Compliance Monitoring Data

Usage for Operational Risk Measurement

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Agenda

1. About the author

John Cyriac is a process control engineer by profession with a master's degree in Corporate Finance Law. He is passionate about Operational Risk Management and Compliance and enjoys challenging consulting assignments. He has implemented various risk and compliance assignments with major banks in the UK. Currently he runs ComplianceTrack.Com – compliance software as a service designed as a first step before implementing GRC.

2. Abstract

The initial sections of this paper define Operational Risk (OR), discuss the rational for measuring OR and details of Basel II recommendations for OR mitigation. The case study section of this paper considers a sample UK financial institution and its existing initiatives and recommends certain changes for best practice OR Management implementation by leveraging the existing compliance function.

3. Operational Risk – Introduction

3.1. Definitions and history

The following paragraphs enumerate various definitions of Operational Risk and give an evolutionary history of the discipline in the context of financial industry starting from 1991.

"The generic term 'operations risk' existed as a generic term of COSO in 1991."[i]

"Risk that deficiencies in information systems or internal controls will result in unexpected loss is the definition of Operational Risk as per Volume 16 of the Basel Committee's Risk Management Guidelines published in 1994."[ii]

"Operational risk is the risk of everything other than credit and market risk as per BBA survey of 1999."[iii]

As per Basel Committee on Banking Supervision, we got similar definitions from 2001 through to 2004. "Operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk."[iv]

A very interesting definition with an upside consideration is "Operational risk is the risk that the operation will fail to meet one or more operational performance targets."[v]

3.1.1. Rational behind measuring Operational Risk

The relationship between risk and return or downside and upside can be said as the yin and yang of the financial markets. So while considering investing in the stock of a financial institution, its value is nothing but the "present value of its future cash flows adjusted for risk and that operational risk is a major source of earnings volatility for financial institutions"[vi]. The Capital Asset Pricing Model (CAPM) is used as a standard to calculate the required return of an asset, which considers only the systematic risks. The risks, which are specific to a firm (unsystematic risks), are not considered in calculating the required return in the CAPM calculations as it is assumed that a diversified portfolio can nullify the effect of such risks. Therefore, it is natural to question the logic behind measuring Operational Risk and assuming a capital charge, if the entire risk can be nullified by the shareholders by holding a diversified portfolio. Also, if we look at the first Basel Accord of 1988, it considered capital allocation by measuring market risk and credit risk alone.

"Operational risk, however, differs from the usual types of unsystematic risk in that it is asymmetric, primarily causing losses and not gains. Hence, to the extent that operational losses have a negative mean, it makes sense for financial institutions to make expenditures on managing operational risk at least to the point where the marginal expenditure equals the marginal reduction in expected losses from operational events. Operational loss events may serve as signals of poor management quality and operational controls, leading the market to reduce expectations of future cash flows."[vii]

Other than the need to assume a capital charge, managing operational risk is good business judgement as it reduces the losses created by operational issues. "Large operational risk-related financial services losses have averaged well in excess of $15B annually for the past 20 years, but this reflects only the large public and visible losses."[viii]

Therefore, we can summarize the rationale for financial organizations to implement an operational risk management strategy as

- Good practice to give more shareholder value by reducing operational information asymmetry.
- Get a sign of approval by banking supervisors for getting market confidence.

4. Developing an Operational Risk Management Programme

4.1. Compliance Management and Operational Risk Management

While writing this case study, it is possible that I will make various errors like 1) spelling mistakes 2) grammatical errors 3) inconsistent font or style usage etc. The process of eliminating these errors is not a complex task. It is simple and it is a matter of common sense. I need to know 1) what can go wrong 2) check those areas diligently 3) correct if there are any mistakes and 4) continuously diligent of these issues while writing. I should follow a "program" of assessments and corrections to perform well and avoid errors. Such is the case for somebody handling a process in a financial institution, correcting an operational issue is not a very complex task and may not require specialized skills. However, a person working in the finance department of a bank analyzing the credit risk before underwriting a loan needs specialized knowledge.

