



**HAL**  
open science

## Multicriteria Decision Analysis for banks risks evaluation

Jean-Baptiste Rakotoarivelo, Pascale Zaraté, Josvah Paul Razafimandimby

► **To cite this version:**

Jean-Baptiste Rakotoarivelo, Pascale Zaraté, Josvah Paul Razafimandimby. Multicriteria Decision Analysis for banks risks evaluation. 1st EWG-DSS International Conference on Decision Support Systems Technologies on Big Data Analytics for Decision Making (ICDSST 2015), May 2015, Belgrade, Serbia. 978-86-768, pp.0, 2015. hal-01371770

**HAL Id: hal-01371770**

**<https://hal.science/hal-01371770>**

Submitted on 27 Sep 2016

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



## Open Archive TOULOUSE Archive Ouverte (OATAO)

OATAO is an open access repository that collects the work of Toulouse researchers and makes it freely available over the web where possible.

This is an author-deposited version published in : <http://oatao.univ-toulouse.fr/>  
Eprints ID : 15326

The contribution was presented at ICDSST 2015 :  
<https://ewgdssbelgrade2015.wordpress.com/>

**To cite this version** : Rakotoarivelo, Jean-Baptiste and Zaraté, Pascale and Razafimandimby, Josvah Paul *Multicriteria Decision Analysis for banks risks evaluation*. (2015) In: 1st EWG-DSS International Conference on Decision Support Systems Technologies on Big Data Analytics for Decision Making (ICDSST 2015), 27 May 2015 - 29 May 2015 (Belgrade, Serbia). (Unpublished)

Any correspondence concerning this service should be sent to the repository administrator: [staff-oatao@listes-diff.inp-toulouse.fr](mailto:staff-oatao@listes-diff.inp-toulouse.fr)

# ICDSST 2015

1st International Conference on Decision Support System Technology  
An EWG-DSS Conference  
Belgrade, Serbia, May 27 29 2015

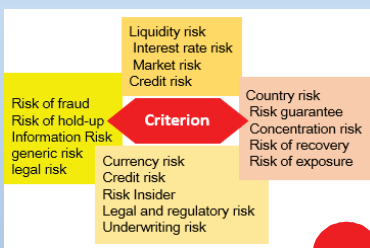
## Multicriteria Decision Analysis for Banks Risks Evaluation

**RAKOTOARIVELO Jean-Baptiste**  
PhD Student University of Toulouse (IRIT)  
Jean-Baptiste.Rakotoarivelo@irit.fr

**Pascale ZARATE**  
Supervisor University of Toulouse (IRIT)  
Pascale.zarate@ut-capitole.fr

**Josvah Paul RAZAFIMANDIMBY**  
Supervisor University of Fianarantsoa (ENI)  
razafimandimbyp@gmail.com

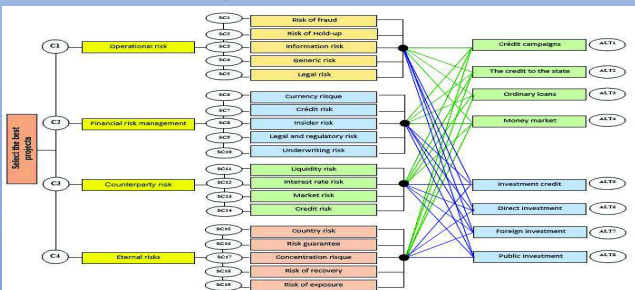
### Methods



The decision process required to the AHP method is presented in 12 steps, first the problem or the objective of the analysis must be clearly identified as the figures above: the objective select best projects (1) criteria (2), sub-criteria (3) and alternative (4)

The steps after identifying the problems are as follows:

