

VIABILIDADE DE MERCADOS FUTUROS DE ETANOL NA BM&F- BOVESPA: ESTUDOS DE CASO

FEASIBILITY OF ETHANOL FUTURES MARKETS IN THE BM&F- BOVESPA STOCK EXCHANGE: CASE STUDIES

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RESUMO

O objetivo do artigo é analisar os fatores favoráveis e impedimentos do uso de contratos futuros de etanol na BM&F-Bovespa pelas usinas operando no Brasil. O aparato teórico é baseado nos critérios tradicionais da teoria do sucesso e falha de mercados futuros aplicados em diversas commodities no Brasil. O método de análise é fundamentado em múltiplos estudos de caso coletados através de questionários enviados aos agentes comercializadores de etanol nas usinas. Os resultados sugerem que os principais obstáculos à criação de liquidez nos mercados futuros de etanol no Brasil são: i) concentração de mercado no elo da distribuição; ii) competição com preços controlados da gasolina; iii) verticalização a jusante por parte das maiores firmas; iv) possibilidade de maiores lucros durante períodos de safra e entressafra e através de grupos de comercialização, e; v) inadequação do desenho contratual.

Palavras-chave: Etanol; BM&F-Bovespa; Mercados futuros; Estudos de Caso.

ABSTRACT

This paper analyzes favorable factors and impediments to the use of futures contracts for ethanol in the BM&F-Bovespa Stock Exchange by agents of ethanol-producing firms. The theoretical framework is rooted on traditional criteria of the theory of success and failure of futures markets analyzed by empirical research into commodities in Brazil. The method is based on the analysis of multiple case studies collected through questionnaires sent to trader agents of ethanol-producing firms. The results suggest that the main obstacles to create liquidity in futures contracts for ethanol in Brazil lie in the: i) concentration of the distribution market; ii) competition with controlled gasoline prices; iii) the downstream verticalization on the part of some major players; iv) possibility of earning higher profits between seasons or through consolidated trading pools, and; v) inappropriateness of the contract design.

Keywords: Ethanol; BM&F-Bovespa; Futures markets; Case studies.

JEL Classification: G13 Contingent Pricing • Futures Pricing

1. INTRODUCTION

Despite the importance of agribusiness in the Brazilian economy in several aspects, as a source of employment, income, GDP share, among others, the literature on futures markets for agricultural commodities in Brazil is still a field of study that can be much more explored by market professionals and academics.

The Brazilian ethanol market has been increasingly studied in various areas of research, among which special mention should be made of those related to logistics (Milanez Et Al., 2010), competitive strategies (Vian; Lima; Abdo, 2007), internationalization of the industry (Pozas, 2010), economic relations between ethanol production and distribution channels, which are largely coordinated by commercialization pools (Dolnikoff, 2008; Marques Et Al., 2012), evolution of market concentration (Beiral ET AL., 2013), the recent expansion observed in ethanol production (Gordinho, 2010) and analysis of the current situation and prospects for the industry's development (Marjotta-Maistro, 2011).

Although the sugar-ethanol industry has been the subject of many economic studies, it is noteworthy that studies on how futures contracts for ethanol are negotiated are still incipient, given the relatively recent possibility of adopting this type of price risk management both domestically and internationally. One of the few studies that investigated the efficiency of the new ethanol futures contracts in quantitative terms was Quintino and David (2013).

The present paper focuses on this gap. The research question is to analyze which contractual forms the Brazilian ethanol-producing firms trade, in order to verify the relevance of ethanol futures contracts from BMF-Bovespa. We intend to verify if firms use ethanol futures contracts and its main characteristics.

Our method of analysis is data exploratory research. In order to shed light to additional evidences showed in Quintino and David's (2013) work, we use field research to study how ethanol is commercialized e how are the mechanisms to accomplish the negotiations. By collecting primary data from agents in charge of trading ethanol in producing firms, an attempt was made to check, in qualitative terms, the main factors contributing to the success or failure of hydrous ethanol futures contracts in Brazil.

