A Fuzzy Soft Mathematical Framework for Journal Impact Assessment Based on CiteScore SJR and SNIP

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Abstract. Bibliometric indicators provide an effective framework for evaluating the scientific influence, visibility and prestige of scholarly journals. This study presents a comparative analysis of the world top ten high-impact journals using three widely accepted bibliometric indicators CiteScore, SCImago Journal Rank (SJR), and Source Normalized Impact per Paper (SNIP). The analysis identifies journals with the highest performance in individual metrics and evaluates their overall scientific impact through a combined bibliometric assessment. The results reveal that MMWR Recommendations and Reports achieves the highest CiteScore (131.2) and exhibits outstanding overall performance across all three indicators, while Nature Reviews Clinical Oncology records the highest SJR and The Lancet attains the highest SNIP. The study further classifies journal performance across medical, engineering, chemistry, materials science, physics, and public health disciplines, highlighting the dominance of medical and review journals in citation-based metrics. To provide a dynamic mathematical framework, the bibliometric indicators are integrated into a Fuzzy Soft Differential Equation (FSDE) model, where CiteScore, SJR, and SNIP are treated as fuzzy soft parameters governing journal influence over time. The proposed FSDE model produces a normalized fuzzy soft membership value and dynamic citation trajectories that consistently identify MMWR Recommendations and Reports as the most influential journal. The agreement between bibliometric rankings and FSDE results demonstrates that fuzzy soft differential equations offer an effective approach for integrating multiple citation indicators into a unified dynamic evaluation model for journal impact assessment.

Keywords: Bibliometrics, CiteScore, SCImago Journal Rank (SJR), Source Normalized Impact per Paper (SNIP), Fuzzy Soft Se,Fuzzy Soft Differential Equation, Journal Impact Assessment, Scientific Influence, Citation Analysis, Research Evaluation.

How to cite this article: Hameesha Shirin S, Rekha Ramachandran, Santhiya S, Jayanthi VB, Dhavamani P, Sujithra N. A Fuzzy Soft Mathematical Framework for Journal Impact Assessment Based on CiteScore SJR and SNIP. Int J Drug Deliv Technol. 2026;16(67s):1431-1449. DOI: 10.25258/ijddt.16.67s.127

INTRODUCTION

The rapid growth of scientific publications has increased the need for reliable methods to evaluate the quality, influence, and visibility of scholarly journals. Bibliometric indicators have become essential tools for assessing research performance, supporting academic decision-making, and guiding researchers in selecting appropriate publication venues. Among the most widely recognized journal evaluation metrics are CiteScore, SCImago Journal Rank (SJR), and Source Normalized Impact per Paper (SNIP). Each metric measures a different aspect of journal performance: CiteScore reflects citation frequency, SJR measures journal prestige through citation networks, and SNIP accounts for differences in citation practices across research disciplines. Since these indicators capture complementary characteristics, a combined evaluation provides a more comprehensive assessment of journal quality than any single metric. High-impact journals

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play a critical role in disseminating scientific knowledge and shaping future research directions. Medical and public health journals, in particular, often achieve exceptionally high citation performance because of their broad societal relevance and global research impact. Similarly, review journals generally receive more citations by synthesizing existing knowledge, while leading journals in engineering, chemistry, materials science, and physics continue to influence technological and scientific advancement. Although conventional bibliometric analyses effectively rank journals using citation-based indicators, they often provide static evaluations that do not represent the dynamic nature of research influence over time. Mathematical modeling offers an opportunity to integrate multiple bibliometric indicators within a unified framework capable of describing the evolution of journal impact. Fuzzy soft set theory provides an efficient mechanism for handling uncertainty and multiple evaluation parameters, while fuzzy soft differential equations (FSDEs) extend this framework by modeling the temporal behavior of journal influence.In this study, the top ten journals are analyzed using CiteScore, SJR, and SNIP to compare their citation performance and scientific prestige. A fuzzy soft differential equation model is then developed to integrate these bibliometric indicators into a dynamic mathematical framework. The proposed approach calculates normalized fuzzy soft membership values and models citation influence over time, providing a comprehensive evaluation of journal performance. The consistency between bibliometric rankings and the FSDE model demonstrates the applicability of fuzzy soft mathematical methods for advanced journal impact assessment and multi-criteria research evaluation.

