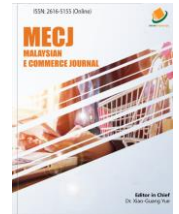




ISSN: 2521-0505 (online)
CODEN: MECJBU

Malaysian E Commerce Journal (MECJ)

DOI: <http://doi.org/10.26480/mecj.03.2019.11.17>



REVIEW ARTICLE

AGRICULTURAL DERIVATIVES: THE USE OF BIBLIOMETRICS AND SOCIOMETRY

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ARTICLE DETAILS

Article History:

Received 10 October 2019
Accepted 18 November 2019
Available online 4 December 2019

ABSTRACT

This paper aims to map and analyze the main contributions of current researchers on agricultural derivatives through bibliometrics and sociometry techniques. Data for the analysis were collected from the Web of Science (WoS) core collection. The articles were searched using the terms "agricultural derivatives", "options market", "futures market" and "swaps market". From the refinements adopted, 321 articles were used that make up the research sample. For data analysis, VOSviewer software was used. The results demonstrated a range of work by Chinese researchers on agricultural derivatives. It is evident that the search for agricultural derivatives is associated with the process of financing of production, price risk management and marketing mechanisms for agricultural products. We conclude that agricultural derivatives help producers in managing their business, making them safer. Of course, adopting risk management for companies is also essential, whether they are linked to agricultural production, trade, industry, distribution, financial or agribusiness institutions.

KEYWORDS

Futures Market, Option Market, Swaps Market.

1. INTRODUCTION

In Brazil, the derivatives market is relatively recent. In 1986, the Mercantile and Futures Exchange was founded and the São Paulo Stock Exchange Index contracts were launched. In 1991, the Mercantile and Futures Exchange was merged with the São Paulo Commodities Exchange, resulting in the Commodities and Futures Exchange (BM&F) [1]. Thus, derivative contracts were supplied by the São Paulo Commodity Exchange, which was limited to the spot commodity market. Over time, other institutions began to offer forward, futures and options contracts. Today, B3 (a merger between BM&FBOVESPA and the Private Securities Central Custody and Settlement - CETIP) is the main controlling body not only of shares and securities traded, but also derivative contracts over a broad portfolio options: commodities, assets, rates, and currencies [2].

Unlike others, the agricultural sector is known to present constant variations in product prices, due to exogenous factors related to production, climate forecasts, exchange, domestic consumption and availability of related goods, and there is a need for protection against these variations [3] [4] [5] [6]. Commercialization is one of the most crucial points of agricultural production, there is a lot of uncertainty at the time of commercialization, market fluctuations lead many to sell their products faster, without looking for a new alternative than for a better gain [1]. Derivative markets have emerged out of concern for efficient mechanisms to protect against price fluctuation risk. One of the main categories of derivatives is agricultural derivatives, which have as their object agricultural commodities such as coffee, corn, soybeans [7] [8].

There are several reasons for operating in derivative markets, ranging from hedging and leverage to speculation and arbitrage [7]. Risk aversion, attraction or neutrality behavior is a personal trait. Therefore, research that may relate the use of derivatives to producer behavior in relation to risk seems to be advisable, ie, derivatives as an instrument to minimize price risk [6]. In this context, the following problem arises: What is the focus of studies on agricultural derivatives? Probably, the studies focus on

risk management, especially price risks. But in addition to risk management, derivatives are used by speculators to achieve profitability based on the knowledge and practices gained from trading in these markets. It is worth noting that we still have the participation of the arbitrators. They take two positions on two or more instruments in order to lock in gains. Given the importance of derivatives for risk management, this paper aims to map and analyze the main contributions of current researchers on agricultural derivatives through bibliometrics and sociometry techniques.

2. CONCEPT OF AGRICULTURAL DERIVATIVES

Derivative means financial transactions whose trading value derives from other assets, called underlying assets, for the purpose of assuming, limiting or transferring risks. They cover a wide range of operations such as: forward; future; options and swaps, hedging of both commodities and financial assets such as interest rate, future index quotes, etc. [1]. The derivatives are financial instruments whose price derives from the price of another asset, the underlying asset. These instruments are formalized from contracts in which one party makes a purchase and the other party sells a particular asset at a pre-determined price and quantity for settlement at a future date [9]. Historically, derivatives have arisen from the practical need for producers, traders and other market players to hedge against risk. Later came the derivatives of financial assets, such as interest rates, stock market indices, inflation indices, currencies, etc. [10].

