

## Stock Prices Variation

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### Abstract

A bibliometric review of the research field "stock price variation" is presented, with a search from 2012 to 2022. The analysis was performed using the indexes, WOS and Scopus databases, search strategies and filters were applied that allowed finding a total of 68 related research in a single file in csv format, this after unifying them and eliminating duplicate records. The file was processed using the Bibliometric package of the statistical program R. The main results show that the scientific production worldwide presents a fluctuation with highs and lows throughout the period, with the highest number of research presented in the years 2017 and 2020 (7); the author and one of the journals with the highest impact in the field of study were, Barnish B. and Management science respectively.

**Keywords:** Stock Prices, bibliometric analysis, variation, literature review.

### 1. Introduction

One of the most representative elements in current financial systems are the capital markets, which allow investors to carry out transactions for the acquisition of fixed or variable income securities according to their needs and the trends of the same environment (Hidayat, et al., 2020). In this sense, variable income securities or also called shares are one of the most relevant investment methods today; whose valuation positively impacts both the entity that issues the shares and the one that acquires or deals with them (Medina, Cruz and Urquijo, 2010). Said actions certainly, being variable income, are extremely volatile to the changes that occur within the economic, social, and political environment; being affected by variables as complex as social networks. Certainly, this is highly relevant in the current financial context, which is increasingly fast and interconnected (Peñafiel, 2021). Based on the above, there are many studies dedicated to knowing and studying the phenomenon of shares within the capital market from various methodologies and perspectives as part of the process of generating new knowledge in this dynamic branch of economies (Guevara and Moreno, 2012). It is based on this that the present study is

directed to present a review of the research field "stock price variation" between the years 2012 and 2022.

## 2. Methodology

An analysis of the literature on the research topic "share price variation" was carried out with the index databases most used by researchers today, such as Wos and Scopus, search strategies with keywords were implemented. , Boolean operators and the use of filters by dates and languages, the search equations were as follows: for Scopus, ( TITLE-ABS-KEY ( "stock price variation" ) OR TITLE-ABS-KEY ( "stock price variance" ) ) AND PUBYEAR > 2001 AND ( LIMIT-TO ( LANGUAGE , "English" ) ), which generated 66 documents and for WoS, (TS=("stock price variation" )) OR TS=("stock price variance") and English (Languages), when filtering by the years from 2002 to date, 20 records were found.

These records found were downloaded from the metasearch engines in bibtex format and were unified using the statistical program Rstudio, in this step 18 duplicate documents were found, which were removed and a single document of 68 works in csv format was formed, which later It was processed with the Bibliometrix package of the Rstudio software, the tables, graphs and maps extracted from the application are presented in the results section of this work.