TABLE 1. Top 10 Journal Analysis Based on CiteScore, SJR, and SNIP

Rank	**Journal**	**CiteScore**	**SJR**	**SNIP**	**Major Observation**
1	MMWR Recommendations and Reports	131	27.2	24.974	Highest CiteScore and overall citation impact
2	Nature Reviews Clinical Oncology	126.6	28.076	15.907	Highest SJR and strongest journal prestige
3	Kidney In	117.7	12.369	27.114	High SNIP

	ments				and strong field-normalized impact
4	Nature Reviews Materials	110.6	20.801	10.317	Leading journal in materials science
5	Chemical Reviews	109.1	16.918	11.444	Exceptional mancein chemistry
6	IEEE	98.	14.	14.	Highe
	ECommunications Surveys and Tutorials	7	838	933	st-ranked journal in the list
7	MMWR maries	93.2	14.728	24.050	Strong public health influence
8	The Lancet	92.4	14.821	27.703	Highest SNIP valuea

					mongall journals
9	Progress in Energy and Combus-tion Science	87.5	8.013	9.398	Influential energy and combus-tion research journal
10	Reviews of Mode rn Physics	80.3	13.041	15.461	Highly cited journal in physics
Average	–	**104.73**	**17.16**	**18.06**	Overall group

The analysis of the top 10 journals based on CiteScore, SJR, and SNIP demonstrates that these journals constitute a highly influential group within the global scientific community. The average values of CiteScore (104.73), SJR (17.16), and SNIP (18.06) indicate exceptionally high citation impact, journal prestige, and field-normalized research influence. Among all journals, MMWR Recommendations and Reports achieved the highest CiteScore (131.2) and maintained very high SJR (27.974) and SNIP (24.296) values. This indicates outstanding overall citation performance and confirms its position as the most influential jour-nal in the dataset. Nature Reviews Clinical Oncology recorded the highest SJR value (28.076), reflecting

exceptional prestige and influence within the scientific citation network. Similarly, The Lancet obtained the highest SNIP value (27.703), demonstrating the strongest field-normalized citation impact among all journals considered. The results further reveal that medical and public health journals dominate the upper ranks. MMWR Recommendations and Reports, Nature Reviews Clinical Oncology, Kidney International Supplements, MMWR Surveillance Summaries, and The Lancet consistently achieve superior bibliometric performance. This dominance reflects the extensive global importance of healthcare and medical research. Specialized journals also exhibit strong performance within their respective disciplines. Nature Reviews Materials leads the materials science field, Chemical Reviews represents one of the most influential jour-nals in chemistry, IEEE Communications Surveys and Tutorials is the strongest engineering journal in the dataset, and Reviews of Modern Physics maintains substantial influence within physics research. A com-parison of the three bibliometric indicators shows that no single metric completely captures journal quality. CiteScore measures citation frequency, SJR reflects journal prestige and SNIP evaluates field-normalized influence. Therefore, combining these indicators provides a more comprehensive assessment of journal impact. MMWR Recommendations and Reports emerges as the overall leading journal because it combines

TABLE 2. Top 10 Performance Summary

Metric	Highest Journal	Value
Highest CiteScore	MMWR Recommendations and Reports	131.2
Highest SJR	Nature Reviews Clinical Oncology	28.076
Highest SNIP	The Lancet	27.703
Highest Combined Performance	MMWR Recommendations and Reports	Outstanding across all metrics

the highest CiteScore (131.2) with exceptionally strong SJR (27.974) and SNIP (24.296) values. Although Nature Reviews Clinical Oncology has the highest SJR and The Lancet has the highest SNIP, the combined bibliometric evaluation indicates that MMWR Recommendations and Reports demonstrates the strongest overall scientific impact and visibility among the selected journals.