"The risks that blew up in the faces of boards at companies such as WorldCom, Enron, and Parmalat all come under the general category of operational risk."[ix]

History has taught us that people may not always do the simple tasks in eliminating operational failures, because it is unnoticed and ignored since they think they are in control of it already. Most of the banking regulations are proposed to mandate such commonsense checking and to mitigate such operational failures. For example, "the Sarbanes-Oxley Act of 2002 (often shortened to SOX) is a legislation enacted in response to the high profile Enron and WorldCom financial scandals to protect shareholders and the public from accounting errors and fraudulent practices in the enterprise."[x]

The duty of compliance departments in financial institutions is to report adherence to various regulatory requirements to the corresponding regional regulator. However,

as we see from the above example, most of the regulatory requirements came as a measure for institutions to mitigate operational risks.

Based on the above analysis, we can say that the underlying function of the compliance department in a financial institution is to mitigate operational risk. However, in most organizations, the compliance function is used for just "tick in the box" regulatory reporting.

4.2. Basel II and Operational Risk Management

Operational Risk Management is about minimizing operational losses by following good business practice. Basel II stipulations in this area is about maintaining regulatory capital to protect investors and the economy as a whole if operational losses bring the institution down. Both of them may sound different, but as established in Section 4.1, Basel II as a compliance standard is aiming for the same goal but with a different perspective. It is easy to accept that it is more practical to use one "programme" which leverages on the compliance requirements of Basel II and managing operational risk. However, it is important to mix the right ingredients of both concepts to create the best recipe for an institution.

Measurement (Pillar I) of possible operational risks is overemphasized in academic literature related to Basel II than management (Pillar II) of operational risks. At the 2002 OpSummit conference in the South of France, central banker Cole told about his experience in the US Air Force, handling atomic warheads. "We never once tried to calculate the potential damage of such a warhead going off, but we made double and triple sure that none of them ever went off by accident."[xi]

4.2.1. Basel II -An Overview[xii]

Basel II implementation is complete when an institution has implemented the "three pillars"[xiii] of the Basel Accord.

Pillar I

The minimum overall capital ratio remains at 8% but Basel II proposes a detailed method to measure market, credit and operational risk exposures.

Capital Ratio =

Capital Requirement / (Credit Risk Exposure + Market Risk Exposure + OR Risk Exposure)

In this section, we will consider the measurement approaches to OR alone. The overriding concept in the first two measurement approaches is to consider gross income as an "indicator" for assessing the underlying risk exposure.

Basic Indicator Approach

The formula to determine capital charge using the Basic Indicator approach is as follows.

$$K_{BIA} = \left(\sum (GI_{1..n} * \alpha) \right) / n$$

Where,

- K_{BIA} is the capital charge under the basic indicator approach
- GI is the annual gross income (net interest income + net non-interest income) over the last three years where 'n' is the number of previous three years where gross income was positive.
- And α is the fixed percentage, set by Basel Committee, currently it is 15%

This approach is applicable to any bank. Institutions using this approach are encouraged to use the "guidance document"[xiv].

Standardized Approach (TSA)

The formula to determine capital charge using Standardized Approach is as follows.

$$K_{TSA} = \left\{ \sum_{years(1\text{-}3)max} \left[\sum (GI_{1\text{-}8} * \beta_{1\text{-}8}) \right] \right\} \Big/ 3$$

Where,

- K_{TSA} is the capital charge under the standardized approach.
- $GI_{1\text{-}8}$ is the annual gross income for each of the eight business lines in a given year over a period of three years.
- $\beta_{1\text{-}8}$ is the fixed percentage, set by Basel Committee, related to the business line. Please refer to Annexure I for a table showing the business lines and the suggested β.

The Standardized Approach can only be used if the bank can demonstrate effective management and control of operational risk. Also it needs to demonstrate that it has the following implementations.

- Independent risk control and audit function.
- Effective risk reporting systems.
- ORM functions with clear responsibilities assigned to them.
- Board of directors and senior managers are actively involved in the oversight of ORM programme.
- ORM system that is robust and is implemented with integrity
- Sufficient resources for using the approach in the major business lines as well as in the control and audit areas.

Supervisors will have the right to insist on a period of initial monitoring of a bank's standardized approach before it is used for regulatory capital purposes.

Advanced Measurement Approach (AMA)[xv]

In contrast to the previous two approaches of measurement where the "indicator" is Basel II prescribed gross income, in AMA, the bank can use its own internal measurement indicators for each business line. AMA is defined as "all measurement techniques that lead to a precise measurement of the exposure of each business line of a financial institution to each category of operational loss event"[xvi].

Before getting into the various AMA approaches and considering the volume of published academic literature in the area, it is worth considering the following statement from the Basel Committee.

