

Venezuelan Scientific Journals in Scopus: Production and Impact 2000-2020

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Abstract

The historical behavior of Venezuelan journals indexed in Scopus from 2000 to 2020, their visibility and impact were studied. The data were obtained from the Scimago Journals and Country Rank portal and were a number of journals, published papers, impact factor (SJR) and quartile of location. The historical behavior of each variable was analyzed using sequential time series models to establish whether the behavior has been random or whether it follows a defined trend. It was found that both the number of journals and the number of published papers follow definite trends and SJR behaves randomly. The decrease in the number of journals may be influenced by the critical socioeconomic situation of the country; however, the number of papers has increased over time and the SJR has remained in a narrow range, meaning that most journals fall between the Q3 and Q4 quartile.

Keywords: Venezuelan journals, historical behavior, impact, visibility

1. Introduction

Scientific production has become a priority for most countries in the world, especially for developing countries. In the last 20 years, scientific production in Latin America and the Caribbean, as in other regions of the world, has been influenced by the development of the Internet, with scientific journals moving from the printed format to coexist in digital format, and by the development of the open access movement, which promotes the publication of scientific articles without economic, technological, or legal barriers, in accordance with the Budapest Declaration, which has had a positive impact on most of the countries in the region [1].

The increase in the scientific production of countries has been related, in recent decades, to emerging economies, which has seen an expansion of productive activities at different levels, especially in the science, technology, and innovation sectors [2]. In the case of Venezuela, its scientific production ranked it number 5 in Latin America in 2000 according to the SJR ranking, surpassed only by Brazil, Argentina, Mexico,

and Chile. However, as a result of the country's economic situation, which has led to a hyperinflationary process [3], in addition to the degradation of the university system and research centers, scientific production has fallen significantly, reaching position 9 in 2016 and position 10 in the SJR ranking by 2020.

Venezuelan scientific production has also been negatively influenced by the decrease in the number of teachers and researchers, who have emigrated to other countries, many of whom have dedicated themselves to activities other than research and those who are doing so, produce scientific papers with institutional affiliations in other countries. It is estimated that, by the end of 2020, Venezuela has lost 2,630 scientific researchers, with different levels of expertise and coming from the entire spectrum of knowledge; from laboratory technicians to law graduates, to full professors or emeritus professors [4]. The number of researchers who have emigrated represents slightly more than 16% of the national research force, taking as a reference the 15,394 active researchers registered in the country for the period under analysis. The scientific production of those who have migrated represents 26% of the production of all researchers in the country. 26% of what is produced by all Venezuelan scientists and technologists [5].

The problem of the decrease in Venezuelan scientific production has been the subject of previous studies mainly due to the brain drain [6]. Likewise, the relationship between the emigration of researchers in Venezuela and overall scientific productivity has been analyzed [4]. Similarly, research has been conducted on the support to Venezuelan scientists, academics, and professionals in exile, refugees, and at risk [7]. Similarly, it has been reported in recent studies that in the period 1960-2014, 14% of the scientific community emigrated, corresponding to 1783 researchers, who are responsible for 31% of Venezuelan scientific production [8].

The negative effect of the migration of scientists has not only been on the country's scientific production but has also been manifested in the number of scientific journals published in the country, their production, and their impact. Therefore, the present research aims to analyze the behavior of the number of Venezuelan journals, their scientific production, and their impact in the period 2000 - 2020.

2. Materials and methods

2.1. Data collection

The data necessary to carry out the research were obtained from the Scimago Journal and Country Rank portal (www.scimagojr.com). It was filtered by country to obtain the data for Venezuela and each year from 2000 to 2020. All the data were downloaded to then choose those necessary for the research, which were: Number of journals, Published documents, SJR, Best quartile, and Number of journals by area of knowledge. The indicators analyzed in the study are described in Table 1.

Indicator	Codification	Description
Journals	Journals	Number of journals indexed in Scopus for each year analyzed.
Documents	Documents	Total number of papers published by the journals in each year analyzed.
SJR	SJR	Impact Factor according to Scopus average obtained for each year of study.
Best quartile	Q	Best quartile location of the journals for each year studied.
Knowledge area	KA	Specific knowledge area where the journals are located according to the Scopus database classification.