The overall bibliometric evaluation demonstrates that MMWR Recommendations and Reports is the strongest-performing journal among the selected top 10 journals. Although Nature Reviews Clinical On-cology achieves the highest SJR and The Lancet records the highest SNIP, MMWR Recommendations and Reports combines the highest CiteScore with exceptionally strong SJR and SNIP values. Therefore, it exhibits the greatest overall scientific impact, citation visibility and research influence among the journals analyzed. Overall Highest-Ranked Journal: MMWR Recommendations and Reports Highest CiteScore:
131.2 Highest Combined Bibliometric Performance: MMWR Recommendations and Reports

The category-wise analysis reveals significant differences in biometric performance among the selected journal groups. Medical journals occupy the highest positions across all major citation indicators, demon-strating their dominant role in contemporary scientific research. Their consistently high CiteScore, SJR, and SNIP values indicate strong citation influence, academic prestige and field-normalized impact.Review journals generally achieve higher CiteScore values because they synthesize extensive research findings from multiple studies, making them highly cited resources within their respective disciplines. This broad citation coverage contributes significantly to their overall bibliometric performance.Among engineering journals, IEEE Communications Surveys and Tutorials emerges as the strongest representative. Its high CiteScore, SJR, and SNIP values reflect its importance in communications engineering and information technology re-search. The journal serves as a leading source of survey-based knowledge and technological advancements.In the field of physics, Reviews of Modern Physics demonstrates remarkable citation influence and scientific prestige. Despite being specialized, the journal maintains a strong reputation due to its publication of author-itative review articles that significantly influence theoretical and experimental physics research.Public health journals exhibit exceptional performance throughout the analysis. In particular, the

MMWR journal series shows outstanding global visibility and citation impact. These journals play a crucial role in disseminating public health information, epidemiological findings, and healthcare recommendations, leading to substantial

TABLE 3. Comparative Ranking by Individual Indicators

Rank	CiteScore Ranking	SJR Ranking	SNIP Ranking
1	MMWR Recommendations and Reports	Nature Reviews Clinical Oncology	The Lancet
2	Nature Reviews Clinical Oncology	MMWR Recommendations and Reports	Kidney International Supplements
3	Kidney International Supplements	Nature Reviews Materials	MMWR Recommendations and Reports
4	Nature Reviews Materials	Chemical Reviews	MMWR Summaries
5	Chemical Reviews	IEEE Communications Surveys and Tutorials	Nature Reviews Clinical Oncology
6	IEEE Communications Surveys and Tutorials	The Lancet	Reviews of Physics
7	MMWR Summaries	MMWR Summaries	IEEE Communications Surveys and Tutorials
8	The Lancet	Reviews of Physics	Chemical Reviews
9	Progress in Energy and Combustion Science	Kidney International Supplements	Nature Reviews Materials
10	Reviews of Physics	Progress in Energy and Combustion Science	Progress in Energy and Combustion Science

TABLE 4. Overall Interpretation of Top 10 Journals

Category	Observation
Medical Journals	Dominate the highest positions in all bibliometric indicators
Review Journals	Generally achieve larger CiteScore values due to broader citation coverage
Engineering Journals	IEEE Communications Surveys and Tutorials represents the strongest engineering journal
Physics Journals	Reviews of Modern Physics maintains high prestige and citation influence
Public Health Journals	MMWR journals exhibit exceptional impact and global visibility
Overall Leader	MMWR Recommendations and Reports demonstrates the strongest combined performance

scholarly and practical influence.The overall bibliometric evaluation identifies MMWR

Recommendations and Reports as the leading journal among all categories. The journal combines the highest CiteScore with exceptionally strong SJR and SNIP values, demonstrating superior performance in citation impact, journal prestige, and field-normalized influence. Its dominance across multiple indicators confirms its position as the most influential journal within the selected dataset.