"The Committee recognizes that the AMA soundness standard provides significant flexibility to banks in the development of an operational risk measurement and management system. However, in the development of these systems, banks must have and maintain rigorous procedures for operational risk model development and independent model validation. Prior to implementation, the Committee will review evolving industry practices regarding credible and consistent estimates of potential operational losses. It will also review accumulated data, and the level of capital requirements estimated by the AMA, and may refine its proposals if appropriate."[xvii]

So it is important to consider current industry practices before adopting a specific measurement approach. Based on a recent industrial research into best-practice ORM methodologies, "in Europe, 60% of respondents are applying Loss Distribution Approach (LDA), 41% are using a COSO-based approach, and 59% are using a combination of both"[xviii]. The data inputs into the ORM systems consisted of "70% of the respondents use risk/control self-assessment data, 55% of respondents use scenario analysis data, 45% use external loss data, 37% use KRI data and 11% use near-miss data"[xix].

AMA based measurement is "described as encompassing three versions: the loss distribution approach (LDA), the scenario based approach (SBA) and the scorecard approach (SCA)"[xx]. This description and the above-mentioned industry practice can

point in the direction of using at least one qualitative approach (SBA or SCA) and LDA for implementing the AMA.

Scorecard Approach (SCA) - a qualitative, forward looking approach to AMA

"A structured presentation of Key Risk Indicators (KRI) covering the business process of a bank is what we call an operational risk scorecard."[xxi] A detailed example of using SCA is covered in Section 5.

Scenario Based Approach- a qualitative, forward looking approach to AMA[xxii]

A typical SBA starts with risk identification at a top board level. It may start with a management brainstorming to identify, categorize and assign responsibilities of the major risk factors. Normally, the internal audit department and external industry experts are employed to augment this top down risk identification.

The second stage in an SBA project is to create an inventory of risk items and the steps to mitigate them. For this, the cause and effect scenario of each risk item is considered. An understanding of how the loss might occur, increases the chance of creating the right steps to mitigate them. In this step of the SBA, formal interviews of experts in each business line of the company ("Delphi Technique"[xxiii]) or brainstorming workshops are conducted. Using these steps, SBA creates an estimate of loss and the probability of loss and these data points can then be plotted to a graph. For example, if the SBA data gives a log normal distribution (See Figure 2 for an example distribution), one may find the average area under the curve to determine aggregated loss.

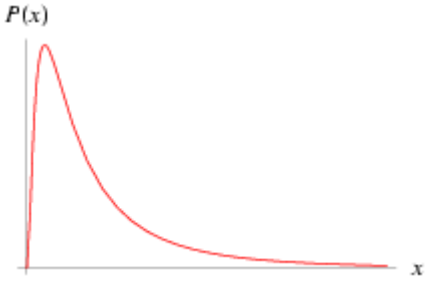


Figure 2. An example of a log normal distribution.[xxiv]

Loss Distribution Approach – a quantitative, backward looking approach to AMA

LDA provides a way to map the actual losses experienced by a bank to a categorization system proposed by the Basel Committee. A detailed example of LDA usage is covered in Section 5.

Pillar II

Pillar II is not about measurement, but this requires the "supervisors"[xxv] to ensure that the financial institution has sound internal processes to determine capital adequacy based on a detailed evaluation of its risks. An unsatisfactory outcome of the review can result in additional capital charge or changes in senior management responsibilities. The main recommendations of Pillar II are to have an effective activity/process/framework for 1) risk management 2) determining OR capital charge 3) monitoring and reporting 4) resolution of risk events and 5) managing risk.

Pillar III

Pillar III is about disclosures to the market about the institution's risk profiles and its capital adequacy.

4.3. Enterprise Risk Management (ERM) for a resilient enterprise

Basel recommends ORM systems to be "conceptually sound and implemented with integrity"[xxvi]. However, this guidance does not give a precise methodology to implement ORM nor does it give a benchmark for comparing ORM implementations

between organizations. It is important for the industry to adopt a standard of ORM implementation at an early stage. “Recent research”[xxvii] shows a trend for adopting a COSO framework as a standard for implementing ORM.

COSO proposes an integrated approach for internal controls to mitigate operational risk and recommends using Enterprise Risk Management (ERM).

“Enterprise risk management is a process, effected by an entity’s board of directors, management and other personnel, applied in strategy setting and 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.”[xxviii]

As per COSO, this enterprise risk management framework is geared to achieving an entity’s objectives, set forth in four categories:

- Strategic – high-level goals, aligned with and supporting its mission
- Operations – effective and efficient use of its resources
- Reporting – reliability of reporting
- Compliance – compliance with applicable laws and regulations.