Table 1. Description of the bibliometric indicators used in the study.

2.2. Data processing

To analyze the behavior of the number of journals, the production of scientific papers and the impact factor (SJR) with respect to time, a time-series analysis with a randomization test [9], was performed to analyze the trend of the data and whether they follow a random behavior or, on the contrary, behave according to a defined trend. The results will be presented graphically and in tables.

A time-series consists of a sequential set of numerical data taken at equispaced time intervals, usually over some time data were taken at equispaced time intervals, usually over some time or space of time or space. Models available include moving averages, random walks, various types of exponential smoother, trend models, and parametric models trend models, and parametric ARIMA models [10]. For the selection of the time-series trend model, the criterion used was the Mean Absolute Percentage Error (MAPE), the best-trend model being the one with the lowest MAPE. All analyses were performed using Statgraphics Centurion XVII statistical software.

3. Results and discussions

From the data collected, Table 2 shows the number of journals per year and the number of journals that were placed in each quartile according to the SJR.

A progressive increase in the number of indexed journals was observed between 2000 and 2010, indicating a decade of growth in the quality of Venezuelan journals. From 2011 onwards, the number of journals decreased until 2020. This decrease was mainly because some journals ceased to circulate, i.e., they did not continue publishing, and others were discontinued from Scopus due to non-compliance with the minimum requirements demanded by the indexer, but they are still active, although they are no longer indexed in Scopus. The most recent cases of discontinued journals are observed in 2020 where the two journals located in the WQ column (without quartile) were removed from the database, these were the journal *Opción* and the journal *Utopía y Praxis*; both in the areas of Social Sciences and Arts and Humanities.

Year	Journals	Q1	Q2	Q2	Q4	WQ
2000	12	1	3	3	5	0
2001	13	0	1	7	4	1
2002	15	0	2	4	7	2
2003	17	0	2	5	8	2
2004	18	0	1	6	10	1
2005	18	0	2	6	9	1
2006	19	0	1	4	13	1
2007	25	0	1	6	10	8
2008	39	0	1	9	15	14
2009	42	0	1	9	28	4
2010	43	0	1	14	27	1
2011	43	0	1	17	25	0
2012	42	0	1	19	21	1
2013	40	0	0	19	20	1
2014	40	0	0	11	29	0
2015	40	0	1	14	25	0
2016	39	0	0	17	21	1
2017	40	0	0	12	27	1
2018	39	0	1	7	31	0
2019	37	0	3	11	23	0
2020	31	0	1	6	22	2

Table 2. Number of Venezuelan journals indexed in Scopus between 2000 and 2020 and quartiles.

Despite the decrease in the number of journals in the last decade, there is still a positive difference concerning the year 2000 of 19 journals, which indicates that Venezuelan scientific publications still represent 3.5% of the total number of journals in Latin America and the Caribbean, This is only surpassed by countries with a research tradition such as Brazil (44.6%), Colombia (13.0%), Mexico (12.8%), Chile (12.6%) and Argentina (7.5%) and surpassing countries that are in a stable economic situation and considered to be among the fastest-growing in the region, such as Peru (1.5%), Costa Rica (0.7%) and Ecuador (0.3%). This shows that even with the migration of scientists, Venezuela will continue to maintain by 2020 an important number of journals where scientific articles are published not only in the country but also in other parts of the world. This is even more relevant if we consider that the number of LAC journals indexed in Scopus has been increasing in recent years [11].

Regarding the placement of Venezuelan journals in quartiles, in 2000 the only journal in Q1 was *Interciencia* (Multidisciplinary). In the rest of the study period, the

maximum location of the journals was in Q2, reaching 3 journals in that quartile in 2019 and one in 2020. The largest number of journals were located in the Q3 and Q4 quartiles, which shows that in the last 20 years the impact of Venezuelan journals indexed in Scopus has been medium-low. This behavior is not exclusive to Venezuelan journals, but is a trend observed in LAC journals [1] and was reported in the case of Peru with a greater number of journals between the Q3 - Q4 quartiles [12].