Result Based on Fuzzy Soft Differential Equation. Using the formal definition of a Fuzzy Soft Differential Equation (FSDE), $\frac{d}{dt}F(e,t) = G(e,t,F(e,t)), \quad e \in E,\ t \in I$, the journal impact data can be modeled as a fuzzy soft dynamic system where the citation influence of each journal evolves over time under the parameters CiteScore, SJR, and SNIP. Let $U = \{\text{Journal Impact}\}$ and $E = \{e_1, e_2, e_3\}$, where e_1 = CiteScore, e_2 = SJR, e_3 = SNIP. For the journal MMWR Recommendations and Reports, the normalized fuzzy soft representation is

$$(F,E) = \begin{cases} e_1 \to 1.000, \\ e_2 \to 0.996, \\ e_3 \to 0.877. \end{cases}$$

The corresponding aggregated fuzzy soft membership value is $\mu_{FS} = \frac{1.000+0.996+0.877}{3} = 0.958$. Since this value is the largest among all journals, MMWR Recommendations and Reports becomes the dominant element of the fuzzy soft universe. Assume the citation dynamics satisfy the FSDE $\frac{d}{dt}F(e,t) = -\lambda_e F(e,t)$, where λ_e denotes the citation decay coefficient associated with each bibliometric parameter. The solution of the FSDE is $F_e(t) = C_e e^{-\lambda_e t}$, with initial condition $C_e = \mu_{FS} = 0.958$. Using $\lambda_1 = 0.10$, $\lambda_2 = 0.15$, $\lambda_3 = 0.20$, the fuzzy soft citation trajectories become $F_{e_1}(t) = 0.958e^{-0.10t}$, $F_{e_2}(t) = 0.958e^{-0.15t}$, $F_{e_3}(t) = 0.958e^{-0.20t}$. The aggregated fuzzy soft solution is $F_{FS}(t) = \frac{F_{e_1}(t)+F_{e_2}(t)+F_{e_3}(t)}{3}$. At $t = 3$, $F_{e_1}(3) = 0.710$, $F_{e_2}(3) = 0.610$, $F_{e_3}(3) = 0.525$. Hence $F_{FS}(3) = \frac{0.710+0.610+0.525}{3} = 0.615$. The FSDE model indicates that MMWR Recommendations and Reports possesses the highest initial fuzzy soft impact value (0.958) and maintains the strongest citation influence throughout the evolution process. Although citation influence gradually decreases because of the decay effect represented by the differential equation, the journal remains the dominant journal in the fuzzy soft system. The ranking obtained from the FSDE model is consistent with the bibliometric ranking based on CiteScore, SJR and SNIP. Therefore, the fuzzy soft differential equation successfully integrates multiple citation indicators into a single dynamic framework for evaluating journal influence.

Highest CiteScore Journal = MMWR Recommendations and Reports

CiteScore = 131.2

$\mu_{FS} = 0.958$

Conclusion. This study presents a comprehensive bibliometric evaluation of the top ten high-impact jour-nals using CiteScore, SCImago Journal Rank (SJR), and Source Normalized Impact per Paper (SNIP). The comparative analysis demonstrates that each indicator measures a distinct aspect of journal quality, including citation impact, academic prestige and field-normalized influence. The combined assessment provides a more balanced and reliable evaluation than relying on a single bibliometric metric. The results indicate that MMWR Recommendations and Reports is the overall highest performing journal, achieving the highest CiteScore while maintaining exceptionally strong SJR and SNIP values. Although Nature Reviews Clinical Oncology records the highest SJR and The Lancet achieves the highest SNIP, the integrated evaluation confirms the superior overall scientific influence of MMWR Recommendations and Reports. The analysis also shows that medical and public health journals dominate the highest rankings, while leading review journals in chemistry, materials science, engineering, and physics continue to exhibit outstanding citation performance within their respective disciplines. To complement the bibliometric analysis, a Fuzzy Soft Dif-ferential Equation (FSDE) model was developed to represent journal impact as a dynamic fuzzy soft system. The model successfully integrates multiple bibliometric indicators into a single mathematical framework and generates citation influence trajectories over time. The fuzzy soft membership values and dynamic solutions consistently identify MMWR Recommendations and Reports as the dominant journal, validating the agree-ment between mathematical modeling and conventional bibliometric rankings the proposed FSDE-based framework demonstrates that fuzzy soft differential equations provide an effective and flexible approach for multi-criteria journal evaluation under uncertainty. The methodology can be extended to larger journal datasets, additional bibliometric indicators, and broader research assessment problems, offering a valuable tool for scientometric analysis, academic policy and research evaluation.

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