08, 09, 10 e 11 de novembro de 2022
ISSN 2177-3866

Call auction and the intraday trading in stock markets: a bibliometric study of the international literature

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1. INTRODUCTION

The use of auctions involves transactions of a series of assets such as houses, cars, agricultural products and even securities, including bonds and stocks. (Klemperer, 1999). The extension of its use to the Stock Market in intraday negotiations considers the call auction instruments (hereafter CA) wich in some markets is used in a complementary way to the negotiations that take place on a continuous basis (Theissen & Westheide, 2020). Such instruments are used at different times in the market, such as opening and closing, with the characteristic that they enable the improvement of the price discovery process, as they influence the way in which buy and sell orders are coordinated (Pagano et al., 2013). Changes in trading systems, with the inclusion or exclusion of such instruments, also have effects on the market architecture, which exerts a relevant influence on its quality that is evaluated in terms of volatility and efficiency in price formation, as well as liquidity and stability (P. L. Chelley-Steeley, 2008; Twu & Wang, 2018).

In addition to the issue related to market quality, the investigation about CA considered different approaches, such as issues related to their effectiveness, asset pricing, the bid-ask spread and even in the development of intraday trading strategies. Furthermore, some markets use the prices formed during this event as a reference to disclose their information, which may generate suspicion that these instruments affect the quality of the market and deserve further investigation. In this sense, this work proposes a bibliometric analysis of the scientific articles that involve such instrument, to answer the question of how is the panorama of research on CA in order to identify existing gaps and suggest a future research agenda related to this mechanism and its relationship with the market.

Thus, the structure of the work is as follows. Section 2 describes the methodology of bibliometric analysis used, considering the search for works related to the topic in the Scopus and Web of Science databases. Section 3 classifies the works found, section 4 presents an overview of the research on these instruments, section 5 presents the results of the literature analysis and section 6 presents the final considerations of the work.

2. METHODOLOGY

Systematic literature review comprises the observation of three attributes, namely: structuring – conducted in an order or methodological way, instead of being random; comprehensiveness – covering all relevant research items and delivering a summary of the review that is as understandable as possible and; transparency – which involves disclosing the methodological steps to arrive at the final sample of the systematic review (Hiebl, 2021). Junior and Filho (2010) also point out that this systematic review comprises a literature review considering the variations of the research object; the development of a classification structure; the use of the classification structure to summarize what is known about the research object; the presentation of the literature review using the classification method to organize the review and; review analysis and suggestions for future research.

In this sense, for the development of this research, we made searches in the Scielo, Science Direct, Web of Science and Scopus databases, on January 14, 2022, and no article was found in Scielo and all those from Science Direct are on the last two bases, which made us focus on Web of Science and Scopus. Scientific articles were filtered using the search for the combination of the expressions “call auction” and “stock market” in the title, abstract and keywords, and 79 documents were found in Scopus and 81 in the Web of Science.

50 from those 160 works were referenced in the two databases, which reduced the number

to 110 scientific articles.We don´t put restrictions on the search by period or categories, considering that the topic may involve different approaches. However, by reading the title of the works, nine articles were eliminated that dealt with topics such as water supply, analysis of wood trade control, dynamic pricing based on consumer characteristics, energy sharing, urban planning, risk management of price in the wool industry, pricing in a local energy market, processing of reading transactions in mobile environments and management model for the fishing industry, which are not linked to the object of this research, resulting in 101 valid scientific articles for analysis. Morevover, 13 works were excluded from the sample that were not found in their full version, 10 from Scopus and 3 from Web of Science. Finally, only articles written in English were considered, eliminating one work written in Mandarin, leaving 87 works.

From the analysis of each work, we grouped the research panoramas, pointing out the gaps that we identified. Additionally, we used the folium package from python and the bibliometrix from the R software, which allow the visualization of maps and accurate analysis of the bibliometric relationships of the works contained in our database.

3. CLASSIFICATION

53 journals published the papers, with 15 journals concentrating 56% of the papers published, that is 49 of the total of papers, as shown in table 1.