3.1. Journal trends

To analyze the historical trend of the number of Venezuelan journals between 2000 and 2020 different sequential time series models were applied and the one that obtained the lowest MAPE was the ARIMA (2,0,0) model with a value of 6.32% with a p-value < 0.05 and an estimated standard deviation of 3.29 (Figure 1). According to these results, the historical behavior of the number of journals fits a sequential autoregressive integrated moving average autoregressive model with the quadratic autoregressive term [13].

The randomization analysis showed that the applied test (Box-Pierce) based on the sum of squares of the autocorrelation coefficients yielded a p-value = 0.000 < 0.05, which indicates that the hypothesis that the trend of Venezuelan journals has a random historical behavior is rejected [14], thus proving that the number of Venezuelan journals indexed in Scopus between the years 2000 and 2020 has behaved following a pattern, which has been influenced by the country's internal socio-economic problems since the situation of the Venezuelan science has reported a significant decline in the production of knowledge mainly by its state universities, which has systematically influenced its scientific journals [15].

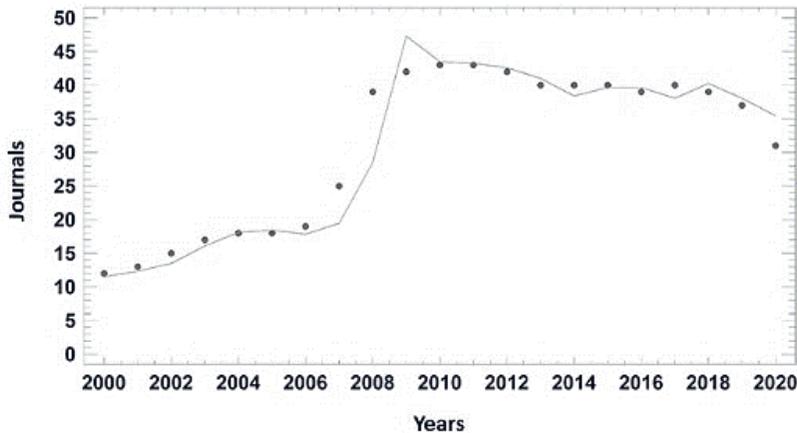


Figure 1. The behavior of the number of Venezuelan journals between 2000 and 2020 according to the ARIMA model.

3.2. Documents trends

The analysis of the historical behavior of the documents published by Venezuelan journals between 2000 and 2020 can be seen in Figure 2. Regarding this variable, it was observed that even when the number of journals decreased from 2010, the number of documents published remained practically constant from this year until 2014, from which a progressive increase was observed with a maximum peak in 2017 and then a decrease until 2020. Despite the decrease in the number of documents published by Venezuelan journals between 2017 and 2020, there is still a higher production than at the beginning of the study period and even higher than the production in the years when there was a greater number of indexed journals.

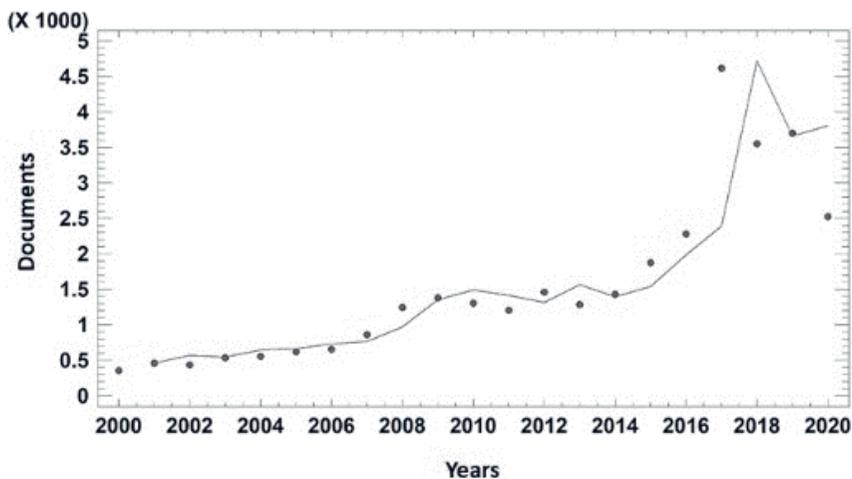


Figure 2. The behavior of papers published by Venezuelan journals between 2000 and 2020 according to the Random walk with drift model.

