OPERATIONAL RISK: WHERE IS THE VALUE?

A first order approximation

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Executive summary

This article focuses on finding the true tangible value of investing in upgrades (such as technology improvements) to the operational risk control framework. Our method calculates an upper and lower bound for the cost of capital incurred from taking on operational risk. This method provides practitioners a first order approximation to quantify the benefits of enhancing the operational risk control framework.

Using Return on Risk Weighted Assets (RORWA) time series and a public loss database, we were able to devise a top-down, data-driven approach to quantify the benefits of enhancing the operational risk framework. The potential savings matrix (as shown below) is a first order approximation for the business case of investing in operational risk technology. In other words, it provides a view of the benefits gained by enhancing the control environment as a linear function of a certain percentage savings level.

Potential Savings Matrix (in 000's)

ENHANCED CONTROL ENVIRONMENT	CAPITAL SAVINGS* $5B INSTITUTION	CAPITAL SAVINGS* $25B INSTITUTION
5%	$292	$1,523
10%	$584	$3,047
15%	$876	$4,570
20%	$1,167	$6,093
25%	$1,459	$7,617

**Midpoint between upper and lower bound cost of capital*

We were able to verify that the Basel II capital calculation falls between our bounded interval.

Summary Recap (in 000's)

	LOWER BOUND COST OF CAPITAL	UPPER BOUND COST OF CAPITAL	COST OF THE BASEL II CAPITAL CHARGE
$5B institution	$1,769	$9,906	$4,696
$25B institution	$11,405	$49,528	$17,236

Here are several methods commonly used in practice today that attempt to answer the question: What operational risks do we face, and what is the potential for losses? These methods can help triangulate on the most probable scenario and impact for a given financial institution.

METHODOLOGY	PROS	CONS
RCSA (Risk Control Self-Assesment)	Provides a detailed subjective view of catalogued risks and controls as well as assesses on an on-going basis which areas of the institution may be the most exposed to potential operational risk. Traditional method is to create a likelihood and impact matrix which focuses executives on the potential trouble areas. Furthermore, it creates a formal structure to get individual business units to identify and assess risks based upon the business processes relevant to each business. This puts the onus on the line of business to own the risk management aspects of their business activities.	RCSA's are not effective if the process is a tick-the-box exercise — where long questionnaires are sent to business users. The questions must be specific and germane to the business; otherwise the value of the RCSA quickly atrophies.
LDA (Loss Distribution Approach)	The loss distribution approach is a very robust and well-understood method of quantifying potential operational risk losses.	Lack of sufficient internal loss data is most often cited as the shortcoming of this approach. Loss experience is a prerequisite to making this approach robust.
Scenarios	Scenarios are often used to either simulate losses for areas where there are insufficient internal loss data (proxy scenarios) or for simulating low-frequency, high-severity tail events (rare-event scenarios).	Scenarios often depend upon expert business opinion. Translation of this opinion into a statistically valid construct (e.g. histogram of losses, severity distribution model) is fraught with peril. It is very hard to pinpoint the difference between one-in-a-hundred year events and one-in-a-thousand year events. The abstract nature of the process can often lead to unrealistic scenarios which gives the method little credibility. At the other extreme, a lack of imagination can lead to underestimation — i.e. an overly conservative estimate of what might be.
Loss database (consortium and public loss data)	External loss databases are an efficient way to benchmark an institution's potential losses and help with the design of potential scenarios. Most banks use loss databases for benchmarking purposes and to supplement the LDA approach.	The biggest drawback of loss databases is the lack of frequency information and scaling of events according to meaningful measures. Other difficulties include left-truncation issues and lack of any information relating to the control environment that occasioned the loss. For example, a $1M loss in two different but comparable FIs may result from two completely different control failures.
Top 10 loss	Very straightforward historical view of the type of losses that may materialize. Provides best justification for investment in operational risk frameworks.	Argument against this approach is that history is not a good predictor of the future. Also, investment in the control environment and change of external business factors may distort the value of the historical "Top 10 loss" picture.

Operational risk: Where is the value? A first order approximation

> *There is a quiet revolution underway inside board rooms and executive management suites; principles of accountability, transparency and improved financial performance are being translated into demands to quantify and measure as much operational activity as possible and to correlate that activity to the business plan. Operational mandates are being handed down to better plan activities across the business, ensure proper measurement of those activities and to have the mechanisms in place to appropriately adjust targeted activities to yield better business outcomes — higher revenue and lower costs all within a defined level of risk.*[1]
>
> *Transforming Compliance Burdens into Better Business Return* – Steven Lindseth

Background

This article aims at answering a series of practical questions that typically confront a chief risk officer (CRO) in a small institutional[2] setting: How do I quantify the benefits of making an investment (say a technology investment) to reduce the current amount of capital assigned to operational risk? Also, how do I provide greater internal and external transparency around the cost of capital attributed to operational risk? Further, how do I explain these benefits to the management committee or to a board of directors in order to obtain funding for that investment?