Table 1 – Papers by journal

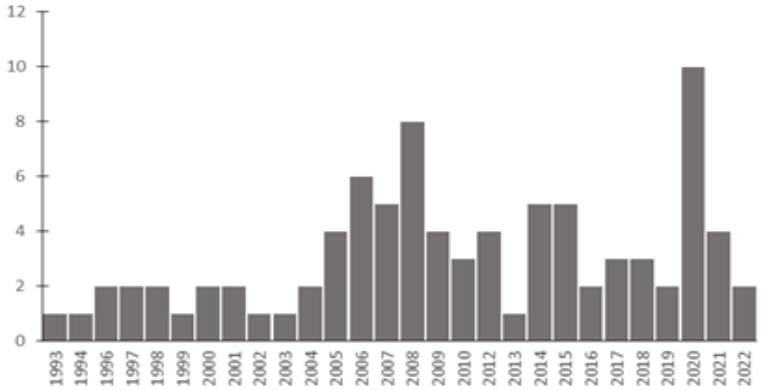
Journal	JCR	CiteScore	H-Index	Total
Journal of Banking & Finance	3.07	4.4	161	8
Journal of Futures Markets	2.013	2.4	55	6
Journal of Financial Markets	2.516	3	59	5
Emerging Markets Finance and Trade	2.315	2.6	34	4
Journal of International Financial Markets, Institutions and Money	4.211	5.2	58	3
Physica A: Statistical Mechanics and its Applications	N/A	5.6	166	3
International Review of Financial Analysis	5.373	4.9	59	3
Review of Quantitative Finance and Accounting	N/A	2.6	43	3
Quantitative Finance	2.222	2.8	72	2
Journal of Financial Economics	6.988	9.6	256	2
Journal of Financial and Quantitative Analysis	3.745	5.3	121	2
Financial Management	2.938	2.9	68	2
Journal of Asian Economics	2.159	3	47	2
Journal of Finance	7.544	N/A	299	2
Review of Financial Studies	5.814	9.2	190	2
Others*	1.50	3.3	48	38
Total	**2.37**	3.28	79.65	**87**

*Values of the indices obtained by the averages

Source: Elaborated by the authors

The classification of journals considered the Journal Citation Reports – JCR (Clarivate), CiteScore (Scopus) and H-Index (Scimago) indexes. The total computation considered the weighted average by the number of articles per journal, and in cases where the index does not apply, zero was assumed, resulting in 2.37 for the JCR, 3.28 for the CiteScore and 79.65 for the H-Index. Such results indicate that the research found support in journals of considerable impact, with a dispersed approach.Considering the period of publication of the works, chart 1 indicates the evolution of the number of publications over the years. It should be noted that the peak of publications occurred recently (2020), indicating an increase in interest on the topic.

Chart 1 – Evolution of the papers by year



Source: Elaborated by the authors

Following a model similar to that presented by Silva et al. (2017), we structured part of our analysis as shown in table 2.

Table 2 – Code table and classification of papers

Group	Subgroup	Group	Subgroup
1 –Type of study	A. Theoretical B. Empirical C. Both	6 –Period studied	A. Up to 2 years B. From 2 to 5 years C. From 5 to 10 years D. More than 10 years E. Not applicable
2 – Approach	A. Quantitative B. Qualitative C. Quantitative and qualitative D. Revision/Survey	7 – Type of data analyzed	A. From market B. From financial reports C. Macroecomics D. From regulators, IMF and others institutions E. Others F. Not applicable
3 – Object of study	A. Anomalies B. Asset characteristic C. Information D. Liquidity/Volatility E. Market F. Order G. Price H. Trading system I. Trader/Trading	8 – Method	A. Econometric/ Statistic/ Multivariate analysis B. Computational/ Simulation C. Mathematical modelling D. Not applicable
4 –Escope	A. One country B. More than one country C. Region/Block D. Not specified /Not applicable	9 – Technic	A. Time series analysis B. Logit/Probit Multinomin C. Descriptive D. Logit/Probit ordened E. Mathematical modelling F. Tests of difference (parametric/non-parametric) G. Panel analysis H. OLS I. Others
5 – Context	A. Developed country B. Emerging country C. Both D. Frontier market E. Not applicable		

Source: Elaborated by the authors

Moreover, table 3 presents the list of evaluated articles with their respective classifications.