The analysis by sequential time series showed a trend adjusted to a Random walk model with drift = 108.65, with a MAPE = 16.64%. This model assumes that the best prediction is given by the last possible data value plus a drift constant up or down. The behavior of published papers with a fit to a random walk model, even if between 2016 and 2016 a stable trend with a slight slope that caused the increase in production is observed, may be influenced by the sharp rise and subsequent fall in production between 2017 and 2020. The above led to the randomness analysis of the historical series, which resulted in the Box-Pierce test in a p-value = 0.0006 < 0.05 indicating that the series is not random, but on the contrary follows a behavior dependent on the determinants on the number of papers published by the journals.

The publication of Venezuelan scientific journals remained stable during most of the study period, despite the deterioration of university institutions and research centers in the country, as well as the slowdown of research stimulus programs [16]. Similarly, the relevance of including socio-political analytical dimensions has been highlighted when considering studies on the behavior of science in Venezuela as part

of new methodologies of analysis for the understanding of this phenomenon in the country [17].

On the other hand, the high production of Venezuelan journals between 2017 and 2019 compared to previous years was determined by some journals that published an excessive number of papers, with questionable editorial processes, such as the case of the journal *Espacios* that published 1959 papers in 2017 and 1683 papers in 2018 which led to its discontinuation in 2019 and definitive removal from Scopus. This is a situation that can also be attributed as a consequence of the Venezuelan socioeconomic situation, since journals such as the aforementioned one were dedicated to publishing papers without scientific rigor, just for a publication fee, which turned it into a simple business.

3.3. Impact factor trends

The historical behavior of the average impact factor of Venezuelan journals between 2000 and 2020 according to the Scopus SJR is shown in Figure 3. This impact indicator was adjusted to a two-term Simple Moving Average model, mainly due to the observed variability, with a maximum value of 0.150 in 2013 and a minimum of 0.121 in 2009.

The analysis of the randomness of the variable through the Box-Pierce method indicated that the SJR of Venezuelan journals behaved randomly between the years 2000 and 2020 with a p-value = 0.7030 > 0.05. This reveals that the impact of the journals has not followed a stable trend, but on the contrary has behaved randomly, so that the importance of the published papers may vary in each year, depending on the quality and relevancy of publishing documents.

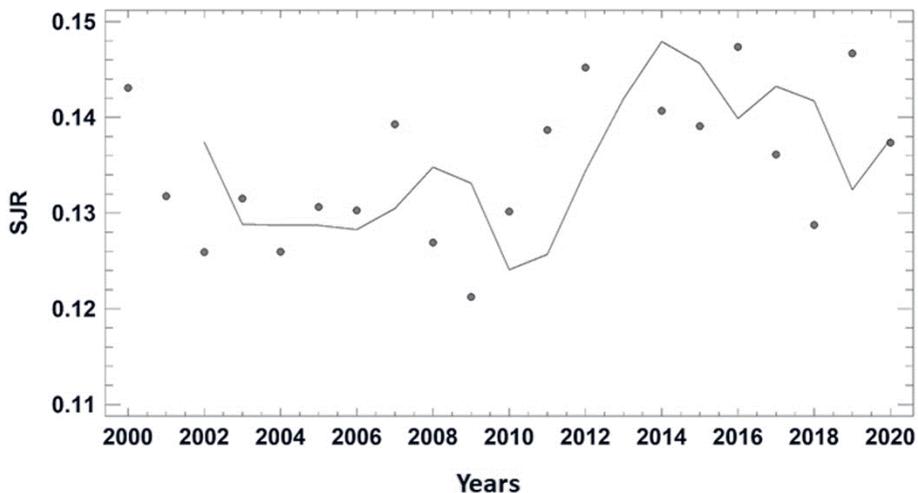


Figure 3. The behavior of SJR of Venezuelan journals between 2000 and 2020 according to the 2-term Simple Moving Average model

The impact factor varies each year and in some areas of knowledge more than in others, that is why important variations are observed in specific periods, such as a fall between 2000 and 2002, then a relatively stable variation between 2003 and 2006, and later increase and fall again between 2007 and 2009. Between 2009 and 2012 occurred the largest increase and then fluctuate between 2013 and 2020. The variations in the annual average impact factor are due in part to the fact that the papers are not immediately cited, but rather that the true impact can be observed in an average of 2 years after publication [18].