#### 1. Establish the hierarchy structure



#### 2. Make the pairwise comparisons (binary) criteria in relation to the objective

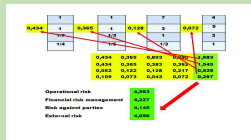
Pairwise comparison criteria	Considered important criteria	Scale	Evaluation
Operational risk / Financial risk management	Financial risk management	also important	1
Operational risk / risk against parties	Operational risk	Very highly important	7
Operational risk / External risk	Operational risk	intermediate value	4
Financial risk management / risk against parties	Financial risk management	Slightly higher	3
Risk against parties / External risk	Risk against parties	Slightly higher	3
Financial risk management / external risk	Financial risk management	highly significant	5

Pairwise comparison criteria	Operational risk	Financial risk management	Risk against parties	External risk
Operational risk	1	1	7	4
Financial risk management		1	3	5
Risk against parties	1/7	1/3	1	3
External risk	1/4	1/5	1/3	1

#### 3. Calculate the priorities vectors

1	1	7	4	
1	1	3	5	0,418
1/7	1/3	1	3	0,385
1/4	1/5	1/3	1	0,265
2,38	2,53	11,33	13,00	0,128
				0,072

#### 4-5-6-7. Determine the mean of the priority value ( $\lambda_{max}$ ), IA, IC, RC



The results can be used to determine the  $\lambda_{max}$  average the index and the ratio of coherence. The average value calculation and found is earlier

$$\lambda_{max} = \frac{\sum_{j=1}^n a_{ij} w_j}{\sum_{j=1}^n w_j} = \frac{4,563 + 4,227 + 4,145 + 4,096}{4} = 4,258$$

We calculate the coherence index (CI) for  $n = 4$

$$CI = \frac{\lambda_{max} - n}{n - 1} = 0,086$$

It reads the value of the Index Random (IA) in the table of coherence index for  $n = 4$  then IA = 0,20

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
IA	0	0	0,058	0,086	0,112	0,135	0,157	0,178	0,196	0,213	0,228	0,241	0,252	0,261	0,269

We calculate the ratio consistency RC

$$RC = \frac{CI}{IA} = \frac{0,086}{0,20} = 0,0955 \approx 9,55\%$$

RC = 9,55% < 10% the degree of consistency of comparison is acceptable

8-9.10. Perform comprehensive comparisons against each existing criterion and the determination of the relative value of each sub consideration of and near the upper level, with the project aggregation

Operational risk	Financial risk management	Counterparty risk	External risk
C1 [0,434]	C2 [0,366]	C3 [0,128]	C4 [0,072]
SC1 [0,1264]	SC6 [0,1944]	SC11 [0,238]	SC15 [0,489]
SC2 [0,606]	SC7 [0,447]	SC12 [0,514]	SC16 [0,202]
SC3 [0,141]	SC8 [0,089]	SC13 [0,133]	SC17 [0,155]
SC4 [0,0752]	SC9 [0,163]	SC14 [0,115]	SC18 [0,091]
SC5 [0,052]	SC10 [0,137]		SC19 [0,063]

#### 11-12. Calculate alternative priorities and Determine the relative performance criteria and alternatives

### Results

The results of this study show that ALT8 > ALT2 > ALT1  
ALT8 : public investment is the best choice among the alternatives.

The results for each risk event depend on choice of pairwise comparison of decision maker, the AHP method is an effective tool for decision makers in the field of financial institutions.

The processing procedure of evaluation criteria proposed in this study provide policy makers with ideas recommendations for the future.

The multi-criteria analysis method is in itself an additional structured approach to deal with all relevant problematic in an organized manner.

[1] SAATY LT "How to make a decision: The Analytic Hierarchy Process, European of Operation Research, Vol. 48, 1990, pp. 9-26. European journal of operational research ISSN 0377-2217 CODEN EJORDT.

[2] Définition des risques, typologie des risques « Gestion des risques et risque de crédit » Vivien BRUNEL, This version: January 28, 2009

[3] Pascal Kerbel « Management des risques inclus secteur banque et assurance », La définition des risques pris en compte dans le secteur bancaire en conformité avec Bâle II et solvency II, Eyrolles, Paris, 2009