This paper is structured as follows: after this introduction, section 2 provides a brief literature review; section 3 explains the method and data sources; section 4 presents the results and section 5 provides the conclusions.

2. BACKGROUND

This section focus on studies that analyzed the feasibility of futures markets specifically in Brazil, with the aim of contextualizing the success and failure within the characteristics of Brazil's macro and institutional environment, as well as on studies that used field surveys to analyzing these determinants.

Despite the different nature of the form of intervention, rice, like ethanol, is another commodity characterized by significant governmental interference. Costa et al. (2010) analyzed the futures market for rice in Brazil and pointed out the following positive factors for implementing futures trading, namely: the possibility of storing and its homogeneity, the presence of volatile prices, lack of a relevant vertical integration framework and of competition with other futures markets. However, the authors defined the variables "size of the spot market" and "degree of market concentration" as inconclusive. Finally, as obstacles, they highlighted a strong government intervention and how the product is traded, as its agents are not used to using risk management contracts.

The analysis of the feasibility of futures markets in Brazil for wheat, another commodity whose prices are under government intervention, was investigated by Schwantes et al. (2010). Favorable factors include: the absence of forward contracts, the volatility of wheat prices, storability for relatively long periods, the fact that the market is close to perfect competition, the low effectiveness of cross-hedging alternatives, and the fact that the vast majority of the surveyed agents reported an interest in adopting this mechanism if it were available in Brazil. Negative aspects, in turn, include the relatively small size of the spot market and government interventions that distort market prices.

Another aspect that influences demand for futures contracts is related to forms of governance, such as the existence of hybrid structures derived from certain

contractual designs and the presence of vertical integration. Relevant share of the sugarcane-ethanol industry is vertically integrated upstream and pork is another commodity marked by this feature.

In this sense, Santos and Aguiar (2003) studied the futures markets for pork and identified several aspects that would be potentially unfavorable: low homogeneity of the product; the relative small size of its spot market, especially as compared to the beef market; the high concentration of slaughtering firms, few of which have a large production capacity or a significant market share. Finally, pork is largely marketed through forward contracts and most of the animals come from integrated farms; attractive factors include price volatility and the lack of futures contracts that could play a cross-hedging role.

Timber is another commodity marked by vertical integration. Soares et al. (2007) investigated the introduction of futures markets for timber in Brazil. Positive aspects include: non-perishable and storable product; price volatility, public policies favoring the development of a competitive market; dynamic and commercially important market and companies financially able of dealing with possible cash flow fluctuations resulting from operations with derivatives; forward markets with failures; absence of cross-hedging, highly educated and relatively young agents in the supply chain. Non-favorable factors include the fact that pulp companies are vertically integrated and consume more of their own wood in face of that bought on the market.

In relation to orange products, Tavares (2008) found that the use of futures market for orange juice in the ICE Stock Exchange is not an attractive option for Brazilian orange farmers. The main impediments include high operational costs, the lack of skills of most farmers on how an Exchanges operate, coupled with the fact that it is located outside Brazil and there are few brokers in the country dealing with futures contracts for orange juice. Besides, the forward contracts provide greater flexibility and that there is market concentration among processing industries. The author argues that policies adopted by large companies for managing stocks can often influence market prices.

The ethanol produced in Brazil is mostly consumed domestically, with exports accounting for a small percentage of the Brazilian production. Milk is another commodity mainly produced for domestic consumption. Siqueira, Aguiar and Silva (2008) analyzed the feasibility of introducing a milk futures market in Brazil and

concluded that its perishability is not an obstacle, although its product standardization is somewhat disadvantageous in relation to other commodities traded on BM&F-Bovespa. Only unpasteurized milk, as compared to UHT milk and milk powder, offered a comparative advantage in terms of price volatility in relation to the other commodities traded on the Brazilian Stock Exchange. The authors observed that government interventions are not seen as an obstacle, as they stimulate competition in the market. In the case of raw milk, there is no potential competition from forward contracts; however, in the case of UHT milk and milk powder, only short- and long-term contracts are used. There is no active cross-hedging, since the main futures contract that could replace it is traded in the US and its prices are formed in a different mechanism than in the Brazilian market. Finally, the profile of this industry's agents indicates that they are relatively young, highly educated and mainly interested in adopting new risk management tools. The authors also reached the conclusion that unpasteurized milk is the best option for launching futures contracts.