Globalization has stimulated the adoption of various financial mechanisms to aid decision-making by individuals. In this context, the derivatives market has emerged as a form of protection against the risk that economic agents and investors face when making decisions based on future events. These mechanisms will be effective and assertive if the market in which they operate is efficient [2]. Using derivatives as a hedge allows producers to hedge against changes in the market price of their products. Through futures and options contracts these producers are able to lock in the price at which they will sell their product, thus ensuring that it is sufficient to cover their costs and still guarantee a profit margin [3]. These new

mechanisms have been indicated to reduce risks due to fluctuating agricultural prices. Risk management arises in agriculture as a necessity as it is mainly subject to two risks the climate and the Market [1].

The advantages of trading derivatives can be significant for an investor. Most economic agents make decisions based on their market knowledge, historical events, and future events. The uncertainty of future asset prices is one of the main factors that are taken into account when making an investment. However, uncertainties may be mitigated by the use of derivatives, which have value derived from market asset prices (hedge operation) [2]. Derivatives operations are also used to manage the risks taken by companies when engaging in various operations. By managing these risks, the company transfers them to someone willing to take and manage them by engaging in a derivatives operation [10]. Risk is inherent in any activity in personal, professional or organizational life, and may involve loss as well as opportunity. Thus, risk management is critical to the health of the organization, be it industrial, commercial, service, or agricultural [3].

The aforementioned authors also infer that, due to the risks inherent in agribusiness, it is of utmost importance to manage companies in the agricultural sector with management tools that enable an adequate treatment of the potential risks to which the company is exposed. The derivative market can be assigned an extremely important social function, transferring risk between agents. In this approach, derivatives become tools to cope with macroeconomic and microeconomic uncertainties and play a role in stabilizing and coordinating the expectations of agents and strongly attenuate the transmission of financial instability to the production sphere. The derivative market can be assigned an extremely important social function, transferring risk between agents. In this approach, derivatives become tools to cope with macroeconomic and microeconomic uncertainties and play a role in stabilizing and coordinating the expectations of agents and strongly attenuate the transmission of financial instability to the production sphere [11].

3. TYPES OF DERIVATIVES

Derivative instruments can be divided into two groups: the first generation are the traditional ones: forward contracts, futures, options and swaps; and the second generation that is the combination of two or more traditional instruments [1]. The most common derivatives are forward contracts - which are contracts negotiated directly between interested parties, in which there is a commitment to deliver or receive a commodity with a fixed term and price, they are not nor guaranteed by the exchanges, which hinders their liquidity. And Futures Contracts - which is a natural evolution of forward contracts [10]. Credit derivatives are financial instruments used to mitigate or take risks by hedgers or speculators. Contracts to guarantee maximum interest rates or minimum rates can be classified under this heading. The combination of two derivatives is called a collar. Credit-backed securities (receivables) also fall under this item, as does the exchange of cash flows (swaps) [10].

For Farhi (2010) derivatives are priced, bought and sold without any change in ownership of the asset to which it relates. This way agents can sell what they don't own or buy what they don't want to own. If there is pressure from one-way speculative trading in the derivatives market, there are necessarily agents who take the other end, either to hedge risk in commercial or financial transactions or to arbitrage [11].

There are three types of economic agents that operate with derivatives: 1) the hedger (its main objective is to hedge against fluctuations in commodity prices, reducing its risk exposure); 2) the speculator (participates in the market for the purpose of making a profit from buying and selling derivatives by betting on trends or relying solely on their beliefs, taking on the risks transferred by the hedgers) and the arbitrator (its purpose is to make profits with the price oscillation between two markets, buying the derivative in the market in which it is cheaper and subsequently selling the same derivative in the market in which it is more expensive [12].

4. FORWARD DERIVATIVES AND FUTURE MARKET

The forward market is similar to the futures market since in both markets there are agreements to buy and sell an asset at a future date at a previously established price [13]. Forward contracts are private agreements between two financial institutions or between an institution and one of its corporate clients. Traded over-the-counter, it is similar to the futures contract in that there is a commitment to buy and sell an asset at a certain price and at a certain future date [9]. In the forward market, the parties will settle the transaction by physical delivery or by the financial settlement itself on the delivery date agreed between the parties. It is a purchase and sale transaction of an asset with an agreed value on the zero date to be physically and financially settled in a future date, and the negotiation of the due date and price is freely concluded between the parties [13].