Table 3 – Papers evaluated

(to be continue**)**

1 is the type of study, where A is theoretical, B is empirical, and C is Both. 2 is the type of approach where A is quantitative, B is qualitative, C is quantitative and qualitative, and D is survey. 3 is the object of study where A are anomalies, B are asset characteristics, C is information, D is liquidity and/or volatility, E is the market, F is the order, G is the price, H is the trading system and I is the trader and/or trading. 4 is the scope where A is a country, B is more than one country, C is a region/block, and D is unspecified or not applicable. 5 is the context where A is a developed country, B is an emerging country, C is both, D is a frontier market, and E does not apply. 6 is the period studied where A is up to 2 years, B is from 2 to 5 years, C is from 5 to 10 years, D is more than 10 years, and E does not apply. 7 are the types of data analyzed where A are from the market, B are from balance sheets, C are macroeconomic, D are from regulators, IMF and/or other bodies, E are from others and F does not apply. 8 is the type of method used where A is econometrics, and/or statistics, and/or multivariate analysis, B is computational and/or simulation, C is mathematical modelling, and D does not apply. 9 is the technic used where A is time series analysis, B is logit and/or multinomial probit, C is descriptive, D is logit and/or ordered probit, E is mathematical modelling, F is mean/median comparison tests, G is analysis in panel, H is OLS and I are others.