In the case of the ethanol Trading Groups, also known as "Trading Pools", Marques et al. (2012) pointed out that of the three groups that were surveyed, two operated only via forward contracts or the spot market. According to the author, these groups prefer to operate in the spot market as opposed to the futures, since they expect to make initial offers that are more attractive in terms of prices (above the Esalq indicator¹), mainly due to the higher bargaining power afforded by such groups. Some groups also trade on the futures market for ethanol of the BM&F-Bovespa Stock Exchange; however, the volume is small due to the lack of participation of distributors.

According to Satolo et al. (2011), there is a certain market "belief" according to which performance will be better if the spot market is used (both on the part of producing firms and distributors), due to price volatility: firms and distilleries use their storage capability that allows them to participate in the market at strategic moments. Firms with access to credit can store a certain amount of ethanol to market it on the spot market in the off-season; however, companies in this industry that do not have the same access to bank finance are forced to sell their goods during the harvest to meet

¹ Esalq indicator is a benchmark for spot prices of ethanol domestic market. For further explanation, see http://www.cepea.esalq.usp.br/english/ethanol/?id_page=242

their cash-flow needs, i.e., the speed to market is influenced by the level of access to credit. The share of contract types used by distributors in relation to the total is different for anhydrous and hydrous ethanol: in the case of anhydrous ethanol, on average 80% of the volume is marketed through contracts, and for hydrous ethanol the ratio decreased to approximately 50%.

Regarding to sugar, however, there are evidences of a strong participation in foreign futures markets by domestic sugar-ethanol mills. An illustrative example was given by Freitas et al (2012): sugar futures contracts accounted for 37.1% of all the sugar traded by COPERSUCAR in the 2009/10 season, the world's largest firm of sugar and ethanol.

After mapping out critical factors observed in Brazilian empirical studies, the next section presents the methodology proposed for analyzing these conditioning elements in the context of success and failure factors of futures markets for hydrous ethanol in Brazil.

3. METHOD AND DATA

With the aim of contributing to a better understanding of how ethanol is traded in São Paulo, Brazil's main ethanol-producing state, a questionnaire is proposed to decision-making agents in production units.

Marconi and Lakatos (1990) provide a detailed account of the five steps to be followed to define the structure of questionnaires, namely:

- identifying the questions to be included in the questionnaire (these should be thirty at most, with a number between twenty and thirty being recommended) based on its predefined objectives, with a maximum estimated time of 30 minutes for completion; the questionnaire should also contain a note explaining the nature and importance of the survey and the need to collect answers;
- the questionnaire should be pre-tested to check its plausibility and efficiency for collecting relevant information for the proposed survey;
- the questions should be classified as follows: i) open questions, characterized by free, essay-type answers, giving greater freedom for the respondents to use their own words; ii) closed questions of the "yes" and "no" binary-choice type; iii) multiple-choice questions, with alternatives related to the same topic;

- identifying any flaws in the questions, so that they are not misinterpreted and are presented in a clear and straightforward manner;
- organizing the questions so that they address issues of a broader nature first, so as to guide the respondents in relation to the objectives of the survey, and then more specific topics, ending with direct and objective questions.

With the aim of clarifying the analysis of results, the questionnaire’s framework can be divided into four parts, as illustrated by Table 1.