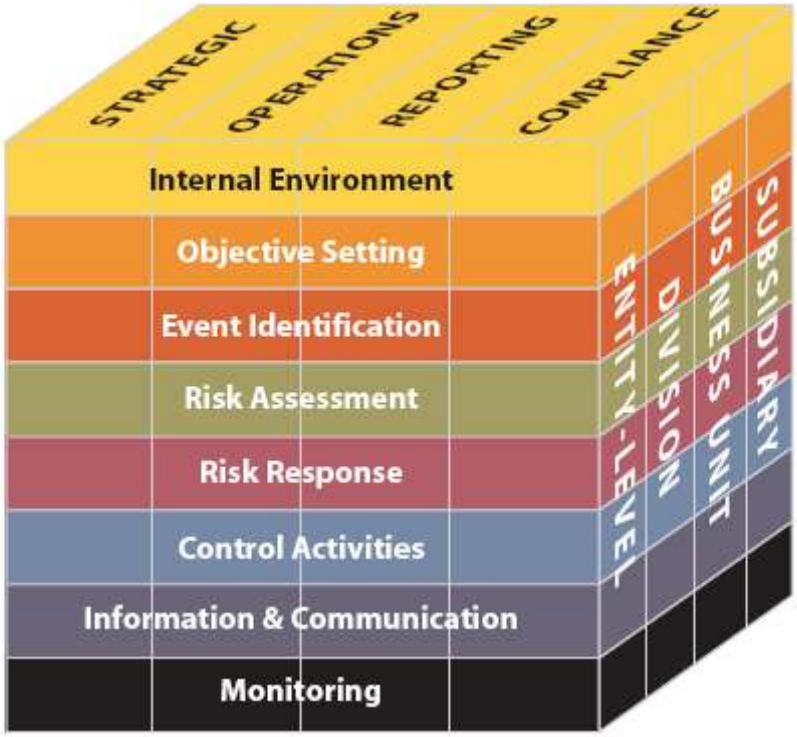


Figure 1. COSO Integrated Framework. [xxix]

5. Case study

5.1. Overview

In this case study, we considered the activities of Compliance Departments of two UK financial institutions. One of them is an asset management firm with fixed income focus and the other is an equity long/short hedge fund. Both are small financial institutions with less than 25 employees. In both the companies, there is no specific Operational Risk Management function or personnel. However, in both the companies, we find a very successful compliance function and one of them also has an auditing function. In this section, we will first consider a snippet of activity by the compliance/risk related activity of one of the companies (Company A) and then we will propose a method to implement an Operational Risk Management programme, which is less onerous and more practical for smaller institutions such as the ones in our example. The purpose is to create a process, which is simple to implement without huge investments but can pave the way for CRD/Basel II compliance as per the UK Financial Services Authority (FSA). Although they may use a Basic Indicator approach or Standardized approach for measurement, the purpose of the proposed approach is to lay the foundation for an AMA approach if needed in the future. More than the mere requirement of complying with the Basel II directive, the proposed approach is aimed at creating a resilient organization with an effective operational risk management programme.

Both of these companies have the following documentation.

- A compliance/procedure manual, which details each process, objectives, responsibilities, risks etc. This is created by incorporating the various elements of the “FSA Handbook”[xxx].
- A list of risks with parameters like frequency, severity, ownership etc available as a separate document or as part of the compliance/procedure manual.
- A document, which details the tests for each risk factor which is used by the compliance officer to do regular tests

The samples used in this case study from "Company A" are from September 2007. The example set we are using is in relation to "Business Standards/Conduct of Business (COB) section in the FSA Handbook"[xxxi]. This specific section was discontinued from October 31, 2007 and it is renamed as "New Conduct of Business Sourcebook (COBS)"[xxxii].

FSA in the UK has provided the section "BIPRU 6"[xxxiii] for Operational Risk. At the time of writing this study, BIPRU 6.5 relating to AMA is not yet made available. So we will be using the "original Basel II recommendations"[xxxiv] to consider the method to implement an AMA approach.

If we use an industrial terminology, the current data collection and monitoring method of "Company A" comes under the classification of Risk and Control Self Assessment (RCSA). We are proposing a methodology to which applies COSO principles and enhance the RCSA with the capability to capture KRI data to create a balanced score card record internal loss data for LDA.