The futures contract represents a commitment to buy or sell a particular asset at a specific future date for a predetermined price, conditions such as terms, contract size, place of delivery, guarantee margin, etc., are established by the Exchange [9]. It can be said that a futures contract is nothing more than a standardized forward contract. It specifies the product so as to define a quality standard for the traded goods, the contract negotiated quantities, specific delivery points, as well as the future settlement date of the contract and delivery, and standardization gives the higher liquidity futures contracts [14]. For the future market to exist, it is essential that certain conditions are met, such as the possibility of standardization and homogenization of the product; the existence of large supply and demand for this product as well as some price volatility; a transparent spot market with no monopoly formation or government constraint; and stable marketing rules [15].

In short, futures markets provide for the pricing of products by negotiating contracts that will be settled at a future date. By buying or selling these contracts, in the trading sessions, the agents involved in the negotiations guard against fluctuations in the value of agricultural marketing [1]. Futures markets are basically organized markets in which standardized commitments to buy or sell a particular commodity, financial asset or economic index are made for settlement at a predetermined future date [14]. The futures market should be understood as a way to control the risk generated by price fluctuations and that, for agricultural commodities, it would also be related to climate, credit availability, and operationalization [15]. Commodity producers can benefit from these markets: farmers have the ability to set the selling price of a given commodity for a future date, thus eliminating the risk of falling commodity prices. The farmer, who in this case represents the seller, is protected from possible decreases in the price of his product and the buyer can be protected from possible price increases [12].

In the absence of futures markets, the producer is exposed to risks. Because the commercialization of production will depend on supply and demand in the postharvest period. On the other hand, the industry that needs raw material is also exposed to price risk [9]. In this context, the producer concerned about the price drop after the harvest and the industry about the price increase needs a negotiation as the futures contract in order to minimize risks. Although futures contracts have a due date, it is always possible for any of the contractors to close their position before the due date, especially if the market moves against the initial expectations for the price to rise or fall. underlying asset [12]. The order of purchase or sale of futures contracts is issued by an accredited broker and on behalf of his client, and it is important to note that such trading takes place at times set by the exchange itself [15].

Participating customers can make purchases or sales even if they do not have the money or merchandise to be delivered, as only a guarantee is required that they will pay their future commitments. The guarantee margin may be deposited in cash, letter of guarantee, government securities or other assets at the discretion of the exchange [14]. Margins are intended to avoid default by minimizing credit risk. When negotiating the purchase of a contract, the broker requires the investor to deposit funds in a margin account, this amount is called the initial margin [9]. In short, to mitigate the risk of breach of contract, futures markets have

developed a mechanism called daily adjustment, whereby sellers and buyers adjust the difference between the previous and current futures prices on a daily basis, according to increases or decreases in price. the future price of the goods. Having negotiated contracts for a future time, if, in the subsequent trading session, the price of the maturity in question changes, sellers and buyers will have to adjust their positions in accordance with the new reality, paying or receiving a financial amount related to the future price variation, dealing with from the margins [14].

The clearing house assists the exchange and acts as an intermediary in future transactions. Its function is to keep track of all transactions that are performed during a day so that it can calculate the net position of each of its members [9]. In one survey, it was evaluated three price variability management strategies to demonstrate the best way to mitigate risks and losses on the part of the agricultural producer. The strategies are as follows: spot market trading, short futures (traditional hedge) and short futures vs spot markets. The futures trading strategy (Hegde) was the most efficient compared to the others, as it allowed producers a better result in the period and the spot market strategy was the least effective due to the devaluation of the commodity in the period analyzed [16]. The application of futures contracts allows the advance purchase prices of inputs, important to adjust strategies and improve the operational organization of a company [2]. Thus, input companies already trade and use futures contracts to lock prices, known as barter operations.

The principle of the hedge is to assume in the futures market a position opposite to that of the spot market so that any losses in one market will be offset by gains in the other market. It can then be classified as hedging all those with any commercial interest in a particular commodity who seeks to defend themselves from adverse price changes, such as farmers, traders or any other companies that carry out operations whose financial outcome depends on the price behavior of the commodity. product under negotiation [14]. However, the derivatives market, among them, futures market, is still little known among producers and has great potential to be developed, despite the significant volume of transactions [6].