Table 1. Description of the questionnaire

<p>Part I: address firm size as well as the nature of its capital (domestic or multinational) and the main sources of risk associated with the production of ethanol.</p>	<p>The idea is that the larger firm, the greater its likelihood to use more sophisticated risk management tools, including price risk management tools through futures markets. Regarding the character of the company’s capital, multinational companies may not have incentives to use the ethanol markets of the BM&F-Bovespa Stock Exchange: if one considers that multinationals have other markets in which they operate, diversification tends to reduce the risks of a particular business and, in this case, this portfolio could be used as “natural” hedge.</p>
<p>Part II: check the nature of the contracts, e.g, spot, forward/futures contracts. Moreover, the average duration of the contracts and their pricing method are also investigated and if firms exports ethanol.</p>	<p>The greater the degree of activity in a spot market, the greater is the likelihood that futures markets are relevant, as markets with low activity levels are more likely to be organized around forward contracts or vertical integration schemes. It was checked whether the firms exports ethanol: in this case, it is expected that exports are not backed by futures contracts for ethanol in the B&MF-Bovespa, given that ethanol is not treated as an international commodity.</p>
<p>Part III: verify whether a firm has participation in distribution segment or if it is a member of Ethanol Trading Groups.</p>	<p>If it is active in the distribution segment, this may limit the use of futures contracts, as price fluctuations that would be unfavourable to the production units (in this case, falling prices) would be offset by the purchase of ethanol at a lower cost by distributing companies. In short, the drive for vertical integration is faced as a potential barrier to the use of futures contracts.</p>
<p>Part IV: deals with the use or non-use of commodities futures contracts by firms. This part also investigates the suitability of the ethanol futures contracts of the BM&F-Bovespa versus CME Exchange, by personal opinion of the respondents.</p>	<p>This part was designed to check how the agents evaluate the market in terms of: i) liquidity and interest in participating, as well as the main vectors that restrict the liquidity of ethanol futures markets in Brazil; ii) the importance of having a futures markets for ethanol in Brazil; iii) whether the contract will have longevity in the portfolio of commodities traded on the Brazilian Stock Exchange.</p>

The sample is non-probabilistic and based on intentional criteria, according to their track record of collaborating with academic research. Thus, a group of representative firms was selected from a database of annual surveys “Production Costs of Sugarcane, Sugar and Ethanol” of the Program of Continuing Education in Economics and Management (PECEGE), linked to ESALQ-USP, (“Luiz de Queiroz” College of Agriculture, University of São Paulo). The questionnaire was sent to the mailing list of the PECEGE Program between February and March 2013.

The questionnaire was pre-tested with a financial manager of an ethanol firm with the aim of correcting any misconceptions and proposing improvements. After a few adjustments that were made according to the results of the pre-test, it was sent to twenty (20) firms that historically collaborate with academic research at PECEGE and five (5) returned. We consider interesting this return, since that Eisenhardt (1989) recommends choosing between four and ten case studies.

Thus, the present research has a qualitative nature with descriptive approach. Our method of analysis is a data exploratory research, since that this issue is complex and it was little explored by the literature. Therefore, according to Gil (1999), this method is appropriate to understand better the relationship between cause and effect when the causality is not very clear in the literature.

4. RESULTS

4.1 Firm size and production risks

In this section, the firms will be designated by letters (A, B, C, D and E) to ensure the confidentiality of the information provided. Table 2 summarizes the main results respecting to firm size as well as the main source of production risk.

The respondent from Firm A was the export manager of a small Brazilian firm that produces up to 50,000 cubic meters per season of each type of ethanol product. Firm B is also a Brazilian firm, but it is a large firm that produces from 301,000 to 500,000 cubic meters of hydrous ethanol and from 101,000 to 200,000 cubic meters of anhydrous ethanol in a crop year. The respondent from Firm B was the trading manager.

Table 2. Size and production risks

Is the firm multinational ?	A	B	C	D	E
	No	No	No	Yes	Yes

Output ranges (in thousands m ³) – Hydrous ethanol					
Firms A, C		Firm E		Firm B	Firm D
0 a 50	51 a 100	101 a 200	201 a 300	301 a 500	> 500

Output ranges (in thousands m ³) – Anhydrous ethanol					
Firms A, C, E		Firm B			Firm D
0 a 50	51 a 100	101 a 200	201 a 300	301 a 500	> 500