5.2. An excerpt from the existing compliance/procedure manual

Procedure: Trade Settlement

This part of the procedure is in line with the "Dealing and Managing (COB 7)"[xxxv] section of the FSA Handbook.

Defined Steps of this Procedure

- For some accounts, the operation person should communicate the trades to the client directly; the client has the responsibility to instruct the custodian.
- The operation person should add any new security identifier to the "system"[xxxvi] using an identifier. This will capture price, price history, rating information from Bloomberg on the nightly feed.
- Faxes to custodians should include the number of trades in the fax and for each account; a sequential numbering system is used for each trade batch. On some accounts, the custodian provides the firm with reference numbers to be included on each ticket batch. For some accounts the operations person

sends an email to notify the recipient that the trades were faxed and retain copies of the fax sheets and fax transmittal as proof of instruction.

- The custodian is responsible for matching broker confirms with advisor confirms and instructing each if there is a mis-match by T+2. Most trades settle T+3, except UK Gilts and US Treasuries that typically settle T+1.
- Generally, the appropriate custodian settles trades through the Euro Clear depository service. In limited cases, tickets are sent to clients for communication to the custodian.

5.3. An excerpt from the table of risks

Risk	Probability / likelihood	Impact / severity	Overall Risk Assessment	How dealt with / Control procedure / Policy	Compliance Monitoring Programme - Formal review	Responsibility	Frequency
Portfolio							
Serious delays in settling trades	Low	High	Low	Trades are matched to broker confirms via CRD. Any unmatched trades are bought to PM attention.	Monthly	Front Office, back office	Every Trade
Stock bought instead of sold or vice versa	Low	High	Low	Trades are matched to broker confirms via CRD. Any unmatched trades are bought to PM attention	Monthly	Front Office, back office	Every Trade
Stock is traded for wrong account	Low	High	Low	Trades are matched to broker confirms via CRD. Any unmatched trades are bought to PM attention	Monthly	Front Office, back office	Every Trade
Wrong stock transacted	Low	High	Low	Trades are matched to broker confirms via CRD. Any unmatched trades are bought to PM attention	Monthly	Front Office, back office	Every Trade
Trades are misallocated	Low	Medium	Low	EIA aggregates trades and very rarely will allocate. Any allocation will follow EIA's Allocation policy. Any allocation is recorded/noted and file in allocations file	Monthly	Front Office	Every Trade

5.4. An excerpt from the table of compliance monitoring programme

Area	Compliance Monitoring Test Undertaken	Date of Review	Quantity	Object	Method	Findings	Conclusion	Recommendations / Actions	Additional Sheets Attached	Notes
Portfolio										
DEALING										
COB 7	Has an deal/advice sheet been fully completed, authorised and matched to any relavent confirmation ?	30/09/2007	8	To ensure that the deal is properly recorded, authorised and followed up	Match trades in Deal book to Broker confirms and EIA confirms. Check EIA confirms for authorised signatures	Deal advices completed, authorised and matched to confirms			see Deal ticket sample report	3
COB 7.6	Were there any delays in effecting the trades? If so, what are the reasons for the delay?	30/09/2007	8	To ensure timely execution of trades	Check date in Deal book & Errors and discrepenacy file	No delays			-	
COB 7.5	Have trades been placed with an approved broker?	30/09/2007	8	To ensure trades are transacted with brokers with whom a relationship exists	Check brokers used (in LIPS) to approved brokers list	Placed with approved brokers	Deals / Advices are properly recorded, authorised and followed up		see Deal ticket sample report	3
COB 7.7	Has allocation been effected promptly, in accordance with the intended basis and EIA procedures, and is this recorded on the deal sheet?	30/09/2007	up to 5	To ensure timely execution and accurate allocation of trades	Check Deal book for allocated trades, review allocation, check to broker confirms	No allocations in Sept 07	-		see Allocation policy review report	1
COB 7	Has best execution been achieved?	30/09/2007	20	To ensure best execution of trades	Check Deal book ensure sample of trades have alternative quotes	see best execution review	trades have been transacted with brokers with whom a relationship exists		see Best Execution sample test report	2
COB 7	Is turnover on each account significantly different from the previous quarter?	30/09/2007	All	To ensure consistency of treatment of client portfolios	compare 6 month average turnover to last month	Reasonable trading volume	-	-	see turnover review.xls	1

5.5. Analysis of the current treatment of data

Currently, the terminology and the method used to document various items in these examples are geared for compliance with the FSA rules and for relevant reporting. This shows a picture similar to what is depicted in Section 4.1, where compliance function of these institutions are doing more of a “tick in the box” without adding tangible value to ORM initiatives. But with minor changes in the presentation and the way data is collected by the Compliance Officer, it is possible to comply with the CRD/Basel II requirements and also create a meaningful programme to create an effective operational risk management.