The article primarily targets smaller financial institutions (FIs) which already have elements of an operational risk framework (for example a SOX or IT risk assessment). This framework may include an integrated set of risk policies, risk methodologies and a risk infrastructure. The risk infrastructure may be very manual in nature and therefore susceptible to operational risk. If the FI has invested a meaningful level of resources already, then the FI might ask: Why invest more resources than have already been invested — what's the tangible value?

There has been a lack of due diligence in the industry in terms of quantifying the benefit of investing in operational risk improvements. The issue certainly resides with either the newness of quantifying previously perceived unquantifiable operational risk or simply the level of maturity of operational risk measurement as a whole. This article provides a mechanism to quantify the typical expected benefit for an FI of any size. We provide a mechanism to utilize industry peer losses as an input into the calculation of the return of an operational risk investment.

1 *Steven Lindseth, "Transforming Compliance Burdens into Better Business Returns," DM Review, Feb. 2005. Lindseth is the founder and chairman of Axentis, Inc, a leading provider of governance, risk and compliance software. Lindseth is a writer and speaker on enterprise compliance management and how to apply technology to it.*

2 *Smaller financial institutions are defined as those with $1 billion to $10 billion in assets. We also provide comparison with the $10 billion to $50 billion segment.*

Recently, we met with a community bank's executive team that was trying to get a grasp on the potential benefits of increasing the robustness of its operational risk framework. The executive management team was trying to figure out a way to turn compliance obligations into value-added activities. The team's main question was: How much will this save us beyond the intangible benefits of process convergence? We believe that our approach provides a first cut reasonable approximation to directly quantify the savings. We have not seen any other published research on this important topic.

What is operational risk?

If we look at the typology of risks, as defined in the *Essentials of Risk Management* by Crouhy, Galai and Mark, we find six primary categories of risks. These include both financial risks (market and credit risk) as well as nonfinancial risks. The nonfinancial risks include operational risk, business risk, reputation risk and strategic risk.

Our definition of operational risk for the purpose of this article incorporates the standard Basel II definition. The regulators have defined operational risk as "the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events." These failures include computer breakdowns, a bug in a key piece of computer software, errors of judgment, deliberate fraud (e.g., most recently at SocGen) and many other potential mishaps. Basel II includes legal and regulatory risk in its definition of operational risk. We do not include business risk, strategic risk or reputational risk in our definition of operational risk.

Business risk refers to the uncertainty about the demands for a product or the cost to produce the product. Reputational risk refers to such things as risk of loss of prestige, respect or trust from the perspective of clients and/or other stakeholders. Strategic risk refers to the risk of a significant investment going wrong, and therefore there is a high degree of uncertainty about success and profitability.

How does a financial institution justify an investment to reduce operational risk?

What is the tangible benefit of increased investment in an FI's operational risk framework and how does this increased investment translate into better business management? Is there a back-of-the-envelope technique to justify such an investment and quantify its benefits? Without proven quantifiable methods, executives are left to their intuition for this analysis.

It is safe to say that GM and Ford did not embrace the Six Sigma concept early on during their dominant stretch. Why was that? Could it be that the method used to quantify the benefits of Six Sigma was too hard to come by in the early days? Also, could it be that the investment decisions made by the management committee and the board were driven primarily by the bottom line and therefore made it hard for these companies to be early adopters of the Six Sigma concept?

We draw a parallel between operational risk and the auto industry's movement toward Six Sigma. The Six Sigma effort[3] began in the mid- to late 1980s with the likes of Motorola and GE. It is a rigorous framework that allowed firms to measure and optimize each part of the production chain in order to reap benefits ever so minute on a stand-alone basis but, when put together, represented large scale improvement. There was no clear method to quantify the benefits of investment in such techniques until after it was done. However, history shows that it was later deployed very effectively by the Japanese auto industry, which was searching for better ways to compete with the American supremacy in efficient car building and other manufacturing processes.