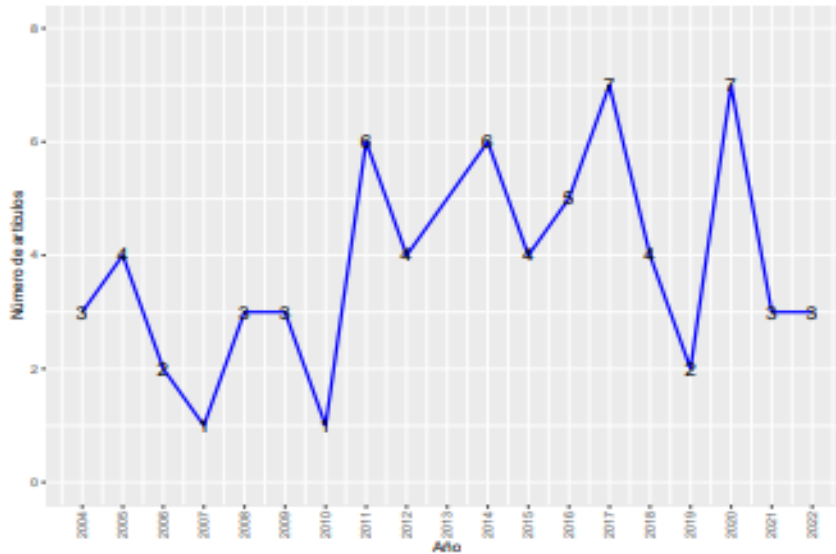
## 3. Results and Discussion

Figure 1: Word Cloud



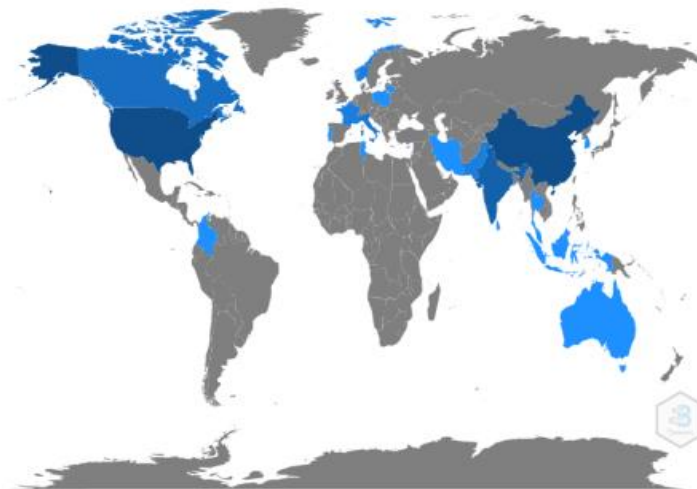
Graph 1 shows a cloud of key terms from the summary of the 68 works extracted from the Wos and Scopus index databases, where it can be seen that the words stock market, machine learning and stock price prediction are the most used. relevant to the study area.

**Figure 2: Annual scientific production**



The annual scientific production for the research topic between the years of 2004 and 2022 shown in graph 2, indicates a fluctuation in production with a slight growth, highlighting the years 2017 and 2020 as the most productive and there is evidence of a decrease in more than 100% by 2021 in the number of investigations in the field of study, due to unknown factors.

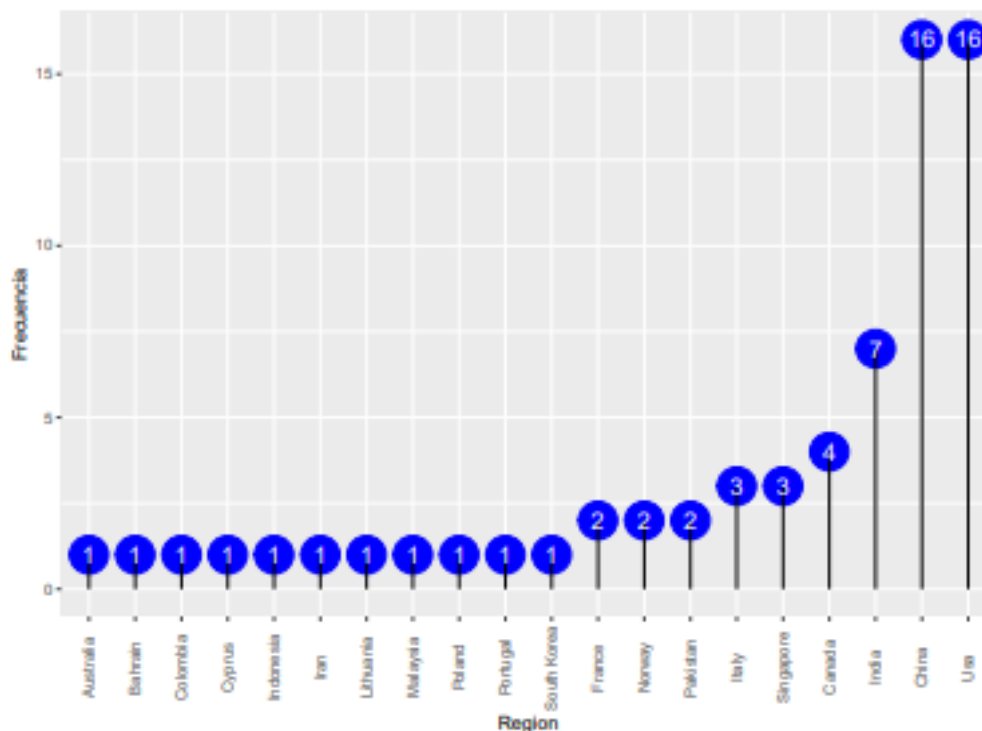
**Figure 3: Scientific production by country**



In the map of scientific production by country shown in graph 3, the regions that made academic contributions to the field of research can be seen in blue; darker colors indicate a greater number of works.

In Figure 4, the twenty most productive countries in the field of study on the variation in stock prices are represented.