As we understand from the basic definition of Operational Risk, the drivers for OR are 1) people 2) internal processes 3) systems or 4) external factors. So an OR event can happen when any of these resources are insufficient. A good indicator will measure this insufficient resource and the organization can implement control measures.

Let us consider “serious delays in settling trades” from the risk table in 3.3 and the COB7.6 test “Were there any delays in effecting the trades? If so, what are the reasons for the delay documented?”.

The number of delayed settlements can be indicative of lack of performance of the trader. The risk involved in this case is the inability to conclude the deal in the specified market parameters. For example, delayed settlement can cause the company to bear the risk of interest rate or exchange fluctuations.

Create KRI for a balanced scorecard

Based on the analysis in the previous section, first we need to give the right labels to the defined data. In our case, the identified risk and KRI are to be correctly categorized. Table 2 gives the output of such a categorization. In the same manner, other risks and KRIs are to be properly categorized and as per the defined business lines as per Annexure 1.

Risk Driver	Risk factor	Risk	Loss	Key Risk Indicator
People	Quantity(Sufficient Staff), Quality (Competent Staff), Criticality (key staff), Failure (unauthorized behaviour)			
Process	Quantity (existing process can handle all instances), Quality (appropriate processes), Criticality (appropriate process unavailable), Failure			
Technology	Quantity (system capacity), Quality (incorrect market information), Criticality (critical application), Failure (infrastructure breakdown)			
External dependency	Clients, Regulators, Suppliers, Competitors	Inability to settle deal in planned market parameters	Direct financial loss	Delayed settlements

Table 2[xxxvii]

Now, during the assessment, each of the identified KRIs should be checked for their status and appropriate weighting should be given. For example, if there are 8 delayed settlements and if 24 hours is the threshold, you may arrive at an output like Table 3.

Indicator	Above threshold	Above limit	Value	Evolution (%)	Threshold	Limit	Scores[xxxviii]	Weight
Delayed Settlement	8	0	2	5	24	48	2	1

Table 3 [xxxix]

Calculating regulatory capital using balanced scorecard approach

Now we have identified the weightings for each of the indicators for each of the Basel II recommended business lines, the next step is to calculate the aggregate loss indicator for each business line and with that, the supervisor will be able to instruct the required regulatory capital. Please refer to Annexure III for details to calculate aggregate loss indicator for each business line.

Another interesting way to look at qualitative inputs is to look from a performance point of view. Company's objective (Key Performance Indicator –KPI) of the responsible back office person coordinating with the broker is to do the settlement within 24 hours. The acceptable limit set by the company is 48 hours and anything above is treated as a High Severity loss event.

"A KPI is a quantitative metric metric representing one or more goals or objectives. The relationship between KPI and KRI can be stated as follows

$\overrightarrow{KPI} = \mathbf{B}\overrightarrow{KRI}$ where B is the matrix of regression coefficients.

Similarly, operational risk can be deducted from the KPI measures by considering operational risk as the probability that at least one KPI will fall outside of its error tolerance

$P(\Delta KPI_i < min_i \text{ or } \Delta KPI_i > max_i)$, for i=1 "[xl]

In summary, it is possible that some of the assessments conducted by the Compliance officer can be giving direct values of KRI for a stated risk, others may be providing KPI values, and some may be providing both. In either case, if the data collected is categorized, one will be able to arrive at the operational risk exposure. In addition, since the KPI/KRI data is collected with a categorization consistent with business processes and industry standard types, it can be collated to a balanced score card which shows the various KPI/KRI heat maps.

5.6. Loss Distribution Analysis

Strategy for compliance data collection

Now, let us consider that there was an actual deal settlement, which concluded after the threshold of 48 hours. The Compliance Officer anyway considers this event in his normal line of duty. However, if the event is recorded in an appropriate manner, that can give the necessary internal loss data for a LDA analysis. The first consideration is to record the business line where this event happened and classify the Event Category as per Annexure II. The second consideration is to record the loss type and classify the Cause Type as per Annex 7 of the Basel Committee on Banking Supervision (June, 2004). It is enumerated as follows.