3.4. Trend of journals by area of knowledge

A review of the evolution of the number of journals per year according to the area of knowledge showed that the largest number of journals indexed in Scopus are in the areas of Arts and Humanities, Agriculture and Biological, Social Sciences and Medicine (Figure 4).

These areas of knowledge showed a higher number of journals between the years 2007 and 2018, from this year they suffered a decrease but remain as the areas with the highest number of journals. By the end of the period, the highest number of journals corresponds to Social Sciences and Medicine with 10 and 11, respectively.

In the rest of the areas of knowledge, the number of Venezuelan journals has been low throughout the study period (<4) with some journals being excluded from Scopus towards the end of the period, as in the case of environmental sciences. This indicates that although the number of journals has decreased, the areas of knowledge have been maintained over time, some with greater presence than others.

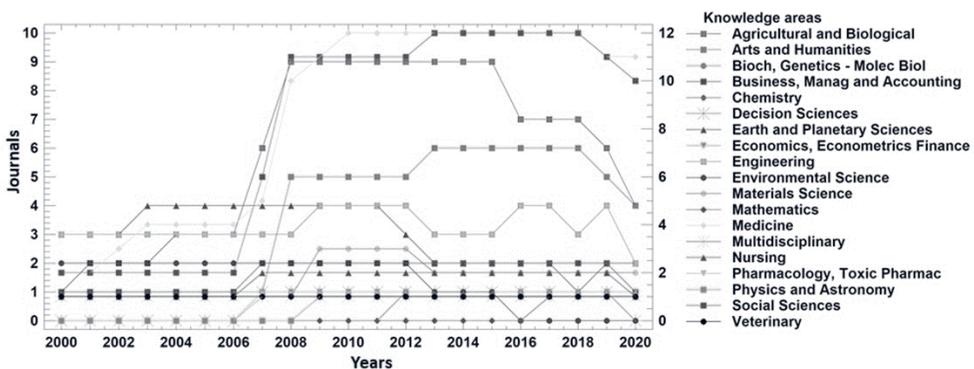


Figure 4. Number of Venezuelan journals by area of knowledge between 2000 and 2020

Venezuelan scientific diffusion based on its scientific journals is still maintained, although these journals, being mostly associated with public universities, have suffered significantly due to the budgetary deficiencies resulting from the government's misguided economic policies [19], which is why Venezuela is still the sixth country in the number of journals indexed in Scopus for the year 2020.

In specific areas of knowledge such as natural resources and engineering, it has been shown that socioeconomic indicators such as public spending on research and development, the number of researchers, spending on education, and GDP are determinants in the number of journals in Latin American countries [11], [20], which may also influence the historical behavior of journals in other areas of knowledge, as observed.

4. Conclusions

Despite the problems generated by the socio-economic and political situation affecting Venezuela, which have led to a decrease in scientific production, the loss of researchers who have emigrated to other countries, and the critical conditions in which public universities find themselves, which have generated a decrease in the number of scientific journals indexed in Scopus, the country remains as the sixth in the Latin American and Caribbean region in the number of indexed journals with 31 for the year 2020, which indicates a degree of commitment of universities and editorial teams to keep alive these means of scientific dissemination par excellence.

It was observed that the number of Venezuelan journals indexed in Scopus has had a non-random historical behavior between the years 2000 and 2020, so it is concluded that both the increase shown between the years 2006 and 2011 and the tendency to decrease from 2012 have not occurred randomly, but have been behaviors influenced by the critical situation through which the country has gone through during the entire study period. Accordingly, the temporal sequential trend model to which the behavior of the number of journals was adjusted can be a predictive tool for future years, especially because there is no improvement in the conditions affecting journals, at least in the short term.

Regarding the number of documents published by Venezuelan journals indexed in Scopus between 2000 and 2020, the historical behavior showed a trend of a sustained non-random increase so that even when the number of journals decreased, the number of published documents continued to increase. This leads to the conclusion that Venezuelan journals have maintained a certain level of prestige as a means of scientific divulgation, and that authors have continued to rely on them to publish their articles. At the end of the period, there was a greater variation in the number of articles published in Venezuelan journals, as a result of excess publications by some journals with dubious editorial processes that were discontinued by Scopus, resulting in a decrease by the year 2020, returning to stabilize the historical trend.