5. OPTIONS MARKET

In the options market, the right to buy or sell a good for a fixed price at a future date is negotiated. The person who acquires the right must pay a value to the seller, this value does not deal with the price of the good, but rather a value (known as a premium) so that one can exercise the possibility (option) of buying or selling said well in a future date at a previously agreed price [13]. An option is defined as a contract between two parties, a buyer and a seller, in which the buying party assumes the right, but not the obligation, to buy or sell a certain amount of the underlying asset at the strike price at a pre-determined date. established or at any time by that date. The selling party of the option is in a position of holding under the buyer's right. As compensation for having to stay in this state, the seller demands from the buyer a certain amount (premium), which is referred to as the option price [12].

Thus, the option buyer (holder) will always have the right to exercise his right to purchase but not the obligation to exercise it, while the option seller (launcher) will have to exercise the option if the holder chooses for exercising the contract [13]. There are two types of options: calls and puts. In this contract, there is the holder (who buys the right) and the launcher (who sells the right) [9]. A call option entitles the buyer (holder), but not the obligation, to purchase the underlying asset at the agreed price for a specified period of time and by paying a premium to the seller of the option. The call option seller is required to surrender the long position of the underlying asset at the agreed price if the buyer decides to exercise the option contract. A put option entitles the buyer (but not the obligation) to sell the underlying asset at the agreed price for a specified period of time and by paying a premium to the seller of the option. The put option seller is required to deliver a short position at the agreed price if the buyer decides to exercise the option contract [12].

With the emergence of options markets, derivatives of these assets appeared, giving investors new possibilities for structured operations, including for agribusiness. Futures and options markets should be

understood as a powerful tool in commodity cost and price management, integrating with the physical market. The options market is an operating modality in which no object shares are traded, but rights over them. Thus, whoever buys (holder) the call or put option has respectively the right to buy or sell (whether or not the contract is assumed), and on the other hand, who sells (launcher) does not make a decision waiting for the the holder's decision whether to take over the contract or trade in the market and lose the prize. Lack of caution or excessive ambition in derivative operations has already brought losses to companies and banks leading to bankruptcy. On the other hand, while offering risks, derivatives also serve as portfolio protection or as protection for a modest coffee producer [10].

6. CREDIT DERIVATIVES (SWAPS)

The English word swap can be translated as swap, ie by swapping one thing for another. What is traded in financial swaps are financial assets: debt, investments, currencies, indices, etc. Of all types of swaps, the interest rate swap is not only the most widespread derivative financial asset but also the most traded in the world [17]. This type of financial instrument can be used as a risk management tool (to hedge financial risks), to exploit arbitrage opportunities, or to speculate (betting on the evolution of some market variables, such as an interest rate) [18]. Swaps is a profitability trading instrument. For example, if a company has an inflation-adjusted debt that is an exporter (revenues in US dollars), it may, by means of a swap contract, transfer the debt correction to the US dollar [19].

The main functions performed by swaps today are: a) risk management, swaps allowing exchange of risk exposures enable a better balance in the management of financing and investment portfolios; b) reduction of short-term financial costs, swaps allow short-term interest rates to be reduced; c) access to other markets, for some companies, the swap also indirectly allows these companies to dive into other markets, due to their characteristics due to regulation, liquidity or degree of development [13]. An interest rate swap is a financial agreement between two parties who wish to exchange interest payments arising from the issuance of bonds or bonds made on different bases (interest rate: fixed and variable), without exchange. principal debt and operating in the same currency [17]. A swap is an agreement between two parties to exchange financial flows in the future for a defined period of time. Swap contracts are customized and traded over the counter. This type of financial agreement sets out the dates on which cash flows should be paid and how they should be calculated.

Typically, at the time the contract is initiated, at least one of these series of cash flows is determined by a random or uncertain variable, such as an interest rate, an exchange rate, a stock index, or a commodity price [18]. As of the early 1990s, banks (swap traders) began selling swaps based on commodity price indices, including agricultural commodities in formal exchanges or subject to any regulation [20]. They also infer that when banks sell commodity swaps, they think of protecting their price risks by buying futures netting contracts. Credit default swap spreads (CDS) have been increasingly used as a measure of credit risk in practice. CDS is mainly driven by key variables such as firm volatility and leverage, market conditions and investor risk aversion. However, excess demand and liquidity are important additional factors (Tang & Yan, 2017).