Paper	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Time of CA**	**Exchange analyzed**
Abad & Pascual (2007)	B	A	A	A	A	B	A	A	A	N/A	Spanish Stock Exchange
Agarwalla et al. (2015)	B	A	G	A	B	A	A	A	H,I	Open	National Stock Exchange
Aitken et al. (2005)	B	A	D	A	A	A	A	A	F,I	Close	Australian Stock Exchange
Alderson & Fraser (1993)	B	A, D	B	D	E	B	D	A	D	N/A	N/A
Alexakis et al. (2021)	B	A	I	A	B	B	A	A	G	Close	Athens Stock Exchange
Amihud et al. (1997)	B	A	H	A	A	C	B	A	C,I	Open	Tel-Aviv Stock Exchange
Anagnostidis et al. (2015)	B	A	G	A	B	A	A	A	C,D	Open	Athens Stock Exchange
Anagnostidis et al. (2020)	B	A	I	A	A	A	A	A	C,I	Open	Euronext Paris
Barclay et al. (2008)	B	A	F	A	A	C	A	A	C,H,I	Open	New York Stock Exchange; Nasdaq
Battig & Chelley-Steeley (2010)	B	A	H	A	A	B	A	A	C,I	Close	London Stock Exchange
Brooks & Moulton (2004)	B	A	D	A	A	A	A	A	F,I	Open	New York Stock Exchange
Brünner (2019)	C	A	C	A	B	A	A	A	C,E,F	N/A	Euronext Paris
Camilleri & Green (2009)	B	A	H	A	B	A	A	A	C,F,I	Both	National Stock Exchange
Camilleri (2015)	B	A	D	A	B	A	A, B	A	F,I	Both	National Stock Exchange
Ceretta & Silva (2017)	B	A	A	A	B	B	A	A	F,H,I	Open	Bovespa
Chakraborty et al. (2012)	A	A	F	D	E	E	F	C	E	N/A	N/A
Chan et al. (2020)	B	A	H	A	B	A	A	A	C,F,I	Close	Taiwan Stock Exchange
Chang et al. (2008)	B	A	H	A	A	A	B	A	H,F	Both	Singapore Exchange
Chang et al. (2020)	B	A	H	A	B	A	A	A	C,F,I	Close	Taiwan Futures Exchange
Chelley-Steeley (2009)	B	A	H	A	A	B	A	A	C,H	Close	London Stock Exchange
Chelley-Steeley (2008)	B	A	H	A	A	B	A	A	I	Close	London Stock Exchange
Cheng & Kang (2007)	B	A	G	A	B	A	A	A	I	Both	Taiwan Futures Exchange
Clapham & Zimmermann (2016)	B	A	G	C	A	A	A	A	C,I	N/A	Deutsche Borse Group, BATS Chi-X Europe
Comerton-Forde & Rydge (2006)	B	A	H	A	A	B	A	A	F,I	Both	Australian Stock Exchange
Comerton-Forde et al. (2007)	B	A	H	A	B	A	A	A	C,H	Open	Hong Kong Exchanges and Clearing Market
Eaves & Williams (2007)	B	A	H	A	A	A	A	A	C,I	N/A	Tokyo Grain Exchange
Eldor et al. (2006)	B	A	D	A	A	A	A	A	C,I	N/A	Tel-Aviv Stock Exchange
Ellul et al. (2005)	B	A	F	A	A	B	A	A	C,F,H	Both	London Stock Exchange
Eom et al. (2021)	B	B	H	A	B	A	C	A	C,B,G	Both	Korea Exchange
Gerace et al. (2015)	B	A	H	A	B	A	F	C	C,F,I	Open	Shanghai Stock Exchange
Greene & Watts (1996)	B	A	G	A	A	B	A, B	A	C,F	N/A	New York Stock Exchange; Nasdaq
Gu et al. (2008)	B	A	F	A	B	A	A	A	C,H,I	Open	Shenzhen Stock Exchange
Gu et al. (2010)	B	A	F	A	B	A	A	A	C,H,I	Open	Shenzhen Stock Exchange
Haeberle & Todd Henderson (2016)	C	B	E	A	A	E	E	D	I	N/A	N/A
Hagströmer & Nordén (2014)	B	A	H	A	A	A	A	A	I	Close	Nasdaq OMX options and futures Exchange
Henke & Lauterbach (2005)	B	A	H	A	B	A	A, D	A	C,F	Both	Warsaw Stock Exchange
Henke & Voronkova (2005)	A	A	G	A	B	B	A	A	F,H,I	Both	Warsaw Stock Exchange
Henke (2006)	B	A	D	A	B	A	A	A	C,F,I	N/A	Warsaw Stock Exchange
Hsieh (2009)	B	A	B	A	B	C	A	A	C,H	Close	Taiwan Stock Exchange
Hu (2006)	C	A	G	A	B	A	A	A	C,I	Open	Taiwan Stock Exchange
Hu et al. (2020)	A	A	G	D	E	E	A	C	E	N/A	N/A
Huang & Chan (2010)	B	A	I	A	B	A	A	A	C,I	Close	Taiwan Stock Exchange
Huang & Chan (2014)	B	A	H	A	B	A	A	A	I	Close	Taiwan Stock Exchange
Huang & Tsai (2008)	B	B	H	A	B	A	A	A	C,H	Close	Taiwan Stock Exchange
Huang (2004)	B	A	D	B	C	A	A	A	C,H,I	N/A	Taiwan Futures Exchange; Singapore Exchange Derivatives Trading Limited
Ibikunle (2015)	B	A	H	A	A	A	A	A	H	Both	London Stock Exchange

(conclusion)