Problem statement

An FI assumes a tolerance for a certain level of earnings volatility in order to achieve desired returns. Acceptance of a .03 percent chance that losses will exceed capital over the course of a year is roughly equivalent to a AA long-term bond rating (99.97 percent confidence level). FIs are willing to invest in projects that either increase returns for the same volatility (risk) or provide the same return for less volatility. FI's have made significant progress in quantifying the amount of financial risk and the return to risk tradeoffs.

However, it has proven to be a more complex task to quantify the level of return they gain for investing to reduce operational risk. For example, how does an FI quantify the reduction in operational risk achieved by investing in automation, early risk detection, better reporting for decision support and so on?

3 *http://en.wikipedia.org/wiki/Six_sigma*

Smaller FIs often look to combine governance (G), operational risk (R) and compliance (C) activities (such as SOX) under one organizational umbrella. Our benefit analysis does not include the intangible benefits gained from the convergence of GRC activities. In other words, the benefits that can be gained from combining self-assessment processes from audit, IT security, SOX and operational risk functions are excluded from this analysis. Also, there are other benefits gained from providing the lines of business with an enhanced operational risk framework to better identify and manage their key operational risk encountered at the line level. Further, the standard efficiency gains and benefits obtained from business process improvement are not the object of this article.

Quantifying the benefits of operational risk reduction: A first but useful approximation

The first step toward quantifying the dollar benefit of reducing operational risk calls for quantifying the amount of operational risk.

As mentioned earlier, our approach is geared toward smaller institutions[4]. Articles have been written and studies[5] completed on identifying and attributing earnings volatility to different types of risk. We borrow from a February 2006 study by Kuritzkes and Schuerman (K&S)[6]. K&S examined more than 300 banks with over $1 billion in assets from 1981 to 2005. K&S attributed the breakdown of earnings volatility across the different risk types (see Figure 1).

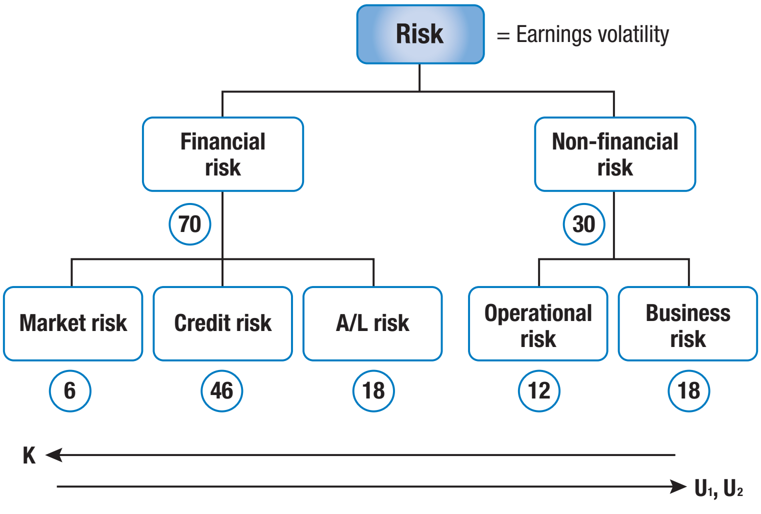

Figure 1: Risk taxonomy revisited, with risk contribution. Numbers in circles are risk allocation percentages.

4 *Our work shows that a first cut approximation for the amount of operational risk capital at larger FIs can also be calculated using a variation of the approach we describe in this article.*
5 *Another study by same authors is "Risk Measurement, Risk Management, and Capital Adequacy in Financial Conglomerates."*
6 *Andrew Kuritzkes and Til Schuermann, "What We Know, Don't Know and Can't Know About Bank Risks: A View from the Trenches" (March 2006). Wharton Financial Institutions Center Working Paper No. 06-05. Available at SSRN: http://ssrn.com/abstract=887730.*

K&S (as shown on the bottom of Figure 1) reveal the fully diversified attribution of the amount of risk that drives earnings volatility across the five risk types. Observe that the fully diversified risk calculation is such that 6 percent is for market risk, 46 percent is for credit risk, 18 percent is for A/L risk, 12 percent is for operational risk, and 18 percent is for business risk. We will not cover how K&S compute the calculation of the diversification benefit in our article because this is a topic that is well covered elsewhere. The reader should note that the diversification benefit for financial risk is attributed across its three underlying risk types (i.e., 70 percent = 6 + 46 + 18). Similarly the diversification benefit for nonfinancial risk is attributed across its two risk types (i.e., 30 percent = 12 + 18). We can see that 12 percent of this nonfinancial risk is directly attributable to operational risk. We then had a starting point to quantify operational risk. However, for the sake of this article and the example that follows, we did not make any adjustments for operational risk. In other words, we will use 12 percent as the portion of earnings volatility that is attributable to operational risk.