**Figure 4: Most productive countries**



Graph 4 highlights the four countries that contribute the most to the issue, including the United States with 16 contributions, China with 16, India with 7 and Canada with 4 contributions. Of the country that contributes the most in the area of research, we can highlight the study that examines the relationships between high-frequency trading, the toxicity of the order flow, the volatility of the share price during the periods of toxicity of the normal order flow and high, and the predictability of changes in liquidity supply and demand from high-frequency traders. Using volume-synchronized reported trading probability (VPIN), a flow toxicity metric, we found a negative relationship between high-frequency trading and order flow toxicity. Our results also show that VPN can be a good predictor of high-frequency traders' liquidity supply and demand changes. Finally, we find that the impact of high-frequency traders on stock price movement is non-uniform and changes with levels of order flow toxicity and stock volume. (Van-Ness, Van-Ness and Yildiz, 2017).

**Figure 5: Journals with the most impact**

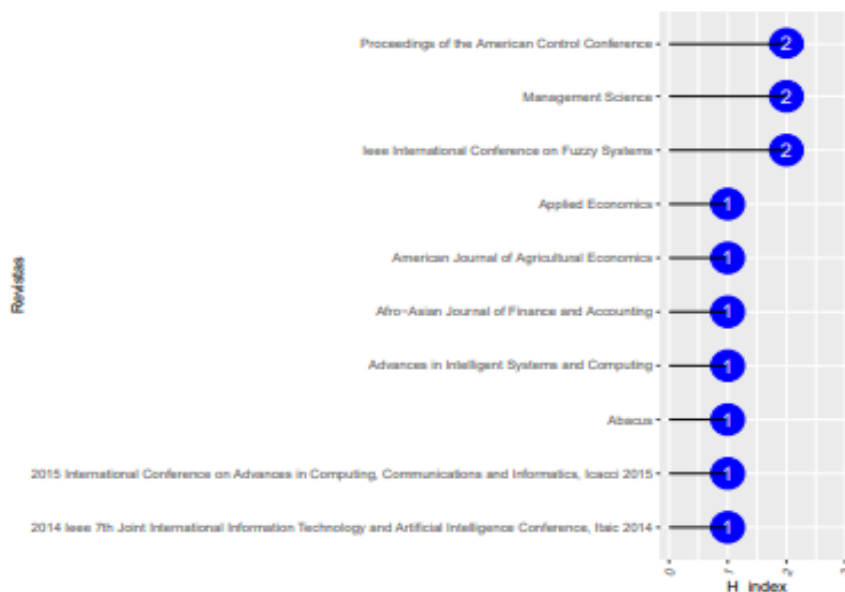
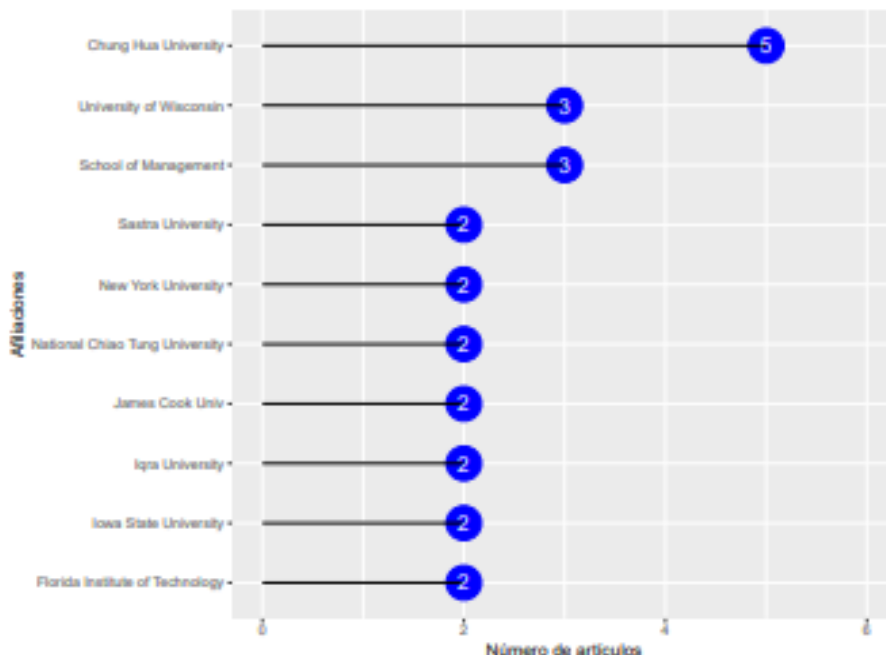