- Internal fraud
- External fraud
- Employment practices and workplace safety
- Clients, products and business practices
- Damage to physical assets
- Business disruption and system failure
- Execution, delivery and process management

So, in our example, the only action to take is to record the details of the loss event in the following manner with the following data elements.

- Event Category : (*Payment and settlement*)
- Cause Type : (*Execution, delivery and process management*)
- Impact Type : (*High*)
- Descriptions : (*broker/ non-client counterparty misperformance*)
- Date and location of event & loss : (*DDMMYY,LON)*
- Loss Amounts
    - Actual loss, potential loss, recoveries : (*100,000)*
    - Currency : (*GBP)*

Calculating the required regulatory capital[xli]

Using the collected data we can use the standard Loss Distribution (LDA) model to calculate the regulatory capital requirement.

Total loss is defined as a random sum of individual losses.

$$L = \sum_{n=1}^{N} X_n = X_1 + \ldots + X_n$$

where L is the aggregate loss, N is the annual number of losses (that is frequency of events) and X_n are loss amounts. Aggregate loss will refer to the loss incurred in a class of risk, where class designates one cell among the seven risk types in eight business-lines cells defined by the consultative paper.

Aggregate losses result from two types of randomness (frequency and severity) which both have to be modelled.

The regulatory capital requirement (or capital-at-risk) is the sum of expected loss (EL) and unexpected loss for a one-year holding period and a 99.9% confidence interval[xlii]. This definition implies that frequency distribution must be understood on a yearly basis. In the spirit of value-at-risk-like measure, the regulatory capital requirement K is the 99.9% percentile of distribution of the aggregate loss:

$K=G^{-1}(99.9\%)$

The total loss L of the bank is then the sum of aggregate losses for each business line X loss-type class. Let H be the number of classes (where H=7 times 8 in the Basel II context). Therefore:

$$L = \sum_{h=1}^{H} L_h$$

6. Conclusion

To conclude, first, organizations should consider Basel II implementation of ORM as an opportunity to improve shareholder value by minimizing operational failures and second, instead of creating an isolated ORM function, organizations should leverage existing functions like compliance and audit.