The caveat with this valuation of operational risk is that rare events in the tails are not fully reflected in the K&S study. We therefore consider the "earnings volatility method" as the lower boundary value of unexpected losses due to operational risk. We compute an upper bound on the amount of unexpected loss by using the relevant elements of an external loss database. The SAS® global loss database incorporates rare plus unexpected events and thereby provides a proxy for the upper boundary value since a certain percentage of losses is in the tails. We believe that picking off a threshold percentage (such as 90 percent) from the external database provides a good representation of an upper bound on the potential unexpected operational risk losses. We use these losses as the spatial representation of all possible losses and will refine the categories by including and excluding loss event categories that are not applicable to smaller institutions.

It is important to note that there are a few sources of external loss data available. These include the SAS database, Fitch[7] databases and the ORX[8] consortium. We settled on using the SAS database[9] since it was made available to us and is deemed a complete source, including consideration of things like details on loss events, granular Basel II classifications, and the loss event process (i.e., was the loss a one-time loss or a series of losses over time caused by an incident, legal liability vs. reported loss, etc.?). The database also adjusts for currency and time value of money by using the CPI index. However, the main downside of using any external loss database, no matter how good it is, is that it does not allow you to meaningfully calculate a loss frequency which is a crucial element of an operational risk capital calculation.

7 Algo OpData includes exposure data for the top 500 banks and includes total assets, total equity, total revenues, total deposits and number of employees. Losses in the Algo OpData database are categorized according to the Basel Committee on Banking Supervision's (Basel II) definition of operational risk and its event type hierarchy.

8 The Global ORX database is a database from a consortium of banks pooling their data together and contains losses from 35 member banks. It now contains 63,500 losses, each loss over $20,000 in value. Every member of ORX receives the entire anonymous database (see below) containing every loss and associated standard characteristics.

9 The SAS global loss database is SAS® OpRisk Global Data – a comprehensive and accurate repository of information on publicly reported operational losses in excess of $100,000. This database documents more than 16,000 events across all industries worldwide, and provides up to 50 highly relevant fields of descriptive information for each loss event.

Sample operational risk calculation: "earnings volatility" method

We utilized the earnings volatility method in order to quantify what we term the lower boundary of operational risk capital, since this method does not fully reflect large unexpected events. We used data available from the FDIC Web site[10] (covering the period from 1992 to 2007) to calculate the return on risk weighted assets[11] (RORWA) for two segments of US banks: (1) $1 billion to $10 billion in assets and (2) $10 billion to $50 billion in assets.

We used net income as the numerator as defined by the FDIC source database, which is net interest income plus total noninterest income plus realized gains (losses) on securities and extraordinary items, less total noninterest expense, loan loss provisions and income taxes. As a denominator, we used the RWA defined by the FDIC source data, which is risk weighted assets adjusted based on the risk-based capital definitions for prompt corrective action (PCA).

The average RORWA in our sample is outlined in Figure 2 along with the distribution statistics in Figure 3. It is important to note that we neutralized bank holding effect by subtracting the average RORWA for each bank for each data period. As expected, by construction observe that the mean adjusted RORWA for each sample is equal to zero[12].

10 http://www2.fdic.gov/sdi
11 The method to calculate RORWA is outlined in the K&S article and was used for consistency. We used a sample of banks; not all banks are within each segment.
12 For more information, please refer to the K&S article.

ASSET SIZE	ADJUSTED RORWA MEAN	RORWA SIGMA	SKEWNESS	KURTOSIS	ROA AVERAGE	RORWA
$1-10B institutions	0.00%	0.975%	3.39	44.75	1.20%	1.91%
$10-50B institutions	0.00%	1.110%	3.33	39.80	1.25%	1.74%
All institutions	0.00%	1.024%	3.38	42.98	1.22%	1.85%

Figure 2

Adjusted RORWA 1992-2007 (1-10B)