Figure 5 shows the journals that have the greatest impact on the field of research, of which the 3 with the highest H index are: IEEE international conference on fuzzy systems, Management science and Proceedings of the american control conference, with 2 each. Chen, Da and Priestley's (2012) research addresses the issue that “The relative predictability of returns and dividends is a central issue because it forms the paradigm for interpreting asset price variation. An understudied question is how dividend smoothing, as a corporate policy option, affects predictability. We show that, even if dividends are assumed to be predictable without smoothing, dividend smoothing can hide this predictability. Because aggregate dividends smooth out much more in the postwar period than before, the lack of predictability of dividend growth in the postwar period does not necessarily mean that there is no cash flow news in price movements, of actions, rather, a more plausible interpretation is that dividends are smoothed. Using two alternative measures that are less subject to dividend smoothing (net payout and earnings), we consistently conclude that cash flow news plays a larger role than discount rate news in changes. of prices in the post-war period.

**Figure 6: Most important affiliations**



From figure 6, it can be highlighted that the three institutions that contribute the most to the research topic are: Chung hua university, School of management and University of wisconsin, from the first institution, the study that deals with "The predictions of the Stock price variation is at the core of many research topics, and neural networks (NNs) are widely applied and proved to be more efficient than time series forecasts for stock price forecasting. However, this type of research always determines the configuration of the parameters of the NN in a rational way through a trial-and-error methodology. This paper integrates design of experiments (DOE), Taguchi's method, and backpropagation NN (BPNN) to build a robust engine that further optimizes prediction accuracy under a DOE-based robust predictor. Adopting data from the Taiwan Stock Exchange (TWSE), technical analytical indices and  $\beta$ -value of TWSE listed shares were calculated. The research results indicated that the proposed approach can effectively improve the forecast rate of stock price changes." (Hsieh, Hsieh and Tai, 2011)

**Table 1: Authors with the greatest impact**

Author	h_index	g_index	m_inde x	TC	NP	PY_start
Barmish B.	4	4	0,333	86	4	2011
Primbs J.	3	3	0,25	57	3	2011
Chen Y.	2	2	0,333	32	2	2017
Huang Y.	2	2	0,111	6	2	2005

Kao L.	2	2	0,111	6	2	2005
Ma J.	2	2	0,222	10	2	2014
Wohar M.	2	2	0,222	10	2	2014
Abelha A.	1	1	0,125	2	1	2015
Aggarwal H.	1	1	1	1	1	2022
Ahmed B.	1	1	0,333	5	1	2020

In table 1, the five researchers with the highest H index who work on the topic of “share price variation” are: Barmish B. with 4, followed by Primbs J. with 3, Chen Y. with 2, Huang Y. with 2 and Kao L. with 2. The research work of the author with the highest H index, deals with the “Development of a new version of the so-called simultaneous long-short linear feedback stock trading controller (SLS) for a class of idealized markets characterized by continuously differentiable stock prices. The two outstanding features of our new driver are as follows: First, all trading gains are appropriately discounted to account for the opportunity costs associated with an alternative investment in a risk-free bond. Second, the new feedback control strategy gives the investor flexibility to make trading gains that are decoupled from overall market behavior; that is, a certain condition of market neutrality is met. The subject of arbitration is the central point of this document. That is, even considering the interest rate discount from trading profits, whether the market goes up or down, the value of the account  $V(t)$  will exceed its initial value  $V(0)$  for all variations not trivialities of the stock price. In recognition of the fact that the idealized market only serves as a benchmark indicating the scope of a real market, we also include numerical simulations indicating controller performance using real-world historical prices.” (Barmish and Primbs, 2012).