The average annual impact factors (SJR) between the study years had a narrow range between 0.121 and 0.150, with historical behavior fitted to a 2-term Simple Moving Average model. From the above, it is concluded that the impact of the documents published by Venezuelan journals between 2000 and 2020 has been low, which is also based on the fact that most of the journals were located between the Q3 and Q4 quartile, i.e. the middle-low quartile.

In general, it is concluded that the Venezuelan journals indexed in Scopus between 2000 and 2020 have been influenced by the socioeconomic and political situation that the country is going through, which has caused them to have a tendency

to decrease, although the publication of documents is on an upward trend and the impact factor remains within a stable range. The above merits a continuity in the deeper study of how the situation in Venezuela is going through is affecting the bibliometric indicators of its journals in comparison with those of other countries whose socioeconomic and political situation is more stable, since Venezuela continues to maintain an important presence of journals indexed in Scopus in Latin America and the Caribbean.

References

- [1] J. L. León, A. R. Socorro, M. L. Cáceres and C. J. Pérez, “Scientific production in Latin America and the Caribbean in the period 1996-2019,” *Revista Cubana de Medicina Militar*, vol. 49, no. 3, September, 2020. [Online serial, In Spanish]. Available: <http://www.revmedmilitar.sld.cu/index.php/mil/article/view/573>. [Accessed Apr. 15, 2021].
- [2] L. Strehl, L. Calabró, D. O. Souza and L. Amaral, “Brazilian Science between National and Foreign Journals: Methodology for Analyzing the Production and Impact in Emerging Scientific Communities,” *PLoS ONE*, vol. 11, no. 5, May, 2016. [Online serial]. Available: <https://doi.org/10.1371/journal.pone.0155148>. [Accessed Apr. 20, 2021].
- [3] M. A. Echarte, M. Martínez and O. Zambrano, “An analysis of the economic crisis in Venezuela from the postulates of the Austrian School of Economics,” *Revista Lasallista de Investigación*, vol. 15, no 2, 2018. [Online serial, In Spanish]. Available: <https://doi.org/10.22507/rli.v15n2a5>. [Accessed Apr. 20, 2021]
- [4] E. Diez, Y. Freites, M. García-Pérez, L. Ordoñez, J. Pineda, J. Requena and S. Romero, “Venezuelan research community migration: impacts and public policy implications,” *Interciencia*, vol. 46, no. 1, January, 2021. [Online serial, In Spanish]. Available: <https://www.redalyc.org/jatsRepo/339/33965751002/index.html>. [Accessed Apr. 21, 2021]
- [5] J. Requena, “Talent loss in Venezuela; migration of its researchers,” in *Venezuela in Focus: Economic, Political and Social Issue*, M. S. Bisson, Ed. Nueva York: Nova Science, 2019. Available: <https://novapublishers.com/shop/venezuela-in-focus-economic-political-and-social-issues/>. [Accessed Apr. 21, 2021]
- [6] J. Requena and C. Caputo, “Loss of talent in Venezuela: migration of its researchers,” *Interciencia*, vol. 41, no. 7, July, 2016. [Online serial, In Spanish]. Available: <http://www.redalyc.org/articulo.oa?id=33946267002>. [Accessed Apr. 21, 2021]

