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An empirical study to measure the effects of various factors on operating loss

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A B S T R A C T

In this paper, we present an empirical investigation to measure the effects of various factors on operating loss in one of major Iranian banks called Bank Mellat. The proposed study of this paper uses a standard questionnaire and distributes it among 57 people who are mainly in top management levels. The questions are categorized into five groups including events related to the processes and methods, events outside the organization, related events within the organization and business disruptions and system failure. The results of our survey confirm that the loss associated with events related to the processes and methods increases operating risk meaningfully, the loss associated with business disruptions and system failure increases operating risk meaningfully and the loss associated with related events within the organization increases operating risk meaningfully. However, our survey do not confirm that the loss associated with events outside the organization increase operating, risk meaningfully. Finally, the preliminary survey of our analysis shows that there is not enough evidence to believe that the effects of business disruption and internal affairs are significantly different from the other event.

1. Introduction

The primary objective of the new Basel capital accord (Basel II) was to create an international standard for banking regulators to control how much money banks require setting aside to protect against the types of financial and operational risks banks and the whole economy face. One focus was to keep enough consistency of regulations so that this would not become a source of competitive inequality amongst internationally active banks. It is believed that such an international standard would help protect the international financial system from the types of problems that might arise should a major bank or a series of banks collapse. In theory, Basel II tries to build this by setting up

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risk and capital management needs designed to ensure that a bank has enough capital for the risk the bank exposes itself to through its lending and investment practices. During the past few years, there have been tremendous works devoted to this method to understand how effective this method is.

Basel II promises standards for measurement of financial and operational risk for the banking industry. However, the approach to such risk measurement has been criticized in the literature, raising doubts concerning the efficiencies of Basel II. Wahlström (2009) in an assignment used data from 25 semi-structured interviews with banking staff in four Swedish commercial banks and reported that Basel II is well established but there are still some concerns that this method may intentionally impact banks' activities. Although Basel II is supported by banking staff who work directly with risk measurement, the advantage of using such method is still questioned by banking staff in operations. This difference between these two groups may be explained in association with variations in their respective frames of reference. Wahlström recommends for addressing this schism within banks to encourage a wider debate about the different approaches for implementation of Basel II.

Xie et al. (2011) explained that drawing specific reserve separately for operational risk is one of the primary requirements of Basel II technique. Since 1990, as serious loss incidents in operation risk often occurred all over the world, operational risk has been taken account into the risk management framework for the first time in Basel technique. They analyzed the data of Chinese commercial bank operational risk by Monte Carlo simulation, empirically and reported that China commercial bank should allocate 15 billon capital for its operational risk while the capital reserve fund rate is about 4.79%. Feng-ge and Ping (2012) discussed that operational risks in Decision Engineering absorb so much interest from the bank industry that Basel Committee includes it in the risk capital and considers it as a part of inspection criteria. Therefore, they used conditional-value-at-risk model based on peak value method of extreme value theory to measure the operational risks. Based on the results, theu offered different strategies such as the provision of risk reserves, the allocation of economic capital, insurance and outsourcing to control and manage operational risks.

Chavez-Demoulin et al. (2006) explained that because of the new regulatory guidelines known as Basel II for banking and Solvency 2 for insurance, the financial industry was looking for qualitative and quantitative techniques for operational risk. Whereas a full quantitative technique may never be obtained, they offered some techniques from probability and statistics, which could be used in any quantitative modeling environment. Chateau et al. (2009) computed the bank's capital charge for credit and operational risks of loan commitments at Basel-2 fixed audit date in three steps. Peters et al. (2011) argued that under the Basel II standards, the Operational Risk (OpRisk) advanced measurement approach could not be prescriptive regarding the class of statistical model utilized to undertake capital estimation. They derived a new class of doubly stochastic-stable famil models, which is able to capture the heavy tailed loss processes typical of OpRisk. More specifically, they developed models of the annual loss processes in two scenarios where the first one considers the loss processes with a stochastic intensity parameter and the second one considers discretization of the annual loss processes into monthly increments with dependent time increments. They also derived analytic results for the annual loss distribution density and distribution under each of these models and studied their properties. Aquaro et al. (2010) presented a system for operational risk management based on the computational paradigm of Bayesian Networks, which permits the construction of a Bayesian Network targeted for each bank and considers a straightforward way the correlations among various processes of the bank. They validated the method on synthetic time series and emphesesized that the method could be used for the practical implementation in a mid or small sized bank, since it contains a small effect on the organizational structure of a bank and needs an investment in human resources, which is limited to the computational area.