Production risks	A	B	C	D	E
Major source of risk (+)	Sugar prices	Concurrency with gasoline	BR Ethanol prices	Weather conditions	Sugar prices
Lower source of risk (-)	Weather conditions	Concurrency with U.S. ethanol	Concurrency with U.S. ethanol	Sugarcane prices	Concurrency with U.S. ethanol

The results for Firm C were reported by the sales manager. It is a small national firm that can produce up to 50,000 cubic meters of each type of ethanol per season. Firm D is a big multinational player that can produce more than 500,000 cubic meters of both types of ethanol per season and the information was collected from foreign market trader. Finally, the information for Firm E was provided by its junior financial manager. Firm E produces only hydrous ethanol and it is a medium-sized firm that can produce from 101,000 to 200,000 cubic meters per season.

Regarding the risks of producing ethanol, the main reported factors were the price of sugar and competition with gasoline, and the lowest relative risks were mostly related to competition with North American ethanol and to the price of sugarcane. The price of sugar is key for optimizing the production mix of firms that produces both ethanol and sugar: as the relative price of sugar rises, the units will maximize the share of sugar face to ethanol.

Competition with gasoline is another important point, as the greatest share of ethanol production is intended for use in the domestic market as fuel. Due to the expansion of flex-fuel vehicles in Brazil, end consumers have the option to use gasoline or ethanol according to their relative prices. Moreover, we verified that of the five surveyed firms, three belong to national groups and two to multinationals.

4.2 Contractual forms

In this topic, Firms C and E trade exclusively on the domestic spot market and Firm A only exports a small percentage of its production, less than 5%, while almost all of its production is focused on the domestic market and traded on the spot market. Firm D also trades most of its production on the spot market, followed by a small percentage through forward contracts and an even smaller part traded on futures markets. Firm B, in turn, commercialize most of its production through forward contracts and only a small percentage is sold on the spot market and on foreign markets. Table 3 shows the distribution of the contract forms among mills.

The surveyed companies were more willing to trade on the spot market and through forward contracts instead of making greater use of futures contracts, and only one firm uses the BM&F-Bovespa's futures contracts and another one was engaged in ethanol futures trading on the CME Exchange exclusively for exporting ethanol.

Table 3. Decomposition of contractual forms

Contract form (%) used to trading ethanol	A	B	C	D	E
Spot	100	10	100	25	100
Forward		85		70	
Future		0		5	
Others		5			
Total (%)	100	100	100	100	100

4.3 Verticalization and pools

Three firms also export ethanol: A, B and D (Table 4). In the case of Firm A, prices are formed based on a formula that takes into account the price of the CME's futures

contract for ethanol and also differentials in the quality and specification of the product. The exports of Firm B, in turn, have fixed prices, i.e., they are not linked automatically to any indicator, and in the case of Firm D three items were mentioned: the Esalq indicator, the futures contracts of the BM&F-Bovespa and fixed prices.

In relation to participation in Trading Groups (Pools), Firms A and D reported that they participate in such engagement. Firm A sells less than 20% of its production through pools and it trades on the spot market, with the production unit deciding on the marketing strategy. In the case of Firm D, from 20% to 40% of its ethanol production is traded through Groups and it also trades on the spot market, with its marketing strategy also being defined by the production unit.

Table 4. Verticalization and exports

Firms	A	B	C	D	E
Does the firm export?	Yes	Yes	No	Yes	No
Is the firm a member of the Pool? If so, what the share of pooled sales?	Yes. Up to 20% of sales	No	No	Yes. Between 21% and 40% of sales.	No
Does the firm operate in the distribution industry?	Yes	No	No	Yes	No

4.4 The use of domestic futures contracts and experts' opinion

All the surveyed firms use futures contracts for agricultural commodities either in Brazil or abroad. The sugar futures contracts of the ICE Exchange were mentioned by all the firms. Firms B and D also mentioned the futures contracts for sugar of the LIFFE Stock Exchange and Firms A and D mentioned the futures contract for ethanol of the CME exchange. Firm D was the only one that reported using the futures contracts for ethanol of the BM&F-Bovespa Stock Exchange. The average hedged production percentage (hedging ratio) stood above 75% for sugar for Firms A, D and E, between 31% and 40% for Firm B and between 11% and 20% for Firm C.