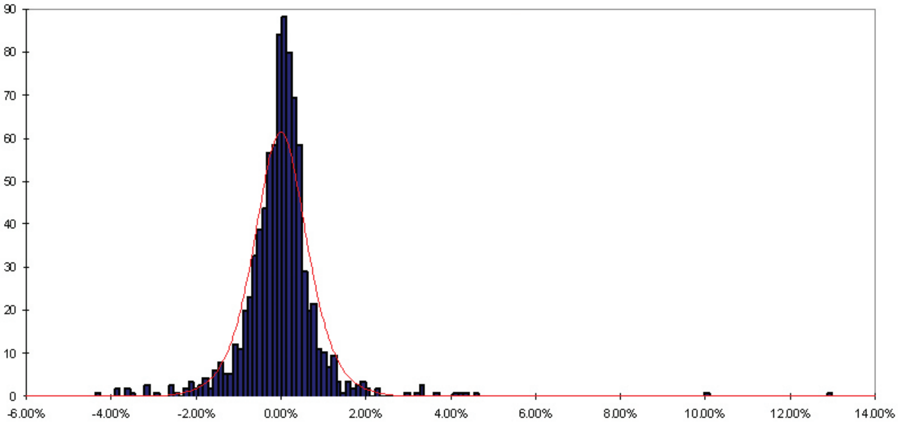

Figure 3

This type of analysis can be done with internal bank data. In order to scale the unexpected loss amount by any given asset size, we used a conversion factor, which is the average risk weighted assets (RWA) per assets for each segment. The scaling factor for the $1 billion to $10 billion segment was 63 percent, and the scaling factor for the $10 billion to $50 billion segment was 72 percent[13]. Given the high level of kurtosis (spread of data in the distribution), we did not assume a normal distribution. If the RORWA distribution were normal, 3.4 standard deviations would cover 99.97 percent of the outcomes (1-tailed). The data indicates that approximately four standard deviations are required to achieve 99.97 confidence that losses will not exceed capital. The kurtosis was 44 and 39, respectively, for the smaller and larger segments, and therefore required us to use the multiplier 4[14] respectively for each segment rather than 3.4 in the case of a normal distribution. We were able to empirically verify that this amount was correct.

13 Scaling factors are used to obtain the RWA for a $5 billion asset bank (on average). Next, we use our RWA statistical analysis to obtain the right unexpected loss amount. If ROA = R/A and ROWA = R/RWA, then RWA/A = ROA/RWA.

14 For simplicity, we rounded to 4 for both segments of our analysis. Both segments were not materially different in that respect.

Figure 4 presents the results of the analysis. We are able to use the sample's calculated volatility and find the tail threshold for unexpected loss (by using 4 as our multiplier of volatility). We multiply by the RWA for two sample banks with $5 billion and $25 billion in assets.

RORWA - Return on Risk Weighted Assets (1992-2007)			
US BANKS $1-10B		**US BANKS $10-50B**	
RORWA volatility	0.975%	RORWA volatility	1.100%
UL (4*σ)	3.900%	UL (4*σ)	4.400%
EXAMPLE (in 000's)			
$5B bank		**$25B bank**	
Unexpected Loss	$122,850	Unexpected Loss	$792,000

Figure 4

If we use the earnings volatility breakdown in Figure 1 from the K&S study and the unexpected loss (UL) calculations (as shown in Figure 3), then we are then able to compute the earnings volatility (UL) due to operational risk as shown in Figure 5.

Earnings volatility analysis (in 000's)						
	FINANCIAL RISK			NON-FINANCIAL RISK		TOTAL UL
	Market Risk 6%	Credit Risk 46%	A/L Risk 18%	Operational Risk 12%	Business Risk 18%	
$5B	$7,371	$56,511	$22,113	$14,742	$22,113	$122,850
$25B	$47,520	$364,320	$142,560	$95,040	$142,560	$792,000

Figure 5

Observe that if you multiply 12 percent by UL (e.g., $122,850,000 for a $5 billion asset bank) you get the operations risk numbers shown in Figure 5. We next use the operational risk calculations in Figure 5 to compute a lower bound on the cost of capital for operational risk. If we assume an after-tax 12 percent cost of capital, then we are now ready to reasonably value the current assumed cost of capital (unexpected loss) for operational risk.

RORWA Risk Volatility (in 000's)		
	CAPITAL	COST OF CAPITAL 12%
$5B institution	$14,742	$1,769
$25B institution	$95,040	$11,405

Figure 6

This concludes our analysis to find the earnings volatility (i.e., lower boundary) that can be attributed to operational risk based on the earnings volatility method along with the amount of capital for operational risk (as defined in our article). We note that this figure still represents a fully diversified[15] view of the unexpected loss.

15 *We remind the reader, as previously discussed, the breakdown of earnings volatility adds up to exactly 100 percent; therefore we assume throughout our paper that the diversification effects are fully accounted for in this number as previously discussed in the article.*

Sample calculation of operational risk “tail event” method

The method used to determine the upper boundary of operational risk losses was mostly straightforward but required a carefully prepared rules-based preparation of the data. As mentioned earlier, we used the SAS global loss database, which is made of publicly available information for any $100,000 or greater loss incurred by an institution.