Paper	1	2	3	4	5	6	7	8	10	Type of CA	Stock Exchange analyzed
Inci & Ozenbas (2017)	B	A	D	A	B	D	A	A	C,I	Close	Borsa Istanbul
Inci et al. (2021)	B	A	D	A	B	C	A	A	C,F,I	Both	Chilean Stock Exchange
Inci (2020)	B	A	E	A	B	C	C	A	C	Close	Borsa Istanbul
Jeannin et al. (2008)	A	A	I	D	E	E	F	C	B	N/A	N/A
Kadioglu (2021)	B	A	H	A	B	A	A	A	F,G,I	Both	Borsa Istanbul
Kairys et al. (2000)	B	A	H	A	B	A	A	A	C,I	N/A	Riga Stock Exchange
Kalay et al. (2002)	B	B	H	A	A	B	A	A	C,F,I	N/A	Tel-Aviv Stock Exchange
Kehr et al. (2001)	C	A	G	A	A	A	A	A	C,H	Both	Fankfurt Stock Exchange
Khil et al. (2012)	B	A	H	A	B	A	A	A	F,H	Open	Korea Exchange
Lam & Tong (1999)	B	A	D	A	A	B	A	A	C,I	N/A	Hong Kong Exchanges and Clearing Market
Lauterbach & Wohl (2001)	C	A	G	A	A	A	A	A	C,I	N/A	Tel-Aviv Stock Exchange
Lee & Lee (1998)	C	B	H	D	E	E	F	B	I	N/A	N/A
Lei et al. (2020)	B	A	H	A	B	D	A	A	C,D,F	Both	Hong Kong Exchanges and Clearing Market
Lespagnol & Rouchier (2018)	A	A	D	D	E	E	F	B, C	E,I	N/A	N/A
Li et al. (2021)	B	A	H	A	B	B	A	A	C,I	Close	Shanghai Stock Exchange and Shenzen Stock Exchange
Liu et al. (2014)	C	A	I	D	E	E	F	C	E	N/A	N/A
Liu (1994)	B	A	F	A	B	A	E	B	I	N/A	Taiwan Stock Exchange
Ma et al. (2020)	B	A	H	A	B	A	A	A	H	Close	Shanghai Stock Exchange
Ma (2022)	B	A	I	A	A	C	A	A	I	Close	Hong Kong Exchanges and Clearing Market
Madhavan & Panchapagesan (2000)	C	A	G	A	A	A	A	A	C,I	Open	New York Stock Exchange
McKeagan (2009)	B	B	E	A	A	D	F	D	I	N/A	Montreal Stock Exchange
Mike & Farmer (2008)	C	A	D	A	A	B	A	C, D	B,I	N/A	London Stock Exchange
Ohta (2006)	B	A	G	A	A	A	A	A	C,D,F	Both	Tokyo Stock Exchange
Orhun (2020)	B	A	H	A	B	A	A	A	C,F,I	Close	Abu Dhabi Stock Exchange
Pagano & Schwartz (2003)	B	A	H	A	A	B	A	A	F,I	Close	Euronext Paris
Pagano et al. (2013)	B	A	G	A	A	A	A	A	C,F,I	Both	Nasdaq Stock Exchange
Pinfold & He (2012)	B	A	H	A	B	A	A	A	C,I	Close	New Zealand Stock Exchange
Rajesh & Gaikwad (2014)	B	A	H	A	B	A	A	A	C,I	Open	National Stock Exchange
Reboredo (2012)	B	A	H	A	A	A	A	A	I	N/A	Spanish Stock Exchange
Ronen (1998)	B	A	D	A	A	A	A	A	C,I	Open	Tel-Aviv Stock Exchange
Selten & Neugebauer (2019)	A	A	F	D	E	E	F	C	E	N/A	N/A
Shnitzlein (1996)	A	A	C	D	E	E	E	C	I	N/A	N/A
Spatt (2014)	B	B	I	B	A	E	F	D	I	Both	N/A
Theissen & Westheide (2020a)	B	A	D	A	A	B	A	A	C,D,F	Both	Deutsch Börse
Tian & Guo (2017)	B	A	D	A	B	B	A	A	C,F,I	Open	Shanghai Stock Exchange
Tran (2017)	B	A	G	A	D	C	A, B	A	C,F,I	Both	Ho Chi Minh City Stock Exchange
Tsiakas (2008)	C	A	C	B	B	B	A	A, C	C,E,F	Open	London Stock Exchange, Paris Bourse, Frankfurt Stock Exchange, New York Stock Exchange, Nasdaq Stock Exchange
Twu & Wang (2018)	B	A	D	A	B	C	A	A	A,I	N/A	Taiwan Stock Exchange
Wohl (1997)	A	A	H	D	E	E	F	C	E	N/A	N/A
Xiao & Yamamoto (2020)	B	A	F	A	A	E	A	A	C,D,H	Open	Tokyo Stock Exchange
Zhang et al. (2018)	C	A	I	D	E	E	F	B	A	N/A	N/A

Source: Elaborated by the authors

4. OVERVIEW AND RESEARCH AGENDA IN CALL AUCTION

Here we present the approaches identified about CA that includes: market anomalies, asset characteristics, information, liquidity/volatility, market, order, price, trading system and trader/trading. Moreover, we suggest new research approaches as showed in the Table 4.