In relation to ethanol, the hedging ratio of both Firm A and Firm D was below 5%. The surveyed agents also reported that CME's futures contracts for ethanol did not meet

the hedging needs of Brazilian producers due to the lack of standardization of the good and to the different dynamics of domestic prices in relation to the CME contract. These results are summarized in Table 5.

Table 5. Degree of use futures contracts and experts' opinion

Firms	A	B	C	D	E
Does the firm operate with agricultural futures markets from BMF or another abroad Exchange?	Yes	Yes	Yes	Yes	Yes
Commodity and Exchange traded	Sugar (ICE) and Ethanol (CME)	Sugar (ICE / LIFFE)	Sugar (ICE)	Sugar (ICE /LIFFE) and Ethanol (BMF /CME)	Sugar (ICE)
Hedge Ratio (hedge/output)	HR > 75%	31% < HR < 40%	11% < HR < 20%	Sugar(HR> 75%) and Ethanol (HR< 10%)	HR > 75%
Does the CME Exchange meets the hedging needs of Brazilian firms?	No	No	No	No	No
Is the contract design of domestic ethanol futures contracts suitable?	Yes	No	No	No	Yes

Given that all the companies operate in futures markets trading sugar, specifically using ICE's contract for raw sugar, we inferred that the productive capacity of smaller companies (Firms A and C) does not inhibit them from using futures contracts. This fact makes it clear that derivatives are not an exotic tool of the surveyed companies.

The use of futures contracts for pricing ethanol exports by one firm (A) is a fact that deserves attention. Ethanol is not an international commodity, like sugar. In the case of exports to the US market, the CME's ethanol futures contracts is the benchmark for domestic producers. Only the firm D reported that it used BMF-Bovespa's ethanol futures contracts for a small quantity, in relation to the use of sugar futures contracts reported by all the surveyed firms.

Additionally, the five surveyed firms believe that the liquidity of the futures markets for ethanol in the BM&F-Bovespa is not appropriate and they also reported that they would be interested in trading futures if it had liquidity.

The most critical factor for the evolution of ethanol futures contracts is the increase observed in the market concentration of ethanol distributors over the past decade. This item was the one respondents mentioned the most. One of the agents stressed the "conservatism" of distributors, mentioning that they hardly operate based on a hedging horizon of more than 30 days.

The second and third most mentioned items in the survey were: i) "the prices of the spot and futures markets may not converge and, as a result, the hedge mechanism may not work"; and ii) "the pricing mechanism of sugarcane via CONSECANA² (Council of Sugarcane, Sugar and Ethanol Producers of the State of São Paulo), which creates uncertainty for production costs". However, as evidenced throughout this section, the surveyed firms make significant use of sugar futures markets. So, the pricing mechanism of sugarcane has a limited role of creating obstacles for ethanol futures markets.

Regarding the design of the futures contract, Firms A and E believe it is appropriate, as opposed to Firms B, C and D, which did not see it as appropriate. One of the respondents pointed out that the way that the contract is settled does not make it very attractive, as its settlement is based on the last five days of the daily indicator, while the performance baseline between buyers and sellers is the monthly average of the Esalq indicator. Therefore, this difference affects their decision-making of which price risk management will be more attractive.

² For more details about the CONSECANA, see <http://www.fao.org/bioenergy/31534-05a069a7ca48d4b20bbd9b5e9ca6548a8.pdf>

Table 6, based on Schwantes et al. (2010), summarizes how the issues addressed in this paper influence the use of Brazilian ethanol futures markets. It highlights the main drivers that are relevant for analyzing success and failure factors of commodities futures contracts.

