95	0.6	0.41
Slack	8.59	9.38	0.8	0.62
Size	9275.03	11352.64	2077.61	2.13**
Opacity	7.26	7.96	0.7	0.84
R&D	0.28	0.24	-0.04	-1.75*
Market to Book	2.53	3.01	0.48	0.93
ROE	4.86	21.41	16.55	1.74*
SD(RET)	1.05	0.76	-0.28	-1.42
SD(E)	2.56	2.15	-0.41	-2.09**
Panel B: Banks	Before	After	Change	t-stat
Duration Ratio	0.41	0.28	-0.13	-1.55
Loan Loss Provision	0.39	0.34	-0.05	-0.53
Tier1 Capital	8.87	9.72	0.85	2.22**