We assumed that all operational risk losses within the SAS database were unexpected losses. Our reasoning was that banks typically do not disclose any specific information about individual operational risk losses that are deemed “expected.” In other words, we assumed that if the losses had been expected losses then these would probably not have been publicly disclosed[16]. In Figure 7 below, we present a summary table of all losses within the database by Basel II categories. In order to use the database and take account of the varying sizes of the institutions reporting the losses, we computed the dollar loss per asset for each loss category.

Loss database analysis Basel II category			*Scaling for bank size* *(Note: All dollar amounts in thousands)*	
	LOSS ($) M	LOSS PER $ ASSET	$5B	$25B
Agency Services	116	0.07	$363,785	$1,818,927
Asset Managment	136	0.13	$645,485	$3,227,426
Commercial Banking	110	0.08	$391,110	$1,955,550
Corporate Finance	236	0.03	$155,405	$777,027
Payment and Settlement	14	0.02	$103,029	$515,145
Retail Banking	39	0.01	$51,484	$257,420
Retail Brokerage	27	0.16	$819,698	$4,098,488
Trading and Sales	73	0.03	$173,311	$866,554
TOTAL LOSSES	**80**	**0.07**	**$3,131,095**	**$15,655,474**

Figure 7[17]

Note that the unweighted average across each Basel II category does not represent the average across all categories. For example, if there are 99 observations of $1 in Basel II Category A and one observation of $101 in Basel II Category B, then the average across all observations is $2, whereas the average of the average is $51.

16 *While this is a rule of thumb that is broadly backed up by empirical evidence, it is a leap of faith that the reader must make along with us.*

17 *Note: Losses in Figure 5 took place in organizations with different control environments, and therefore our analysis ignores these considerations.*

In order for these to be applicable to smaller institutions, we drilled down to the level two definition of these losses and removed any losses that were most likely not pertinent[18] for smaller institutions. The next table, Figure 8, is the same table with the following risk categories removed: Trading and Sales (except treasury), Asset Management, Insurance, Retail Brokerage and Corporate Finance.

Loss database analysis Basel II category			*Scaling for bank size (Note: All dollar amounts in thousands)*	
	LOSS ($) M	LOSS PER $ ASSET	$5B	$25B
Agency Services	116	0.07	$363,785	$1,818,927
Commercial Banking	110	0.08	$391,110	$1,955,549
Corporate Finance	236	0.03	$155,405	$777,027
Payment and Settlement	14	0.02	$103,029	$515,145
Retail Banking	39	0.01	$51,484	$257,420
TOTAL LOSSES			**$1,064,814**	**$5,324,069**

Figure 8

Once the right categories and losses are selected, we are able to construct the historical (empirical) distribution of losses from the database in Figure 9. The table below provides a summary of the quantile for the loss distribution.

All 5 Basel categories chosen *(Note: All dollar amounts in thousands)*				
QUANTILE	95%	90%	80%	75%
Loss $ per asset	0.0467	0.0165	0.00464	0.0028
$5B	$233,433	$82,547	$23,177	$14,135
$25B	$1,167,165	$412,737	$115,887	$70,676

Figure 9

We calculate the upper boundary of operational risk capital by taking the 90 percent quantile. We name this the upper boundary since the data point at the 90 percent quantile is in the tail. The reason for choosing the 90 percent quantile was that the level of losses at that percentile were realistic for use within the small FI segment, and in our experience, represents a conservative, yet not too conservative, level of tail estimate. Any higher quantile would produce figures that did not pass the smell test. We include a breakdown for each Basel II category of losses at the 90 percent quantile in Figure 10.

18 *Banks looking to use this method should methodically go through the database and pull out the appropriate losses given their specific environments – the generic approach taken here would have to be refined for a given bank.*

(Note: All dollar amounts in thousands)

All 5 Basel categories chosen	
QUANTILE	90%
Loss $ per asset	0.0165
$5B	$82,547
$25B	$412,737

Corporate Finance	
QUANTILE	90%
Loss $ per asset	0.0136
$5B	$68,177
$25B	$340,885

Agency Services	
QUANTILE	90%
Loss $ per asset	0.0139
$5B	$69,739
$25B	$348,696

Payment and Settlement	
QUANTILE	90%
Loss $ per asset	0.0304
$5B	$151,982
$25B	$759,909

Commercial Banking	
QUANTILE	90%
Loss $ per asset	0.0215
$5B	$107,613
$25B	$538,066

Retail Banking	
QUANTILE	90%
Loss $ per asset	0.0130
$5B	$65,026
$25B	$325,128

Figure 10

We can now compute the upper boundary cost of capital with the tail event method in Figure 11 given a cost of capital of 12 percent:

LOSS DATA 90% QUANTILE	CAPITAL (in 000's)	COST OF CAPITAL (in 000's)
$5B institution	$82,547	$9,906
$25B institution	$412,737	$49,528

Figure 11

This concludes our analysis to find the upper boundary valuation and cost for unexpected losses due to operational risk as defined in this article.