Normally, the swap transaction is between a company and a bank, with contract registration with Cetip or B3. The base volume is fictitious, ie it does not involve principal obligations between the parties and is only for the calculation of profitability flows. The settlement is effected at maturity at the net value: the losing party pays the balance to the winning party. However, as it is a bilateral contract, it can be adjusted to the client's needs (term, fees, etc.). And the bank usually hedged the transaction in other markets, embedding this operating cost in the flow rate of the creditor [19]. In swap contracts the principal is not paid, settling only the difference between the flows of the one who suffers the loss to the one who obtains the gain [13].

7. METHODOLOGY

The present study makes a bibliometric and sociometric analysis of

agricultural derivatives. The bibliometric analysis aims to map the field of study and analyze the level of academic productions, the year of publication, main authors, institutions, knowledge areas and the impact factor of journals and methodological components of publications [21]. Bibliometrics and sociometry methodologies are widespread in Brazil and worldwide. Fulfilling the function of carefully mapping the scientific productions on a given theme, emphasizing the main characteristics, the networks of authorship, co-authoring, citations, institutions, and countries that produced on the subject, etc. [22]. Data for the analysis were collected from the Web of Science (WoS) core collection, as this is considered one of the major international research databases and because the journals present in it are peer-reviewed [23] [24].

The articles were searched using the terms “agricultural derivatives”, searched from the title, from 2010 to 2019, WOS 7 articles were found. To broaden the range of publications, we sought the citations report and found 82 publications, delimiting only articles, totaling 60 articles. Then, using the term “options market” searched from the title, adopting the same previous period and articles only, we found 55 articles. Adopting the same search criteria, the term “futures market” found 203 articles and the term “swaps market” found 4 articles. From the refinements adopted, 321 articles were used that make up the research sample. For data analysis, VOSviewer software was used. VOSviewer is a computer program that maps relevance maps based on distances, grouped keywords of texts, titles, document summaries, and references, being essential for building networks in bibliometric and sociometric research [22].

8. RESULTS AND DISCUSSION

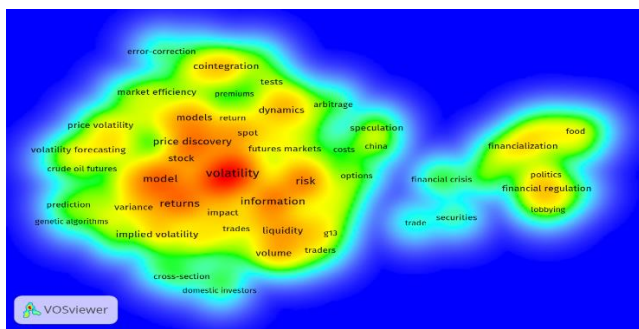


Figure 1: Keyword Networks. The higher the number of occurrences, the more intense red is the color.

Based on the sample data, it was possible to analyze the main characteristics of the publications of the WOS database, from 2010 to 2019. To understand the subjects most addressed by the authors, according to the research sample, the keyword network was built. It can be seen from, Figure 1, that the volatility keyword is the most prominent (intense red color) with 56 occurrences; followed by the word prices, with 41 occurrences; information and model both with 34 occurrences; risk with 32 occurrences; returns with 31 occurrences; financialization and commodity futures both with 15 occurrences, among other words. Of the seven (7) papers found through the term “agricultural derivatives” with the search restrictions described above, six (6) papers stand out, one of which emphasizes other subjects.

The paper entitled “The Interaction of Speculators and Index Investors in Agricultural Derivatives Markets” by authors Guillemot, Ohana, and Ohana [20], analyzing the interaction of index speculators and investors in agricultural derivatives markets. They have shown that speculators are sensitive to commodity-specific fundamental information, and their endogeneity in commodity markets makes it difficult to estimate their impact on the market. They also pointed out an investor’s impact on some agricultural prices and suggest that the synchronicity between speculative positions and index positions is an important determinant of this impact. And they concluded that the index’s investment flows are offset by trading actors, not speculators.

Already the work of Jennifer Clapp and Eric Helleiner [25] entitled “Troubled futures? The global food crisis and the policy of agricultural

derivatives regulation” emphasizes the global food crisis and the policy of regulating agricultural derivatives. The authors comment that the role of agricultural derivatives markets may have been neglected in the past because of their abstract nature and apparent lack of connection between food production and physical distribution, which is the focus of commodity chain analysis. They demonstrated how the 2007-2008 global food crisis highlighted the need to devote greater analytical attention to financialising global agriculture and food. They also presented how US agricultural interests were the main driving forces behind the pressure to regulate agricultural derivatives markets.