Jiménez-Rodríguez et al. (2011) explain that Basel II generates a minimum threshold of 10,000 Euros for operational losses when estimating regulatory capital for financial firms. However, this recommendation is not obligatory for the bank industry and banks are permitted to use internal

thresholds discretionally. Therefore, Jiménez-Rodríguez et al. (2011) analyzed the potential effect that the selection of a specific threshold could possibly have on the final estimation of the capital charge for covering operational risk, adopting a critical perspective. They used the internal operational losses database (IOLD) provided by a Spanish Saving Bank to calculate the loss distribution approach (LDA) for various modeling thresholds. They reported that the opportunity cost in which banks can face depends on the internal threshold chosen.

The proposed study of this paper uses Basel II technique to measure operational risk for one of the biggest banks in Iran called Mellat. The organization of this paper first presents details of our sampling and data validation in section 2 as well as the description of hypotheses. Section 3 presents the results of our study and finally concluding remarks are given in the last to summarize the contribution of the paper.

2. The proposed method

The proposed study of this paper uses a standard questionnaire consists of 50 questions dedicated to Basel II technique and all questions are formed in Likert scale from one to five. There are four variables associated with the proposed study of this paper including events related to the processes and methods (x_1), events outside the organization (x_2), related events within the organization (x_3) and business disruptions and system failure (x_4). Table 1 shows variables and their categories, the number of responses gathered, the number of questions and Cronbach alpha.

Table 1
Cronbach alpha or different questions of the survey

Variable	Category	Responses gathered	Number of questions	Cronbach alpha
Relative importance	Events related to the processes and methods	57	12	0.897
	Events outside the organization	57	8	0.940
	Related events within the organization	57	24	0.982
	Business disruptions and system failure	57	6	0.902
	Summary	57	50	0.984
Likely to repeat	Events related to the processes and methods	57	12	0.905
	Events outside the organization	57	8	0.898
	Related events within the organization	57	24	0.954
	Business disruptions and system failure	57	6	0.807
	Summary	57	50	0.972

Table 2 shows details of 57 participants in our survey.

Table 2
Personal characteristics of the participants

		Number	Percentage	Mode
Sex	Male	50	87.7	Male
	Female	7	12.3	
Education(Years)	12	19	33.3	
	14	5	8.8	16(Bachelour)
	16	29	50.9	
	18	4	7.0	
Age (Years)	<38	17	29.8	
	39-43	25	43.9	39-43
	>43	15	26.3	
Position	Head of Branch	31	54.4	Head of Branch
	Deputy Branch	26	45.6	
Experience (Years)	<=15	13	22.8	
	16-20	22	38.6	2Modes:16-20, <20
	>20	22	38.6	

Table 3
Statistical observation on mean, standard deviation, skew strain for each variable

Var	Number	Mean	Standard deviation	Variance	Skew	Strain	Deviation Skew	Deviation Strain
x_1	57	11.232	4.701	22.097	0.706	-0.230	2.232	-0.369
x_2	57	9.680	4.975	24.753	0.385	-0.359	1.217	-0.576
x_3	57	10.433	4.904	24.049	0.782	-0.149	2.473	-0.239
x_4	57	11.015	4.691	22.003	0.544	-0.588	1.719	-0.943

In order to examine whether the data are normally distributed we need to perform One-Sample Kolmogorov-Smirnov Test, where the null hypothesis is that the distribution is normal and alternative hypothesis is that the distribution of the data is not normal. The results of our test are summarized in Table 4 as follows,

Table 4
One-Sample Kolmogorov-Smirnov Test (The significance level is five percent)

Var.	Number	Mean	z-statistic	P-value	Result
x_1	57	11.232	.876	.427	Normally distributed
x_2	57	9.680	.629	.823	Normally distributed
x_3	57	10.433	.987	.284	Normally distributed
x_4	57	11.015	.788	.565	Normally distributed

As we can observe, we do not have enough evidence to reject the null hypothesis, which brings us to conclude that the data are normally distributed.

3. The results

In this section, we present some of the results of testing six hypotheses.

3.1. First hypothesis: The loss associated with events related to the processes and methods increases operating risk meaningfully.