It is worth spending time to discuss the concept of expected loss in the tail before moving on to the final conclusion and render a hard number for the savings due to an enhanced operational risk framework. The concept of expected loss in the tail refers to the average loss that a firm can incur once it breaches the unexpected loss threshold. Expected loss in the tail addresses the question: If things do go bad, how bad can they be expected to get? The tail VaR region is highlighted in Figure 12. Why is this important? The ability to quantify and manage the level of expected loss in the tail lends greater transparency for the amount of operational risk.

Adjusted RORWA 1992-2007 (1-10B)

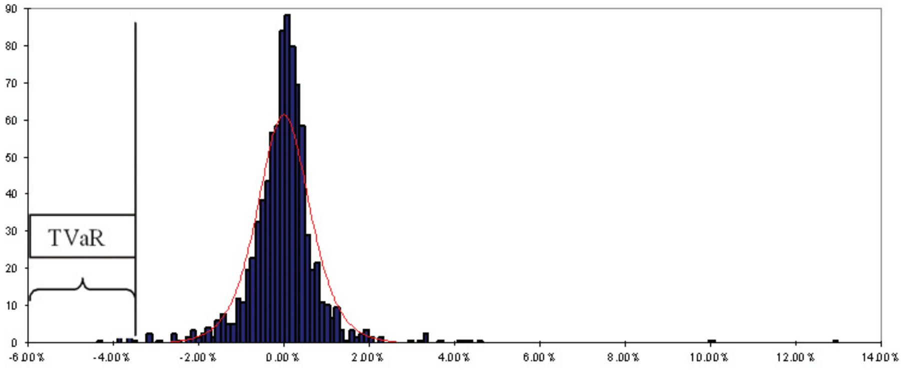

Figure 12

Summarizing our calculation above we are able to now have a clear picture of the upper and lower boundaries for unexpected loss due to operational risk.

Summary Recap (in 000's)		
	LOWER BOUND COST OF CAPITAL	UPPER BOUND COST OF CAPITAL
$5B institution	$1,769	$9,906
$25B institution	$11,405	$49,528

Figure 13

Observe that the lower bound cost of capital numbers in Figure 13 are taken from Figure 6 and the upper bound is taken from Figure 11. We can now provide a range of expected savings due to enhancements of the operational risk controls environment. There are more precise methods that require the use of advanced analytical tools and a good history of internal loss data and Risk Control Self-Assessment (RCSA) metrics. Nevertheless, if the goal is to arrive at a first cut approximation, then the method outlined above should be considered rigorous enough to help build the business case for operational risk technology investments.

The CRO and operational risk heads can evaluate what current portion of earnings volatility is left unmanaged by design. We need to estimate the level of controls currently in place at the bank to manage the volatility due to operational risk. For example, if we estimate this control environment is good enough to catch 60 percent of all unexpected loss scenarios (the level isn't as important as the potential improvement in the level for this exercise), we can then determine what level of improvement is realistic given the available technology.

The potential savings matrix — Figure 14, below — takes the midpoint of the lower and upper boundary unexpected loss calculated above and provides a matrix of estimated hard savings for the improvements due to technological enhancement of the operational risk framework. These are conservative figures and can be explained easily to management committee or board members looking for a direct net effect of investment in operational risk technology.

Potential Savings Matrix (in 000's)

ENHANCED CONTROL ENVIRONMENT	CAPITAL SAVINGS* $5B INSTITUTION	CAPITAL SAVINGS* $25B INSTITUTION
5%	$292	$1,523
10%	$584	$3,047
15%	$876	$4,570
20%	$1,167	$6,093
25%	$1,459	$7,617

**Midpoint between upper and lower bound cost of capital*

Figure 14

Operational risk capital as per Basel II

We find it useful to add a section on the Basel II operational risk capital and how the basic indicator approach[19] number compares with the range we provided above.