Table 4 – Overview and Research agenda

Theme	Findings related to CA	Some papers related	New approaches
Market anomalies	Studies over gap and magnet effect from the CA perspective	Abad & Pascual (2007); Ceretta & Silva (2017)	The impact of the CA on different anomalies, such as calendar effects, in different markets.
Asset characteristics	Researches over classes of the type of stock issued and expiration date of some contracts	Alderson & Fraser, (1993); Hsieh (2009)	The behavior of the trading of assets as a function of the expiration of derivatives, of the different classes of shares, of the entry of assets in market indices during the CA.
Information	Infomation asymetry, insider trading and overnight information from the CA perspective	Brünner (2019; Tsiakas (2008)	Effect of information asymmetry on the CA. Investigation of insider trading patterns considering the CA. Developement of pricing models in CA considering information asymetry for distincts markets.
Liquidity and volatility	Analysis of the CA as a good instrument for the reduction of volatily and the action of market makers to improve liquidity around the event.	Aitken et al.(2005); Inci & Ozenbas (2017); Lam & Tong (1999); Lespagnol & Rouchier, (2018) Mike & Farmer, (2008); Theissen & Westheide, (2020); Tian & Guo (2017); Twu & Wang (2018)	Investigation of the liquidity and volatility of asset prices related to CA in emerging markets.
Market	Social responsability, market development and regulatory issues associated with CA.	Haeberle & Todd Henderson (2016); Inci (2020); McKeagan (2009)	CA efficiency as a governance and market development mechanism.
Order	Quantity discovery, order placement, order revelation, imbalance of orders, behavior of orders at witching days cosidering the CA	Barclay et al.(2008); Chakraborty et al.(2012); Ellul et al. (2005); Gu et al. (2008)	Investigation of the effect of CA on order placement, discovery and revelation in different markets, including emerging ones.
Price	Price Discovery, price clustering, price limits, overreaction, price formation, costs and dividends, price components	Cheng & Kang (2007); Greene & Watts, (1996); Kehr et al., (2001)	Analysis of price behavior around CA. Efficiency of the CA in the formation of fair prices.
Trading system	Change, efficiency and transparency CA	Amihud et al. (1997); R. P. Chang et al., (2008); P. L. Chelley-Steeley (2008); Hagströmer & Nordén (2014); Kadioglu et al. (2015); Orhun (2020); Pinfold & He (2012)	Analysis of the effect of changes from continuous auctions to CA in uninvestigated markets.
Trader/Trading	Trader´s behavior, high-frequency-traders, strategies used, and the information manipulation around the CA	Huang & Chan (2014); A. Ma (2022)	Analysis of market manipulation given the CA. Investigation of traders' behavior in the face of CA. Analysis of informed and uninformed traders around the CA

Source: Elaborated by the authors

5. RESULTS

This section presents the set of results identified with the aid of the bibliometrix (software R) and folium (Python) packages. Next, we detail the results obtained.

5.1. Result by criterion

Regarding the results by criteria according to table 2, it was found that 76 articles operated with empirical analysis, while 11 of the articles implemented both the theoretical and empirical approaches. Another important finding of this bibliometric study is that 79 articles used quantitative methods in the analysis, while one article combined quantitative methods with a survey and the remaining works focused on qualitative methodology. In the case of classification by object of study, the tabulation focused on identifying the central element of the investigation and classifying it according to a single element, even if there are relationships with other events. Table 5 presents the results for this classification.