We also have the work of Assa [26], with the theme “Financial engineering in agricultural pricing derivatives based on demand and volatility”. The author proposes a financial engineering framework for modeling commodity prices based on market demand processes and functions. The results showed that commodity derivative prices are strongly affected by the elasticity of volatility and, consequently, the elasticity of market demand. They also pointed out that different groups of agricultural commodities have different elasticities of demand and volatility. We have seen the interference of speculators, as well as the elasticity of volatility and market demand on commodity price variability, and the need for regulation of agricultural derivatives and US power in this process. But, [9] explains that the participation of speculators in the market allows liquidity of contracts since it is not always possible to find someone interested in the underlying asset willing to take the opposite position of the contract.

Finally, it is worth mentioning 3 works by Brazilian researchers, starting with two articles published in the magazine Custos e Agribusiness Online and one in the magazine Ceres. With the title “The Agricultural Derivatives as a Tool for Price Risk Management”, the authors [3] present the advantages of using derivatives in agribusiness and, thus, encourage their use by other producers as a tool for risk management. They concluded that the use of agricultural derivatives and risk management represent benefits not only for producers who can lock the selling price of their products but also for society and the economy as a whole, as by working with The lower degree of risk is the incentive for investments, which may result in increased production and employment.

The article “Costs and Benefits of Agricultural Derivatives: Following the Use of a Butterfly Put in Improving the Result in Coffee Contracts” by Toledo Filho, Cardoso and Santos [10] also contributed to the use of agricultural derivatives. As a result of the research, they presented how a derivative can contribute, with low cost, to increase the result of the sale of a commodity. They sought to give an overview of the main derivatives of the market, mainly options, with emphasis on the Put Butterfly operation, which is used as a lock for an increase in coffee operations. The aforementioned authors have shown that with a small cost of net premiums paid, the producer will have an additional profit on the sale of the commodity if prices are within a certain range at maturity. Although the transaction is not set up and registered with B3, options traded on the stock exchange are used. Its loss on the transaction will not exceed the disbursed premiums, which is why the Exchange will not require a guarantee margin, as there are no risks. For this operation, we advise the investment bank or brokerage firm.

It is understood that the options market can be used practically by farmers to minimize price risks. The great advantage is the limitation of losses related to the trading of options contracts, ie the premium. The authors [6] published the article entitled “Agricultural derivatives as a mechanism for trading soybeans in Rio Verde, Goiás State, Brazil” in order to analyze the use of agricultural market derivatives in soy trading operations, and their implications, in order to understand the adequacy of these mechanisms to producers’ attitudes, to reduce risks due to product price variations. The results showed that commercialization through agricultural derivatives is not a usual practice among soy producers, although such mechanisms are known by most. For, in the perception of most producers, derivatives do not meet their expectations to minimize price risk, even among those who use these trading mechanisms.

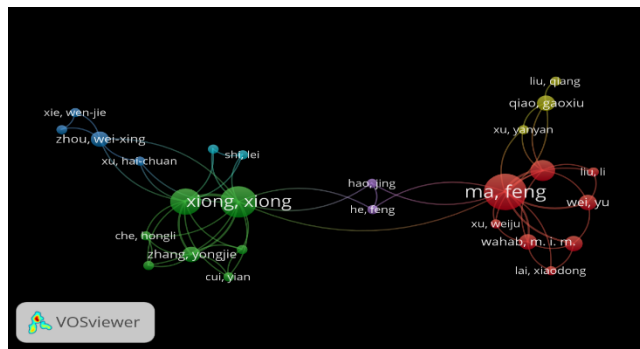


Figure 2: Authors Network. The items are represented by their label and a circle. The size of the label and the circle of an item are determined by the weight of the item, the larger the circle, the more cited. The color of an item is determined by the cluster to which the item belongs. Lines between items represent links, that is, in this figure, collaborations between authors.

In this work we note the risk aversion of farmers, that is, farmers need more information about the use of agricultural derivatives as a tool to minimize price risks. To verify the authors with more publications on the subject, we used the software VOSviewer to structure the authoring network, the results are illustrated in Figure 2. Figure 2 shows six clusters. In the red cluster, there is the relevance of researcher Ma, Feng teacher at the Department School of Economics and Finance of the Southwest Jiaotong University Department of Economics and Finance, located in Chengdu, China, with 6 articles and 43 records from citations, representing a research front. The green cluster featured Professor Xiong, Xiong of the College of Management and Economics of the Tianjin University, Tianjin, China, with 5 articles and 10 citations, and Zhang Hong-Wei of the School of Business of the Central South University, Changsha, China, with 4 articles and 10 citations, with another research front.