Basic Indicator Approach

The least risk-sensitive of these approaches is the Basic Indicator Approach, in which capital is a multiple (capital factor = 15 percent) of a single indicator (base), which is the average annual gross income, where positive, over the previous three years for which gross income was positive. The regulators have postulated that gross income serves as a proxy for the scale of operational risk exposure. Gross income is defined as the sum of net interest and noninterest income.

We used two randomly selected banks' gross income of asset size roughly equal to $5 billion and $25 billion to benchmark our method in Figure 15.

Basel II Capital Charge – 2006 (in 000's)

	GROSS INCOME (Net interest and noninterest income)	CAPITAL CHARGE (15%)	COST OF THE BASEL II CAPITAL CHARGE (12%)
FDIC docket 17308 – YE 2006	$260,901	$39,135	$4,696
FDIC docket 9609 – YE 2006	$957,576	$143,636	$17,236

Figure 15

How does our analysis compare with the already established Basel II guidance on operational risk? We find that the Basel II operational risk capital charge and its cost fall between our range of expected values as shown in Figure 16, which is what one would expect given that our lower bound did not include real tail events. Our upper bound, which includes tail events from many banks, is actually higher, but this is not necessarily bad since that estimate is probably more conservative than the derived Basel II formula. It is probably realistic to estimate the tangible benefits of capital reduction being between our lower bound and the Basel II formula, given any one bank would invest in and adopt a more risk-sensitive operational risk framework.

Summary Recap (in 000's)

	LOWER BOUND COST OF CAPITAL	UPPER BOUND COST OF CAPITAL	COST OF THE BASEL II CAPITAL CHARGE
$5B institution	$1,769	$9,905	$4,696
$25B institution	$11,405	$49,528	$17,236

Figure 16

19 *We used the basic indicator approach instead of the standardized approach since line-of-business level gross income information as defined per Basel II was not available to us.*

Conclusion

Our article has focused on finding the true tangible value of enhancing the operational risk framework with an investment (such as a technology investment). It is clear that efficiencies gained in reducing operational risk, such as automating controls, as well as the ability to react more quickly (say, given timely information) can lead to hard dollar benefits. Over time, the authors plan to conduct other studies and publish results which will track hard dollar operational risk savings and give an empirical flavor to the conceptual framework described in this article.

The CRO and board should not forget that the intangible benefits tied to a better operational risk framework may easily outweigh the hard dollar benefits. Among the few most highly regarded intangible benefits are:

- An operational risk framework for a particular line of business can help give direction and focus to better identify and manage operational risk.
- Operational efficiencies gained by combining risk assessment activities (especially at the small line-of-business level).
- The idea that enhancing and nurturing a risk culture leads to a more efficient risk control environment.

We hope this article provides a road map for internal business cases on the value of technology investment to make the operational risk framework more robust and efficient, and shows the value it provides to institutions, rather than being seen as another regulatory burden.

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Appendix

Other Regulatory Approaches To Operational Risk Models

The banking industry's new Basel Chapter Accord utilizes a spectrum of three increasingly risk-sensitive approaches for measuring operational risk. These also include standardized and AMA approaches.

Standardized Approach

The standardized approach divides the bank's activities into eight lines of business, or LOBi (see the discussion that follows). Each line of business is then assigned an exposure indicator Eli, which is, as in the Basic Indicator Approach, the average annual gross income for that line of business, where positive, over the previous three years for which gross income was positive. Each business line is assigned a single multiplier (capital factor Bi) to reflect its relative risk. The total capital requirement is defined as the sum of the products of the exposure and the capital factor for each of the N business lines:

The Basel Committee has the betas to the following values:	
BUSINESS LINE	BETA FACTOR
Corporate Finance (B1)	18%
Trading and Sales (B2)	18%
Retail Banking (B3)	12%
Commercial Banking (B4)	15%
Payment and Settlement (B5)	18%
Agency Services (B6)	15%
Asset Management (B7)	12%
Retail Brokerage (B8)	12%

Advanced Measurement Approach (AMA)

Under the AMA, the regulatory capital requirement is the risk measure produced by the bank's internal operational risk model. The loss distribution approach described in Crouhy, Galai and Mark is likely to form a core plank of any such model, but individual banks will have to meet some strict qualitative standards before they are allowed by regulators to adopt the AMA approach. The regulators say that any operational risk measurement system must have certain key features, including "the use of internal data, relevant external data, scenario analysis and factors reflecting the business environment and internal control systems." Under the AMA, the Basel II regulators have not set out exactly how these ingredients should be used. Instead, the regulators say that a bank needs to have a "credible, transparent, well-documented and verifiable approach for weighting these fundamental elements in its overall operational risk measurement system."

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