Table 5 – Number of papers by object

Objects	Number of papers
Trading system	32
Liquidity/Volatility	15
Price	14
Order	8
Trader/Trading	8
Information	3
Market	3
Anomalies	2
Characteristics	2
Total	**87**

Source: Elaborated by the authors

Regarding the scope, 72 studies investigated the phenomenon in only one country, 3 articles addressed several countries and one focused on a region, while the remaining 13 did not reference or specify the region. Regarding the stage of development of the countries, the MSCI report (2011) was used, highlighting the fact that we classified the work that investigated the Riga Stock Exchange (Kairys et al., 2000) as an emerging country, as Latvia, which is the host country for this exchange, does not appear in the report. Thus, there remained 35 studies that analyzed developed countries, 39 that analyzed emerging countries and 1 study that analyzed a frontier market, this classification being adopted by the MSCI report and which understood the fact that the market does not allow short selling or stock lending, and the remaining works (11 articles) did not inform the context or the research did not apply to this classification.

Furthermore, with the help of the Python folium package, we developed the map indicated in Figure 1 that presents the grants analyzed in our study. We note that there is a variety of evaluated exchanges, with some markets being analyzed more than once, the most constant being the Taiwan market with eight papers, followed by the London market with six.

Figure 1 – Stock Exchanges evaluated by works

Source: Elaborated by the authors with the *folium* package

Regarding the technics, we note in table 6 that most of the articles presented their results using descriptive statistics aligned with others that included multivariate regressions,

autoregressive models, among others.

Table 6 – Number of papers by technic

Technic	Number of papers
Descriptive, Others	17
Others	12
Descriptive, Parametric/non-parametric difference tests, Others	11
Parametric/non-parametric difference tests, Others	5
Math modelling	5
Descriptive, OLS	5
Descriptive, OLS, Others	4
Time series analysis	2
Parametric/non-parametric difference tests, OLS, Others	2
Others	2
Descriptive,Logit/Probit orderned, Parametric/non-parametric difference tests, Others	2
Descriptive, Math modelling, Parametric/non-parametric difference tests	2
Descriptive, Parametric/non-parametric difference tests	2
Others	16
Total	**87**

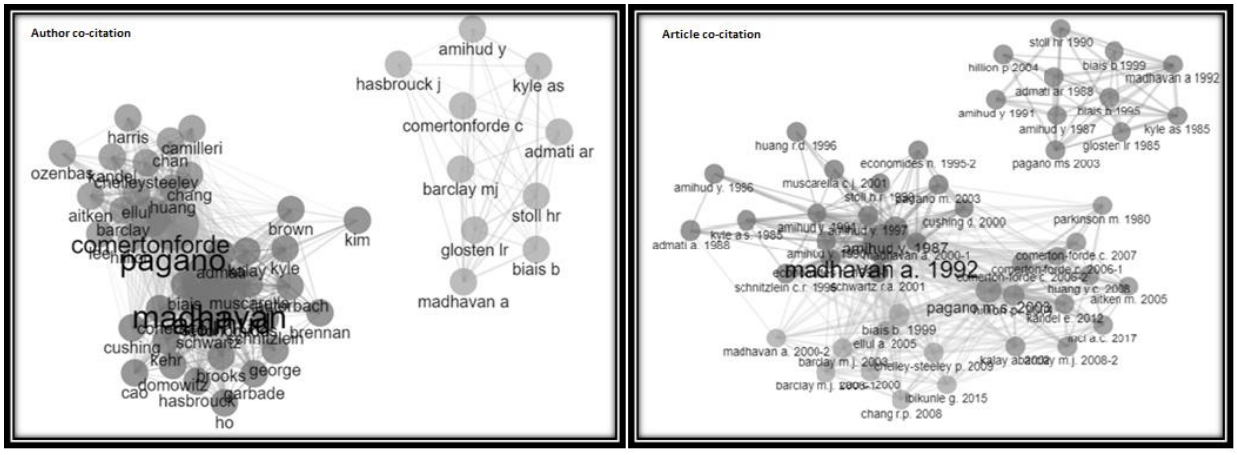
Source: Elaborated by the authors

Also, the use of CA involves different times in the market, whether at the opening, closing or throughout the day, with some markets presenting separate trading sessions. Grouping the cases of separate sessions in opening and the studies that simulated continuous sessions of the instrument, classified as both, our tabulation considering the time of the CA, found that 20 works considered the closing, 19 the opening, 19 both of them and 29 are not applicable

5.2. Co-citation networks

We also observed the existence of isolated patterns of agglomeration both for the network of authors and of articles, as evidenced in figure 2. This result indicate that there may be groups that study specific themes.