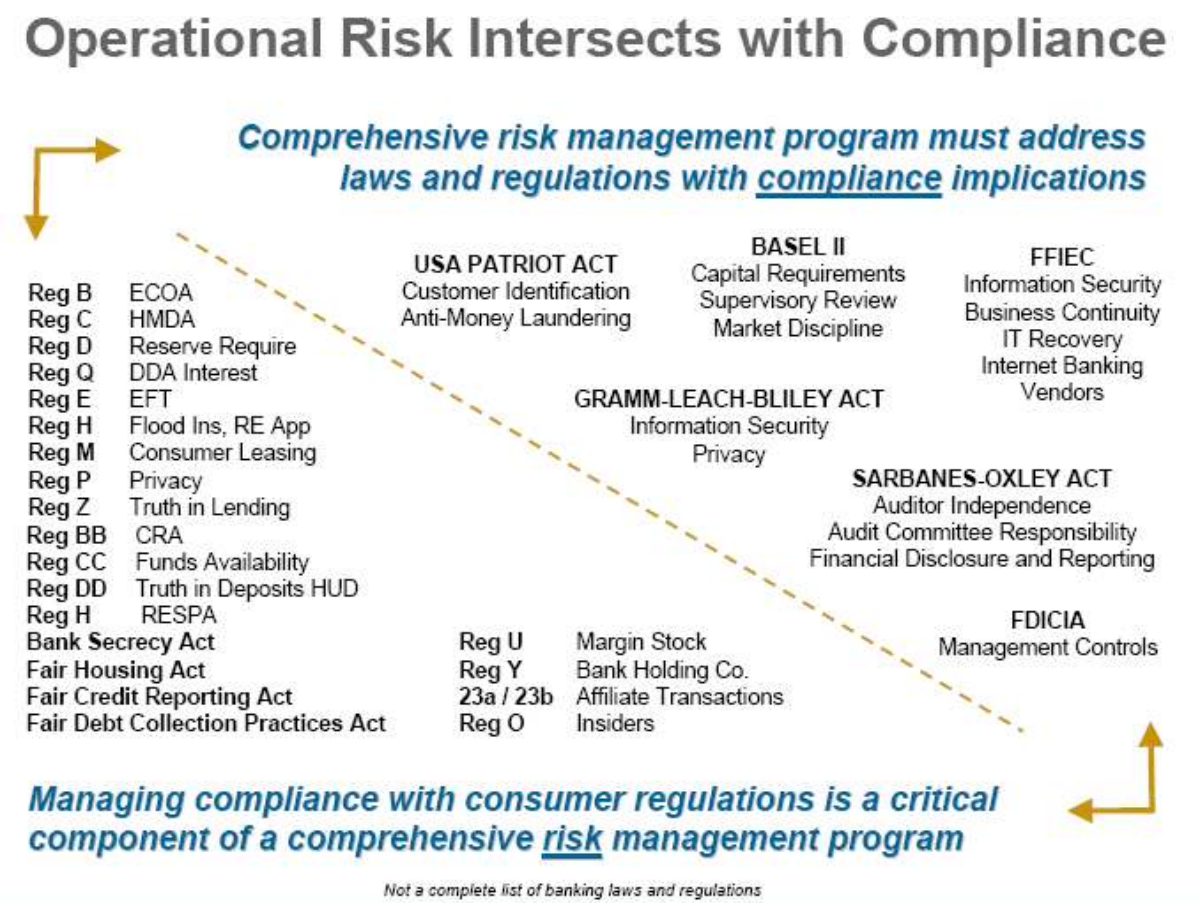
7. Why Compliance Track

The concept presented in this e-book is not unknown in the industry. However, for adoption, the compliance manager needs to have user-friendly tools. Compliance Track is designed as a one-stop solution for a compliance manager for assisting in his day-to-day job. Collecting data in a structured manner is important if he wishes to extend his effort to support ORM at a later stage.

Figure 2. Compliance Track Overview

Visit http://www.compliancetrack.com for more details. Alternatively, call +44 207 754 0347 for a product demo.

8. Annexure 1[xliii]



9. Annexure II Basel business lines and Beta values[xliv]

Business Line	Percent
Corporate Finance β_1	18%
Trading and sales $\beta 2$	18%
Retail Banking β_3	12%
Commercial Banking β_4	15%
Payment and Settlement β_5	18%
Agency Services and custody β_6	15%
Asset Management β_7	12%
Retail Brokerage β_8	17%

10. Annexure III Calculating aggregated risk indicator [xlv]

In order to calculate an overall risk rating for each business line, the individual indicators will have to be normalized, weighted and aggregated. Normalization: Every indicator is normalized, i.e. expressed on a common [0, 1] range by using the following simple transformation (example for the indicator a):

$$a(normalized) = \frac{a}{\max(a)}$$

where max(a) is the maximum value indicator a can take.

Estimation of weights: Each bank will need to develop a set of parameters to assign an appropriate relative weight to each risk indicator. Such weights will be based on loss of data, empirical evidence, scientific literature available on the subject, management information, auditors' opinion, sector experience and best practice. Indicators can also be weighted on the basis of strategic objectives, with the idea of providing incentives for desired behaviours.

Aggregation and risk ratings. The calculation of an overall indicator for each risk category is based on a weighted average of the individual indicators and of the weights discussed above. Such aggregation can provide specific indicators for each risk category as well as for each line of business.

For example, indicator Ii for risk category i within a specific business line could be calculated as follows:

$$I_r = \sum_{j=1}^{m} w_j i_j$$

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[xi] Quoted from Schütter,Hansruedi (2005)
[xii] This section is based on Basel Committee on Banking Supervision (June, 2004)
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[xv] Please refer Basel Committee on Banking Supervision (June, 2004) Item 655 to 659 & 664 to 683 for detailed information.
[xvi] Chapelle, Ariane et al. (2004)
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[xviii] Chartis Research (2007)
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[xxxv] Details of COB7 is available at: http://fsahandbook.info/FSA/html/handbook/COB/7
[xxxvi] Client specific information is removed for confidentiality.
[xxxvii] A modified form of indicator numerical table from Scandizzo, Sergio (2005)
[xxxviii] Indicator below Threshold is scored 1 = acceptable.
Indicator above Threshold, but below Limit, is scored 2 = acceptable, but to watch.
Indicator above Limit is scored 3 = unacceptable.

[xxxix] A modified form of indicator numerical table from Scandizzo, Sergio (2005)
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