In the blue cluster, we highlight researcher Zhou Wei-Xing of the Department of Finances of the East China University of Science and Technology, located in Shanghai, China, with 2 articles and 49 citations. Finally, the less intense clusters, in the yellow cluster show researcher Qiao Gaoxiu of the Department of Statistics of Southwest Jiaotong University, Chengdu, China, with 2 documents and 3 citations. In the violet cluster, the researcher Hao, Jing, with 1 document stands out and in the light blue cluster the researcher Shi, Lei with 1 document and 3 citations. It is also noteworthy that the works of researcher Ma, Feng, are focused on the derivatives market routines. In the article entitled "The heterogeneous impact of liquidity on volatility in the Chinese stock index futures market" by Yanyan Xu (Department of Applied Mathematics at Xihua University); Dengshi Huang (Department of Finance of Southwest Jiaotong University); Feng Ma; and Gaoxiu Qiao [27], the objective was to investigate the heterogeneous impact of liquidity on volatility, using intraday Chinese stock index futures data, based on the quantile regression method.

The results showed that illiquidity can significantly increase right tail volatility, which appears to be a notable J-shaped relationship between illiquidity and futures market volatility in Chinese stock indices. They also comment that the effects of illiquidity on past negative returns (bad news) are much stronger than on past positive returns (good news). They also infer that when documenting the intraday pattern of illiquidity, the greatest impact of illiquidity on volatility occurs in the last half hour rather than the first half-hour of each trading day. It is noted that the derivative market studies by Chinese researchers are works involving graphical analysis, adopting mathematical and statistical instruments to analyze impacts, cause, and effect, variance, standard deviation, etc.

The following will be shown, Figure 3, the network of 46 countries that published on the subject. Looking at the network of countries, China stands out in a number of documents (80) and citations (562) shown by the size of the circle. However, the publications of this country are recent, from the 2000s, demonstrated by the lighter color (yellow). The United States also presented a significant result, with 63 documents and 503

citations, with the circle showing a green trend, showing that research on the subject began after 1950. Australia, with 27 documents and 190 citations, deserves mention.

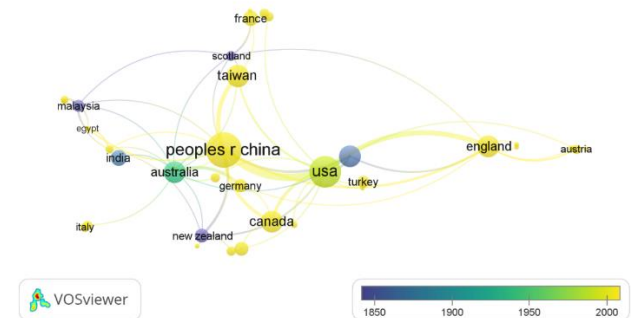


Figure 3: Countries Network. Items are represented by their label and, by default, also by a circle. The label size and circle of an item are determined by the weight of the item. The color of an item is determined by the cluster to which the item belongs. Darker colors (dark blue) represent older searches and lighter colors (yellow) represent current searches. Lines between items represent links, that is, in this figure collaborations between Countries.

On the other hand, South Korea, India, Malaysia, and Scotland represent research fronts, with publications on older derivatives from the 1850s to the 1900s (dark blue circles). It is worth mentioning, Figure 4, the Southwest Jiaotong University in Chengdu, China, with 7 documents presented 45 citation records; followed by Tianjin University in Tianjin, China, with 6 documents and 12 citations; Sungkyunkwan University in Seoul, South Korea with 6 documents and 55 citations, etc.

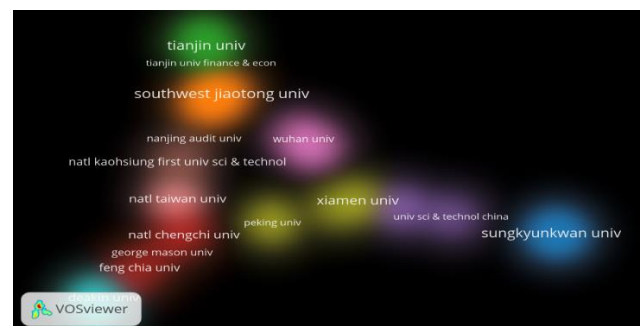


Figure 4: Institutions that Produced Most on the Subject.