Figure 2 – Author and article co-citation network



Source: Elaborated by the authors using the bibliometrix package

5.3. Co-occurrence of keywords

The results here give indications of how the themes previously presented can be grouped. Observing the word clouds of keywords, it appears that the focus is on approaches such as liquidity, volatility, price discovery, among others. Figure 3 present such results.

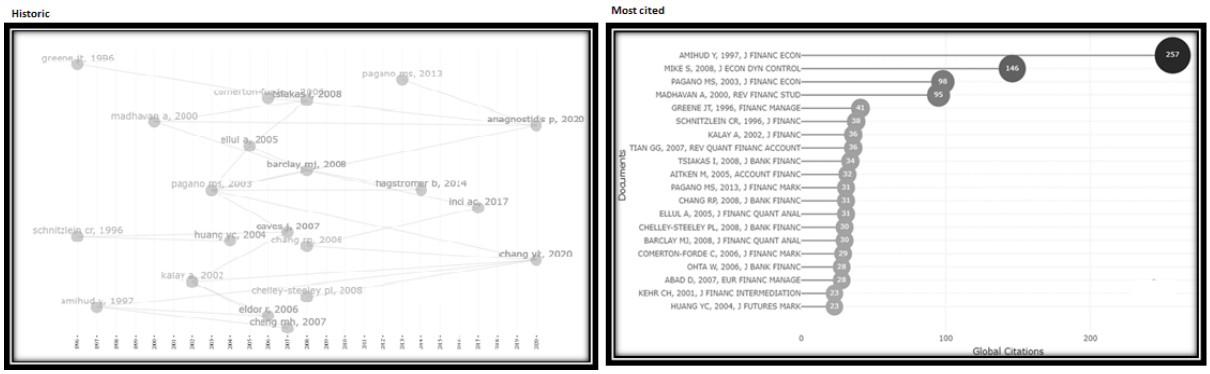
Figure 3 – Word Cloud: Author´s keyword and Keyword plus

Source: Elaborated by the authors using the bibliometrix package.

5.4. Historic and most cited articles

The analysis of the evolution of research development and the most cited articles reinforced the relevance of seminal works such as those of Amihud et al. (1997), Madhavan & Panchapagesan (2000), Pagano & Schwartz (2003) and Kalay et al. (2002) as show in Figure 4.

Figure 4 – Historical citation direct network and most cited articles



Source: Elaborated by the authors using the bibliometrix package.

6. FINAL CONSIDERATIONS

This bibliometric review on one of the market microstructures used in several exchanges around the world, the CA, has the main purpose of suggesting new ways of researching the effects of this instrument on the markets. Thus, the relevance of this work lies in the fact that investigating the approaches of research on CA can provide elements for a better understanding of the effects of these instruments on markets with different particularities.

The results found extended to the presentation of research overviews that involve issues such as market anomalies, information asymmetry, market quality, price-related issues such as price discovery, development of trading strategies and the investigation into adoption of the CA mechanism comparing it with the previous instruments, however with limitations that can extend to the challenge of obtaining the data of the identified periods. In addition, we reveal

that studies on such instruments are concentrated in few markets, although the adoption of these instruments is an event that occurs in several stock exchanges, including the Brazilian one, in addition to the fact that such approaches signal distinct opportunities for investigation that not only those related to the analyzed markets, such as, for example, evaluating the efficiency of the instruments on the formation of market prices.

It was also pointed out that the co-citation networks revealed the existence of isolated clusters that may indicate thematic axes researched by specific groups.

These findings contribute to the expansion of research over CA, with investigations that can explore markets not yet studied, such as uninvestigated approaches, thus fostering the understanding of market microstructures.

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