In this survey, we have multiplied the relative importance by the possibility of occurrence and the average scaling for each part is three. Therefore, we consider a theoretical value of nine for all hypotheses. Therefore, we have,

$$\begin{cases} H_0 : Mean \le 9 \\ H_1 : Mean > 9 \end{cases}$$

In our survey, t-student value is 3.59, which is well above the critical value of 1.96 when the level of significance is five percent. Therefore, null hypothesis is rejected and we can conclude that loss because of events related to the processes and methods increases operating risk, significantly.

3.2. Second hypothesis: The loss associated with business disruptions and system failure increases operating risk meaningfully.

With similar argument we presented in the previous hypothesis we can compute t-student value, which is 3.24>1.96 and this means that we can reject the null hypothesis when the level of significance is five percent. Therefore, null hypothesis is rejected and we can conclude that loss because of business disruptions and system failure increases operating risk, significantly.

3.3. Third hypothesis: The loss associated with events outside the organization increases operating risk meaningfully.

Again, we can compute t-student value, which is 1.04>1.96 and this means that we cannot reject the null hypothesis when the level of significance is five percent. Therefore, null hypothesis is accepted and we can conclude that loss because of business disruptions and system failure does not necessarily increase operating risk, significantly.

3.4. Fourth hypothesis: The loss associated with related events within the organization increases operating risk meaningfully.

Once more, like what we have done in the previous hypothesis we can compute t-student value, which is 2.24>1.96 and this means that we can reject the null hypothesis when the level of significance is five percent. Therefore, null hypothesis is rejected and we can conclude that loss because of related events within the organization increases operating risk, significantly. Table 5 summarizes the results of our survey for four tested hypotheses.

Table 5
One-Sample Kolmogorov-Smirnov Test (The significance level is five percent)

Variable	Mean	Standard deviation	Standard error	t-student	P-value
Events related to the processes and methods	11.232	4.701	0.623	3.59	0.000
Business disruptions and system failure	11.014	4.691	0.621	3.24	0.001
Events outside the organization	9.682	4.975	0.659	1.04	0.153
Related events within the organization	10.434	4.904	0.650	2.21	0.016

Fifth hypothesis: The effects associated with business disruption are more than other events.

Sixth hypothesis: The effects of internal affairs are less than other events.

In order to test these two hypotheses we first do the following test

$$\begin{cases} H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4 \\ H_1 : \mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4 \end{cases}$$

$$f\,(df\ :168,3) = 4.898,\ p = .003$$

As we can observe p-value is very small so we can conclude that at least one of the item is different from the other factors and we need to make bonferroni comparisons among all combinations of variables. Table 6 demonstrates details of our comparisons. Based on the results of Table 6, we realize that the mean of events related to the processes and methods is greater than the mean of events outside the organization but when we compare it with related events within the organization and business disruptions and system failure we do not see any meaningful difference. Details of our findings show that we do not have enough evidence to claim that the effects of business disruption and internal affairs are significantly different from the other event. Therefore, the fifth and sixth hypotheses are not confirmed.

4. Conclusion

In this paper, we have presented an empirical study to measure the effects of different factors on operating loss in one of major Iranian banks called Bank Mellat. The proposed study of this paper used a standard questionnaire and distributed it among 57 people. The questions have been categorized into five groups including events related to the processes and methods, events outside the organization, related events within the organization and business disruptions and system failure. The results of our survey confirmed that the loss associated with events related to the processes and

methods increases operating risk meaningfully, the loss associated with business disruptions and system failure increases operating risk meaningfully and the loss associated with related events within the organization increases operating risk meaningfully. However, our survey did not confirm that the loss associated with events outside the organization increase operating, risk meaningfully. Finally, we did not find enough evidence to believe that the effects of business disruption and internal affairs were significantly different from the other event.

Table 6
Pairwise comparisons

First factor	Second factor	Difference with first factor	Standard error	P-value
Events related to the processes and methods	Events outside the organization	1.553	.412	.002
	Related events within the organization	.799	.376	.227
	Business disruptions and system failure	.218	.509	1.000
Events outside the organization	Events related to the processes and methods	-1.553	.412	.002
	Related events within the organization	-.754	.420	.471
	Business disruptions and system failure	-1.335	.511	.069
Related events within the organization	Events related to the processes and methods	-.799	.376	.227
	Events outside the organization	.754	.420	.471
	Business disruptions and system failure	-.581	.416	1.000
Business disruptions and system failure	Events related to the processes and methods	-.218	.509	1.000
	Events outside the organization	1.335	.511	.069
	Related events within the organization	.581	.416	1.000

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