However, in number of citations the University of Waterloo, Province of Ontario, Canada, with 180 citations is featured. Following is the University of Massachusetts, Boston, USA, with 122 citations, and the University of Toronto, Toronto, Canada, with 91 citations. The following are the newspapers with the most publications on the derivative theme, with standardization by subthemes.

Table 1: Newspapers with more derivative publications. This table presents the 10 newspapers that most published according to the search restriction related to the research.

TOP 10 – JOURNAL	"Agricultural Derivatives"	"Futures Market"	"Options Market"	"Swaps Market"
Journal of Futures Markets	-	23	13	-
Applied Economics Letters	-	8	2	-
Energy Economics	-	9	-	-

Finance Research Letters	-	6	-	-
Physica a Statistical Mechanics and its Applications	-	6	-	-
North American Journal of Economics and Finance	-	5	1	-
Economic Modelling	-	5	-	-
Journal of Peasant Studies	5	-	-	-
Resources Policy	2	3	-	-
Journal of Financial Markets	-	-	3	1

The Journal of Futures Markets, featured in agricultural derivative publications, has an impact factor of 1,449 in 2018, and its purpose and scope is to record the latest developments in financial futures and derivatives. He publishes timely and innovative articles written by leading scholars and finance professionals. Coverage ranges from highly practical to theoretical topics, including futures, derivatives, risk management and control, financial engineering, new financial instruments, hedging strategies, trading system analysis, legal, accounting and regulatory issues, and portfolio optimization. Applied Economics Letters, with an impact factor of 0.591 in 2018, is a complimentary magazine of Applied Economics. She publishes summaries of new original research and encourages discussion of articles previously published in her journal. Letters are reviewed by the Editor, a member of the Editorial Board, or other appropriate authority. They are generally applied in nature but may include a discussion of method and theoretical formulation.

Energy Economics, with an impact factor of 4,151 in 2018, is the leading journal on energy saving and financing. Topics include, but are not limited to, exploration, conversion, and use of energy, commodity, and energy derivatives markets, regulation and taxation, forecasting, environment and climate, international trade, etc. In this article, we map and analyze the main contributions of current researchers on agricultural derivatives, based on publications in the Web of Science database. The results demonstrated a range of work by Chinese researchers on agricultural derivatives. Emphasizing the interference of time series, macroeconomic news, information and asymmetry in the commodity futures market. Speculators and liquidity in price volatility, and others demonstrating futures market efficiency and hedge effectiveness. In the options market, researchers' concerns are no different from the futures market. The research focuses on the relationship return and volatility; analyzing the impacts of macroeconomic information, earnings announcements and the reaction of the options market.

There are several articles about informed stock market trading and predictability of returns. Address the effects of information on the size and direction of trading; investor behavior and sentiment, uncertainties in hedge performance; highlight the importance of financial analysis and volatility forecasts for decision making. They demonstrate effective order and negotiation strategies as well as efficiency in arbitration. They comment on corporate financing policies by adopting the options market. It is evident that the search for agricultural derivatives is associated with the process of financing production, price risk management and marketing mechanisms for agricultural products. The use of derivatives and risk management represent benefits for producers who can lock the selling price of their products, for society and for the economy as a whole. Since working at a lower risk level encourages investments, which can result in increased production and employment [3].

9. CONCLUSION

We conclude that agricultural derivatives help producers in managing their business, making them safer. Of course, the adoption of risk management for companies is essential, whether they are linked to agricultural production, trade, industry, distribution, financial or agribusiness institutions. Agricultural derivatives tend to grow in Brazil, with the expansion and continuous development of agribusiness and the cultivation of various commodities. Allied to the efforts of B3 and the government to encourage producers not only for hedging but also to increase the results of their operations. Of course, in order to operate in this market, the search for knowledge and information is fundamental. But risk aversion is a factor that hinders people's attitudes and behaviors in trading and must be overcome, as there are operations such as arbitrage that there is no risk at all.

DECLARATIONS

• Ethics approval and consent to participate

Not Applicable

• Consent for publication

Not Applicable

• Availability of data and material

Not Applicable

• Competing interests

All of the authors declare that they have no competing interests.

• Funding

The authors didn't receive any funding.

CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to declare.

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