Table 6. Summary of the main factors on the feasibility of domestic ethanol futures contracts

Characteristics	Results
Degree of activity in the spot market and trading forms	Unfavorable
Government interventions	Unfavorable
Effectiveness of hedging with alternative futures contracts	Favorable
Vertical integration	Unfavorable
Market concentration	Unfavorable
Traditional mechanisms for managing price risks	Unfavorable
Intention of use by agents of the sugar-ethanol industry	Favorable

5. CONCLUSION

This paper suggests that Brazilian ethanol futures contracts shows some barriers in order to increase their liquidity. The factors analyzed here are backed up by the theoretical perspective on key factors for the success and failure of futures contracts for agricultural commodities. In short, the main hurdles to developing liquidity in the domestic ethanol futures contracts are the following:

- the increasing concentration of distributors;
- competition with gasoline, whose price is under strong political influence to make it “artificially” competitive as part of the struggle against inflation in Brazil;
- the possibility of earning greater profits in the spot market, usually supplying the product at season’s end and in the off-season or through forward contracts with Trading Groups;
- the drive for vertical integration of major players in the market, which tends to reduce the incentive for them to trade on futures markets;

- the possibility of failures in the contract design, which could the hedge mechanism be inefficient.

Our results aim to contribute to discussion by bringing back the “traditional” characteristics pointed out in the literature under a new approach, ie, case studies with ethanol-producing firms, as well as highlight news aspects that matter in the development of different forms to trade ethanol in Brazil.

The present paper does not claim to be exhaustive in its conclusions, given the limitations imposed by the size of the sample and the fact that it did not consider other agents that use or could use ethanol futures contracts, such as distributors, tradings, banks and brokerage firms, among others. For futures studies, it is suggested that the sampling scope should be expanded to include these agents.

However, this study collected data from companies engaged in the production of ethanol, which would be the main agents providing the “economic fundamentals” for ethanol derivatives, ie, the hedgers agents. We seek to shed light in relevant new questions from a case-study perspective about the feasibility of ethanol futures contracts in Brazil.

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REFERENCES

Beiral, P. R. S.; Moraes, M. A. F. D. D.; Bacchi, M. R. P. 2013. Concentração e poder de mercado na distribuição de etanol combustível: análise sob a ótica da nova organização industrial empírica. [Concentration and market power in the fuel ethanol wholesale industry: analysis from the perspective of new empirical industrial organization]. *Economia Aplicada*, 17(2), 251-274.

Brorsen, B.W., & Fofana, N.F. 2001. Success and failure of agricultural futures contracts. *Journal of Agribusiness, Georgia*, 19 (2), 129-145.

Costa, A.A., Coelho, A.B., Miranda, S.H.G., Lirio, V.S. 2010. Condições para implantação do contrato futuro de arroz no Brasil. [Conditions to implement rice future contract in Brazil]. *Análise Econômica*, 28 (54), 249-279.

Dolnikoff, F. 2008. Contratos de etanol carburante e racionalidade econômica da relação entre usinas e distribuidoras de combustíveis no Brasil. [Ethanol contracts and economic rationality among mills and distributors of fuels in Brazil]. São Paulo, USP. Mestrado em Administração: 162. Available at: http://www.teses.usp.br/teses/disponiveis/12/12139/tde-19012009-115329/publico/The_Final_Cut.pdf. Accessed on: 7 jan. 2013.

Eisenhardt, K.M. 1989. Building theories from case study research. *Academy of Management Review*, Briarcliff Manor, 14,(4), 532-550.

Freitas, B.W.; Santos, J.F.; Almeida, M.A. 2012. Contratos futuros de açúcar: uma análise comparativa entre as estratégias de hedge. [Sugar futures contracts: comparative analysis among hedge strategies]. In: Encontro Brasileiro de Finanças, 12., 2012, 1-48.

Gil, A. C. 1999. Métodos e técnicas de pesquisa social [Methods and techniques of social research]. São Paulo: Atlas.

Gordinho, M.C. 2010. Do álcool ao etanol: trajetória única. [From alcohol to ethanol: unique path]. São Paulo: Editora Terceiro Nome. Available at: <https://www.unica.com.br/wp-content/uploads/2019/06/Do-Alcool-ao-Etanol.pdf>. Accessed on: 10 jan. 2013.

Marconi, M.A.; Lakatos, E.M. 1990. Técnicas de pesquisa. [Research techniques]. São Paulo: Atlas.

