

VRISat: Measuring the Italian Statisticians' Research Activities

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Abstract In this paper we present a model for the evaluation of the statisticians' research activities recently proposed by a Committee of the Italian Statistical Society and a user-friendly application (named VRISat) allowing an easy computation of the indices of this model.

1. Introduction

In 2009 the Italian Statistical Society (SIS) appointed a Committee entrusted with the definition of criteria in order to evaluate statisticians' research activities. These criteria could be employed for example for the selection of which research projects should be granted by the government. The Committee was chaired by Giovanna Nicolini and composed by Maurizio Carpita, Marisa Civardi, Marica Manisera, Giancarlo Manzi, and Franco Peracchi. In May 2010, the Committee proposed a model and an index (VRI) for the evaluation of individual research activity to the SIS. Such model, defined after a long debate among the Committee members, also required a survey involving a sample of SIS members, asked to assign importance weights to the sub-dimensions used in defining the VRI index. The survey results along with the model and the VRI index were fully described in a final report (Nicolini et al., 2010) and presented at a Workshop on the Evaluation of research in Statistics (University of Bologna, March 2010). After this experience, the application VRISat, allowing the use of the proposed model to evaluate statisticians' curricula, was developed.

The aim of this paper is to describe the proposed evaluation model and to show how the VRISat application works. Some hypothetical curricula will be used in order to illustrate different situations.

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2. The evaluation model of the research activities

The criteria proposed by the Committee to rate a single statistician' research activity can be applied starting from his/her curriculum/certification. It leads to the definition of the VRI index, useful to rank scholars belonging to the same scientific field. Such index could be used by different institutions for different objectives. However, it was firstly proposed as a tool to allocate funds with the aim of rewarding who intensively contributes to research.

Generally, the activities of researchers are considered to be composed of different dimensions: (a) *ability in doing research*, which can be related to the number of scientific papers published in the evaluation period; (b) *research quality*, usually measured by bibliometric indicators (for example, Impact Factor or Science Citation Index), which however are affected by different drawbacks, or by the "peer review" method (not feasible in this context); (c) *activities related to research*, like organizing conferences or acting as a referee in the peer review process of articles submitted to journals for publication, that do not produce articles but contribute to the development of scientific knowledge (as pointed out in Tucci et al., 2010, with reference to Economics).

In the evaluation model proposed by the SIS Committee, dimensions (a) and (b) are grouped together in the AREA 1 – PUBLICATIONS. Dimension (c) composes the AREA 2 – ORGANIZATION and is divided into two sub-dimensions: the first one refers to the participation or organization of research groups and conferences (AO_p, Organizational Activity - Participation) and the second one refers to the editorial and retraining activity (AO_E, Organizational Activity - Editorial). Variables belonging to each area are reported in Table 1.

For each dimension and sub-dimension, an evaluating index can be defined and values can be graphically represented (Nicolini *et al.*, 2010).

For AREA 1 – PUBLICATIONS, the index is defined as

$$AP = \frac{1}{T} \cdot \sum_{i=1}^9 \delta_i^p \cdot I_i^p \cdot \left(\sum_{j=1}^{n_i} C_{ij} \right)$$

where, with reference to the i -th activity of AREA 1, δ_i^p is the relative weight of its importance and I_i^p is the indicator of its presence ($I_i^p=1$) or absence ($I_i^p=0$), n_i is the number of publications of type i and C_{ij} indicates the contribute of the researcher to the j -th publication of type i ;² T represents the period of time chosen as reference for the evaluation of the researcher.

² We use $C_{ij} = \exp[-k \cdot (a_{ij} - 1)]$, where a_{ij} is the number of the authors of j -th publication of type i .

Table 1: Variables of Publications and Organization areas

AREA 1 – PUBLICATIONS (AP)
P1. Paper on A-class scientific journal
P2. Paper on B-class scientific journal
P3. Paper on C-class scientific journal
P4. A-class book collecting papers
P5. B-class book collecting papers
P6. A-class book
P7. B-class book
P8. Department working paper published on the department website
P9. Conference short paper (abstract 2-4 pages)
AREA 2 – ORGANIZATION (AO)
2.1 <i>Participation and/or organization of research groups and/or conferences</i>
O _p 1. Chair of granted research group (PRIN, FSE, ...)
O _p 2. Member of granted research group (not chair)
O _p 3. Chair of Scientific Program Committee of conference
O _p 4. Member of Scientific Program Committee of conference (not chair)
O _p 5. Speaker at conferences, seminars, workshops
2.2 <i>Editorial, retraining and visiting activities (AO_E)</i>
O _E 1. Editor or co-editor of scientific journals
O _E 2. Member of scientific journals editorial board
O _E 3. Reviewer for scientific journals
O _E 4. Volume editor
O _E 5. Supervisor of PhD thesis
O _E 6. Visiting at foreign institutions

AO_p measures the importance of the researcher's organizational activities related to participation:

$$AO_p = \frac{1}{T} \cdot \sum_{i=1}^5 \delta_i^{Op} \cdot I_i^{Op}$$

where, with reference to the i -th activity of AREA 2.1, δ_i^{Op} is the relative weight of its importance and I_i^{Op} is the indicator of its presence ($I_i^{Op} = 1$) or absence ($I_i^{Op} = 0$).