- [7] R. Castillo, "Venezuela and the scientific and professional exodus: an analysis of international support programs for Scientists. Venezuelan academics and professionals in exile, refugees and at risk," presented at 1st International Congress Venezuela: From the Search for Peace to Political Discourse, Rome, Italy, 2019.
- [8] B. Paz, O. Alpala and E. Villota, "Analysis of Venezuelan migration in the city of pasto: characteristics and perceptions of migrants," *Tendencias*, vol. 22, no. 1, June, 2021. [Online serial, In Spanish]. Available: <https://doi.org/10.22267/rtend.202102.155>. [Accessed Apr. 22, 2021]
- [9] M. Meyners and N. Pineau, "Statistical inference for temporal dominance of sensations data using randomization tests," *Food Quality and Preference*, vol. 21, no. 7, October, 2010. [Online serial]. Available: <https://doi.org/10.1016/j.foodqual.2010.04.004>. [Accessed Apr. 25, 2021]
- [10] H. R. Yatish and S. R. Swamy, "Recent trends in time series forecasting— a survey," *International Research Journal of Engineering and Technology*, vol. 7, no. 4, April, 2020. [Online serial]. Available: <https://www.researchgate.net/publication/341151347>. [Accessed Apr. 25, 2021]
- [11] S. Crespo-Gascón, F. S. Tortosa and J. Guerrero-Casado, "Production of scientific journals in Latin America and the Caribbean in Scopus, Journal Citations Reports and Latindex, in the field of natural resources: relationship with variables related to economy, environment and investment in research," *Revista Española de Documentación Científica*, vol. 42, no. 1, March, 2019. [Online serial, In Spanish]. Available: <https://doi.org/10.3989/redc.2019.1.1533>. [Accessed Apr. 27, 2021]
- [12] E. R. Acosta, T.D. Marín and A. M. Gonzales, "Policies for scientific production in Latin America: Peru, a case study," *Revista Ciencias Pedagógicas e Innovación*, vol. 8, no. 1, December, 2020. [Online serial, In Spanish]. Available: <http://dx.doi.org/10.26423/rcpi.v8i1.350>. [Accessed Apr. 27, 2021]
- [13] G. Amaris, H. Ávila and T. Guerrero, "Applying ARIMA model for annual volume time series of the Magdalena River," *Revista Tecnura*, vol. 21, no. 52, June, 2017. [Online serial, In Spanish]. Available: <http://dx.doi.org/10.14483/udistrital.jour.tecnura.2017.2.a07>. [Accessed Apr. 30, 2021]
- [14] T. McElroy and B. Monsell, "The multiple testing problem for Box-Pierce statistics," *Electronic Journal of Statistics*, vol. 8, no. 1, January, 2014. [Online serial]. Available: <https://doi.org/10.1214/14-EJS892>. [Accessed Apr. 30, 2021]
- [15] C. E. Blanco, "Scientific Research in Contemporary Venezuela and Colombia: A Brief Summary," *UH*, no. 291, June, 2021. [Online serial, In

- Spanish]. Available: <http://scielo.sld.cu/pdf/uh/n291/0253-9276-uh-291-2.pdf>. [Accessed May. 07, 2021]
- [16] A. Mercado, I. Ávalos, I. Sánchez, M. A. Cervilla, M. S. López and H. Vessuri, *Doing research in Venezuela. Science, Technology and Innovation Capabilities to Overcome the Crisis in Venezuela*. Ottawa: International Development Research Centre, 2020.
- [17] D. Laya and H. Vessuri, "The scientists of the IVIC in the evolution of science and technology policy during the Chávez administration in Venezuela," *Tapuya: Latin American Science, Technology and Society*, vol. 2, no. 1, July, 2019. [Online serial]. Available: <https://doi.org/10.1080/25729861.2019.1616953>. [Accessed May. 17, 2021]
- [18] E. Garfield, "Journal impact factor: a brief review," *Canadian Medical Association or its licensors*, vol. 161, no. 8, October, 1999. [Online serial]. Available: <https://pubmed.ncbi.nlm.nih.gov/10551195/>. [Accessed May. 21, 2021]
- [19] J. I. Rojas-Sola and B. Jordá-Albiñana, "Bibliometric analysis of Venezuelan scientific publications in the ecology category of the web of science database (1997-2008)," *Interciencia*, vol. 35, no. 7, July, 2010. [Online serial, In Spanish]. Available: <https://www.redalyc.org/articulo.oa?id=33914367011>. [Accessed May. 24, 2021]
- [20] T. D. Marín and D. D. J. Arriojas, "Analysis of Latin American journals indexed by Redalyc in the Engineering area: relationship with socioeconomic indicators," *Métodos de Información*, vol. 11, no. 21, December, 2020. [Online serial, In Spanish]. Available: <https://dx.doi.org/10.5557/IIMEI11-N21-001021>. [Accessed Jun. 04, 2021]