**Table 2: Most cited documents**

Paper	DOI	Total Citations
Couillard M, 2005, Phys a Stat Mech Appl.	10.1016/j.physa.2004.09.035	101
Lyócsa, 2020, Finan Res Lett	10.1016/j.frl.2020.101735	67
Chen L, 2012, Manage Sci	10.1287/mnsc.1120.1528	58
Chau F, 2016, Int Rev Financ Anal	10.1016/j.irfa.2016.10.003	51
Markovitch Dg , 2005, Manage Sci	10.1287/mnsc.1050.0401	48
Ben-Nasr H, 2014, j Corp Financ	10.1016/j.jcorpfin.2014.10.004	46

Chang Pc, 2004, j Chin Inst Ind Eng	10.1080/10170660409509416	35
Preethi G, 2012, j Theor Appl Inf Technol	NA	33
Barmish Br, 2011, Proc Am Control Conf	10.1109/acc.2011.5990879	29
Ku Lw, 2009, j Am Soc Inf Sci Technol	10.1002/asi.21067	27

Table 2 describes the top 10 with the most cited documents, of which the three works with the highest number of citations are: Couillard M, 2005, Phys a Stat Mech Appl with (101) citations, Lyócsa, 2020, Finan Res Lett with (67) and Chen L, 2012, Manage Sci with (58). The first paper states that “A fundamental assumption of quantitative finance is that stock price movements are independent and can be modeled using Brownian motion. In recent years, it has been proposed to use rescaled range analysis and its characteristic value, the Hurst exponent, to test independence in financial time series. In theory, independent time series should be characterized by a Hurst exponent of 1/2. However, finite Brownian motion data sets will always give a Hurst exponent value greater than 1/2, and without proper statistical testing such a value can be misinterpreted as evidence of long-term memory. We obtain a more precise statistical significance test for the Hurst exponent and apply it to real financial data sets. Our empirical analysis shows no long-term memory in some financial returns, suggesting that Brownian motion cannot be rejected as a model for price dynamics.” (Couillard and Davison, 2005)

### Co-citation networks

Joint citation analysis assumes that between two or more documents cited together (co-cited) in a third and subsequent investigation, they exist - at least from the point of view of the cited researcher. – a similar topic; The higher the repetition rate, the greater the convergence between them. The extent of this relationship is thus determined by the number of citations that have the same pair of papers in their references. If frequently cited articles are intended to present key concepts, methods, or experiences in an area, then common citation patterns can be used. These co-citation patterns are used to identify and visualize the relationships between these main ideas (Small, 1973). Quoted from (Miguel, Moya-Anegón and Herrero-Solana, 2007)