On the other side, AO_p measures the importance of the researcher's editorial organizational activities:

$$AO_E = \frac{1}{T} \cdot \sum_{i=1}^6 \delta_i^{Oe} \cdot I_i^{Oe}$$

where, with reference to the i -th activity of AREA 2.2, δ_i^{Oe} the relative weight of its importance and I_i^{Oe} the indicator of its presence ($I_i^{Oe} = 1$) or absence ($I_i^{Oe} = 0$).

For AREA 2 – ORGANIZATION globally considered, the index is defined as

$$AO = \gamma \cdot AO_p + (1 - \gamma) \cdot AO_E$$

where γ is the relative weight of sub-dimension AO_p .

Finally, the global evaluation of the research activity of a single researcher is given by the following index of evaluation of individual research

$$\begin{aligned} VRI &= \alpha \cdot AP + (1 - \alpha) \cdot AO = \alpha \cdot AP + (1 - \alpha) \cdot [\gamma \cdot AO_p + (1 - \gamma) \cdot AO_E] = \\ &= \alpha_1 \cdot AP + \alpha_2 \cdot AO_p + (1 - \alpha_1 - \alpha_2) \cdot AO_E \end{aligned}$$

where α is the relative weight of the importance of AREA 1, $\alpha_1 = \alpha$, $\alpha_2 = (1 - \alpha) \cdot \gamma$.

When VRI is used to compare researchers, some problems arise if the sub-indices composing VRI have different orders of magnitude. In order to remove these problems, a normalized version of the index is defined and called VRIC index:

$$VRIC = \alpha \cdot AP^* + (1 - \alpha) \cdot AO^* = \beta_1 \cdot AP^* + \beta_2 \cdot AO_p^{**} + \beta_3 \cdot AO_E^{**}$$

with³ $AP^* = AP / \max_R(AP)$, $AO^* = AO^{**} / \max_R(AO^{**})$,

$$AO^{**} = \gamma \cdot AO_p^{**} + (1 - \gamma) \cdot AO_E^{**}$$

with $AO_p^{**} = AO_p / \max_R(AO_p)$, $AO_E^{**} = AO_E / \max_R(AO_E)$ and

$$\beta_1 = \alpha, \quad \beta_2 = (1 - \alpha) \cdot \gamma / \lambda, \quad \beta_3 = (1 - \alpha) \cdot (1 - \gamma) / \lambda \quad e \quad \lambda = \max_R(AO^{**}).$$

The model weights α , γ , and k was obtained using a “*consensus approach*” (similar to the budget allocation process; Nardo et al., 2008) by a survey of 95 SIS members (see for details the appendix in Nicolini et al., 2010).

3. VRISat to measure the research activities

Using Microsoft Access we developed an application useful to compute VRI and VRIC indices for one or more researchers⁴. The application is user-friendly and will hopefully guarantee the diffusion of the use of VRI and VRIC indices in order to continue the study of the evaluation topic, by involving all SIS members and other scholars. It is worthy to note that SIS has recently appointed a new Committee that should join the work on research evaluation along with the classification of statistical journals (for more information: www.sis-statistica.it and “*Valutazione della ricerca nelle scienze statistiche*” link).

Figure 1 shows how VRISat appears when just opened. The three buttons allow to (1) add a researcher with his/her characteristics, the research time period and the curriculum; (2) modify and update the data of each researcher; (3) generate reports and compute the VRI and VRIC indices, export data in Excel format and set up the model weights (α , γ , C_{ij} and k)⁵.

³ $\max_R(\cdot)$ is the relative maximum of index (\cdot) obtained by the best curriculum in the set of the considered curricula.

⁴ We are grateful to Dr. Silvano Baronchelli for his support.

⁵ The VRISat default weights are those obtained from the SIS survey.

Figure 1: The start screenshot of VRISat

With a click on the first button “*Inserisci un nuovo ricercatore*” a new researcher can be added with personal information (role, scientific sector, first research year), and a wizard allows to quickly insert his/her publications in the “*Area Pubblicazioni*”; the input of organizational activities follows the same pattern, after the access in the “*Area organizzazione*” (Figure 2)⁶. For each year of the research time period it is possible to reduce the months of the research activity (for example, to take into account career interruptions due to maternity). With a click on the second button “*Aggiorna un curriculum*” it is possible to modify and update characteristics, research time period, publications and activities of each researcher included in the database.