Marjotta-Maistro, M. C. 2011. Iniciativas estratégicas para a dinâmica do setor sucroenergético. [Strategic initiatives for the dynamics of the sugar-energy sector]. In: Marjotta-Maistro, M.C. (Org.). *Desafios e perspectivas para o setor sucroenergético do Brasil*, São Carlos: EdUfscar.

Marques, D. S. P.; Paulillo, L. D. O.; Vian, C. D. F. 2012. Grupos de comercialização de etanol e governança em rede. [Ethanol trading groups and network governance]. *Gestão e Produção*, 19(4), 825-840.

Milanez, A. Y., Nyko, D., Garcia, J. L. F., & Xavier, C. E. O. 2010. Logística para o etanol: situação atual e desafios futuros. [Logistics for ethanol: current scenario and future challenges]. Available at: https://web.bndes.gov.br/bib/jspui/bitstream/1408/2407/3/BS%2031%20Log%C3%ADstica%20para%20o%20etanol_P.pdf. Accessed on: 14 jan. 2013

Pozas, M.U.B. 2010. A internacionalização do setor de etanol brasileiro: um estudo multi-casos. [Internalization of Brazilian ethanol industry: multicase studies]. Departamento de Administração. Porto Alegre, UFRGS. Mestrado em Administração: 106. Available at:

<https://www.lume.ufrgs.br/bitstream/handle/10183/26799/000760790.pdf?sequence=1&isAllowed=y>. Accessed on: 16 jan. 2013

Quintino, D.D., David, S.A. 2013. Quantitative analysis of feasibility of hydrous ethanol futures contracts in Brazil. *Energy Economics*, 40, 927-935.

Santos, A.H.G.; Aguiar, D.R.D. 2003. Análise dos fatores determinantes da viabilidade de implantação do contrato futuro de suínos vivos no Brasil. [Analysis of the determinants of implement pork future contract in Brazil]. *Revista de Economia e Agronegócio*, 1(822-2016-54090), 231-256.

Satolo, L.F., Dalbem, A.L.M., Linhares, W.A.L., Erthal, L.C., Carrol, J.D. 2011. Estratégias para a comercialização do etanol. [Strategies to marketing ethanol]. In: Marjotta-Maistro, M.C. (Org.). *Desafios e perspectivas para o setor sucroenergético do Brasil*, São Carlos: EdUfscar.

Schwantes, F.; de Mattos, L. B.; Coelho, A. B.; Lírio, V. S. 2010. Viabilidade de Implantação do contrato futuro de trigo na BM&F-Bovespa. [Feasibility of the implementation of future contract for wheat in BM&F-Bovespa]. *Análise Econômica*, 32(61).

Siqueira, K.B., Silva, C.A.B. da., Aguiar, D.R.D. 2008. Viability of introducing milk futures contracts in Brazil: a multiple criteria decision analysis. *Agribusiness*, 24(4), 491-509.

Soares, N. S., da Silva, F. L., da Silva, M. L., da Silva, A. G.; Lírio, V. S. 2007. Viabilidade da implantação de um contrato de comercialização futura da madeira de reflorestamento no Brasil. [Viability of implement futures contracts of wood reforestation]. *Revista Árvore*, 31(2), 307-314.

Tavares, M.F.F. 2008. Mercado futuro e físico de SLCC: Conhecimento e uso no agronegócio citrícola do Brasil. [Future and spot market of FCOJ: knowledge and use by citrus agribusiness in Brazil]. *Revista Brasileira de Fruticultura, Jaboticabal*, 30 (4), 925-930.

Vian, C.E.F., Lima, R.A.S., Abdo, M.D. 2007. Estudos de casos sobre as estratégias administrativas e operacionais utilizadas pelas usinas de açúcar e álcool da região de Ribeirão Preto, SP. [Case studies on managerial and operational strategies used by sugar and ethanol mills in the province of Ribeirao Preto, SP]. *A Economia em Revista, Maringá*, 15,(1), 5-20.