**Figure 7: Document network**



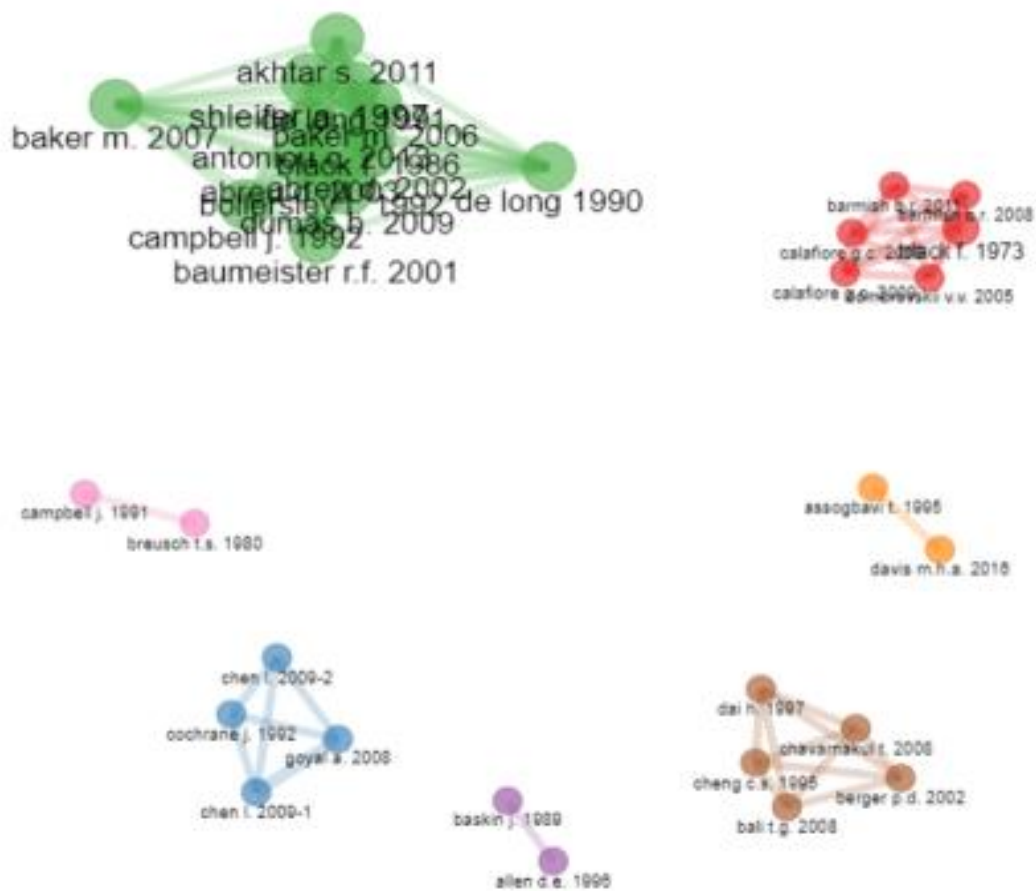


Figure 7 represents the network map of co-citations between documents, in it it is observed that 7 clusters identified with different colors were formed, and this indicates that each of them follows the same thematic pattern, the groups are made up of the following form:

Green cluster: Shleifer A. 1997, Abreu D. 2003 and Abreu D. 2002.

Red Cluster: Black F. 1973, Barmish B.R. 2011 and Barmish B.R. 2008.

Brown cluster: Bali T.G. 2008, Berger P.D. 2002 and Chavarnakul T. 2008

Blue cluster: Chen I. 2009-1, Goyal A. 2008 and Chen I. 2009-2.

Violet Cluster: Allen D.E. 1996 and Baskin J. 1989.

Pink Cluster: Breusch T.S. 1980 and Campbell J. 1991.

Orange cluster: Assogbavi T. 1995 and Davis M.H 2016.



**Figure 9: Multidimensional Scaling visualization from keywords**

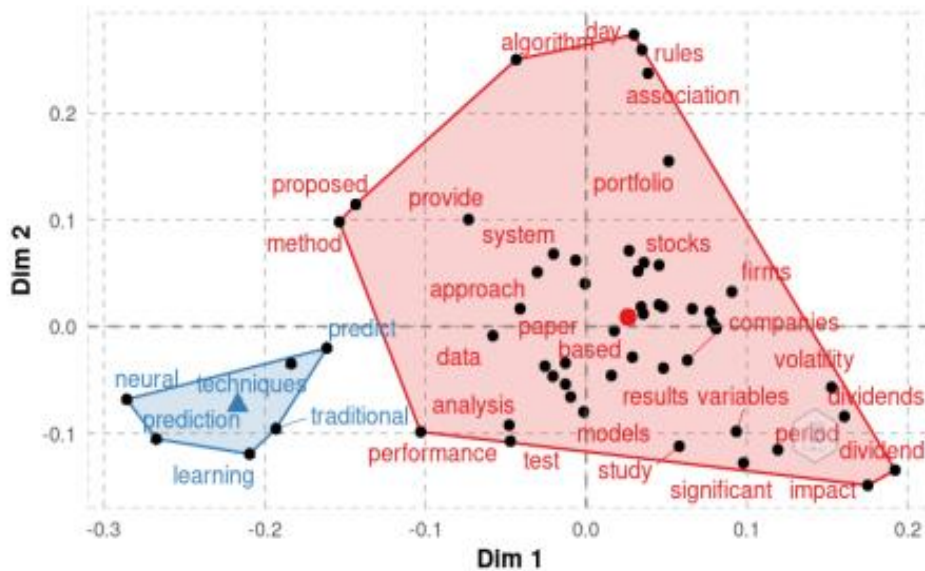


Figure 9 shows two thematic lines distributed as follows:

Cluster 1 (red color): Contains the largest number of terms and for this reason is the most semantically diverse. In this, concepts that deal with dividends, investment portfolios and analysis of variables related to stocks, among others, are related.

Cluster 2 (Blue Color): This cluster focuses mainly on prediction techniques.

#### 4. Conclusions

Scientific production in high-impact sources with respect to the study of share price variation has not had a significant boom in the last two decades (2002-2022), where there is evidence of low scientific production with only 68 documents found. It is concluded with respect to the types of sources of published research that there is a high tendency (56%) to publish mainly articles and conference papers (35%).

The authors with the greatest impact on the research topic are Barmish B. and Primbs J., with an H index of 4 and 3, respectively. There is a strong relevance in the keywords related to the research topic, stock market, machine learning and stock price prediction, they are the most representative terms. In general, the tendency of this area of study is focused on topics such as prediction models related to the variation of shares and analysis from the financial point of view.

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