Figure 2: Inserting in VRISat publications activities for a researcher

Area pubblicazioni			
Un elenco provvisorio delle riviste statistiche classificate dalla SIS in tre fasce si trovi qui			
Attività	Articolo su rivista a carattere scientifico di fascia A	Num. autori	3
Anno	2010	Descrizione	
Attività	Articolo su rivista a carattere scientifico di fascia B	Num. autori	2
Anno	2010	Descrizione	
Attività	Articolo su rivista a carattere scientifico di fascia B	Num. autori	2
Anno	2010	Descrizione	
Attività	Articolo su rivista a carattere scientifico di fascia B	Num. autori	2
Anno	2010	Descrizione	

Area organizzazione		
Attività	Coordinatore gruppo di ricerca finanziato (PRIN, FSE e simili)	
Anno	2010	Descrizione
Attività	Partecipante gruppo di ricerca finanziato (non coordinatore)	
Anno	2010	Descrizione
Attività	Componente Comitato Promotore di convegno (non presidente)	
Anno	2010	Descrizione
Attività	Relatore a convegno, seminario, workshop	
Anno	2010	Descrizione

Finally, the third button “*Crea rapporti di valutazione della ricerca*” allows to view and print the full curriculum, the VRI and VRIC indices. “*Rapporti individuali (seleziona un ricercatore)*” tab allows to view the computation of sub-indices composing the VRI index (Figure 3), while the comparison of the VRIC indices of several researchers are obtained by clicking “*Rapporti collettivi*” (Figure 4).

⁶ In a future version VRISat will allow to import research data from external resources.

Figure 3: The VRI report from VRISat for one researcher

Rapporto di valutazione della ricerca individuale
del Dott. Ricercatore A
Periodo della valutazione: dal 2005 al 2010

La tabella riporta le pubblicazioni e le attività organizzative valutate, l'indice VRI con le sue componenti

Pubblicazioni		
Produzione articoli e volumi		
		Num.
	Articolo su rivista a carattere scientifico di fascia A	1
	Articolo su rivista a carattere scientifico di fascia B	3
	Volume collettaneo di fascia A	2
	Volume collettaneo di fascia B	1
	Comunicazione a convegno (abstract 2-4 pagine)	4
Indice AP	86	
Organizzazione		
Partecipazione o organizzazione di gruppi di ricerca o convegni		
		Num.
	Coordinatore gruppo di ricerca finanziato (PRIN, FSE e simili)	1
	Partecipante gruppo di ricerca finanziato (non coordinatore)	1
	Componente Comitato Promotore di convegno (non presidente)	1
	Relatore a convegno, seminario, workshop	1
Indice AO_p	47	
Attività editoriale e di aggiornamento		
		Num.
	Revisore per rivista scientifica	1
	Visiting presso altre istituzioni straniere	1
Indice AO_e	19	
Indice AO	34	
Indice VRI	70	

Figure 4: The VRIC report from VRISat for eight researchers

Rapporto degli indici di valutazione della ricerca individuale a fini comparativi (VRIC)
Periodo della valutazione: dal 2005 al 2010

La tabella riporta l'indice VRIC con le sue componenti per i ricercatori selezionati nel periodo considerato

Ricercatore	AO _p **	AO _e **	AO**	AO*	AP*	VRIC	VRIC %
Dott. Ricercatore A	16	6	11	11	29	23	26
Dott. Ricercatore B	68	57	63	63	100	89	100
Dott. Ricercatore C	28	41	34	34	91	73	83
Dott. Ricercatore D	49	29	40	40	60	54	61
Dott. Ricercatore E	15	43	27	27	78	63	71
Dott. Ricercatore F	0	12	6	6	62	44	50
Dott. Ricercatore G	100	27	67	67	47	53	60
Dott. Ricercatore H	100	100	100	100	29	51	58

References

- Nardo M., Saisana M., Saltelli A., Tarantola S., Hoffman A., Giovannini E. (2008), Handbook on Constructing Composite Indicators: Methodology and User Guide, OECD.
- Nicolini G., Carpita M., Civardi M., Manisera M., Manzi M., Peracchi F. (2010) *Analisi dei criteri per la valutazione della ricerca individuale in ambito statistico*, Relazione finale della Commissione SIS Riforma dei criteri condivisi per la valutazione della ricerca e revisione delle equivalenze dei titoli accademici europei ed internazionali da applicare alle "chiamate dirette", http://sis-statistica.it/files/pdf/2010/relazione_finalecommissione_valutazione.pdf.
- Tucci M.P., Fontani S., Ferrini S. (2010) L'R-Factor: un nuovo modo di valutare l'attività di ricerca, *Studi e Note di Economia*, XV, 1, 103-140.