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Identification of the most favorable months for coffee trade

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Abstract

Coffee is traded on a stock exchange on which the goods are priced and influence their value both in the physical market and in the futures market, which causes doubts in coffee growers about the most opportune moment for trading. Then, the goal of this work was to consider the most favorable and unfavorable months over the years for the arabica and robusta coffee trading in the physical market and arabica coffee in the future market. The work was carried out using historical data on the price of coffee in Brazil, stratifying it into periods and listing for each year of evaluation the percentage of months with the first and second highest and lowest prices. Arabica and Robusta coffee were assessed respectively from 2018 to 1981 and from 2018 to 1995. Arabica coffee in the futures market was analyzed from 2018 to 1980. The evaluation was performed using descriptive statistics and correlation analysis among the modalities of coffee trading in Brazil. Great instability was observed between the months of high and low prices for coffee trading. This shows the uncertainties existing in the market; however, it is possible to observe a trend of the most favorable and unfavorable months for commercialization. It is determined that for arabica coffee, December and January are the most favorable and unfavorable months for trading, respectively. For robusta coffee, the most favorable and unfavorable sales months were June and January. Arabica coffee in the futures market January was the best month for trading and February in the opposite condition, in alternate years, the least favorable month.

Keywords: *Coffea arabica. Coffea canephora*. Futures Market. Volatility. Price.

Introduction

Brazil is the largest producer and coffee exporter in the world, with 61.7 million bags processed in 2018, with a planted area of 2.1 million hectares (CONAB, 2019a). Even with this representation, the Brazilian market has no control over the price fluctuations seen in the coffee trading, which always raises doubts about the most opportune moment to sell the commodity.

In the years 2018, 2017, and 2016, the difference between the price of the months with the highest and lowest appreciation of Arabica coffee in the physical market was R$ 64.54, respectively; BRL 76.39; BRL 70.94, per 60 kg bag (COOXUPÉ, 2019). This difference can be the profit or loss result of the activity.

These fluctuations in the prices of a bag of coffee are often correlated with the international market trend, being influenced by downward and upward factors, such as supply conditions, weather, speculation on coffee production, increased consumption, oil, and the strong performance of investment funds that intensified operations, promoting an increase in the balance of net purchase positions (CONAB, 2019 B). Brito and Leite (2016) also stated that coffee has one of the highest indexes of price volatility and these fluctuations are due to several joint reasons such as supply and demand, associated with market factors.

In addition to these variables, Brazilian and world coffee exports, the price of Colombian coffee (DIAS; SILVA, 2015), and the dollar price also influence the market. In research on the

futures market, Rodrigues and Martines Filho (2015) stated that coffee prices are influenced by different agents, highlighting producers, consumers, speculators, and the government.

Thus, negotiations on the coffee price in the market show marked variations, with greater magnitude in the peaks of world supply and demand.

The performance of coffee prices in the Brazilian market does not differ at all from the performance of international quotations. The national market operates in line with the behavior of the negotiations that take place within the scope of the New York and London stock exchanges (CONAB, 2019a).

All these trading variables integrate this commodity into a speculative and volatile environment, in which the stock exchanges price and influence its value both in the physical market and in the future market, with Arabica and Robusta coffee being part of this circle, with its quotation established by the Stock Exchange (CONAB, 2019a).

Araújo et al. (2018) stated that the coffee growers who traded agricultural commodities contracts, verified fluctuations that are not always possible to be predicted in the production and price of the goods, therefore, such fluctuations related to prices, justify the origin of futures markets as an alternative to manage the risks involved in the decrease or increase of prices in the coffee market.

As these market oscillations occur in a very dynamic way, establishing strategies and knowing the trading forms and the most opportune moments makes the market less risky for the coffee grower.

Taking into consideration these fluctuations, producers always look for the most opportune moment to sell their coffees, seeking satisfactory profitability. If coffee growers could foresee what might happen in the market, they could make their decisions about the most opportune moment for trading (BARRETO; ZUGAIB, 2016).

So, the goal of this work was to assess the most favorable and unfavorable months for trading over the years for arabica and robusta coffee in the physical market and arabica coffee in the future market.

Material and methods

The research was carried out using historical data on the prices of a 60 kg arabica coffee bag, *Coffea arabica* L. type 6 hard drink, in the period between 1981 and 2018 (COOXUPÉ, 2019) and robusta coffee from 1995 to 2018 (INDEXMUNDI, 2019). Throughout this work, *Coffea canephora* Pierre ex Froenher was designated as robusta coffee. In the futures market, prices for Arabica coffee, type 4-25 hard drink or better, were based on the price in US cents per pound between the years 1980 to 2018 for the months before the expiration of the contract in May (INVESTING, 2019).

In order to assess the data, it was observed in each year, in the specified periods, the month that obtained the first and second highest and lowest trading prices of Arabica and Robusta coffee in the physical market and the quotations of Arabica coffee in the futures market. This assessment was also stratified for the years 2018 to 2009, 2018 to 1999, 2018 to 1989, and 2018 to 1981 for the arabica coffee market. In the robusta market, it was divided between the years 2018 to 2009, 2018 to 1999, and 2018 to 1995. The Arabica coffee futures market was separated by the years 2018 to 2009, 2018 to 1999 and 2018 to 1989, and 2018 to 1980. Stratification will be necessary to verify the consistency of the information between the periods evaluated through the analysis of the number of favorable and unfavorable months for the coffee trading in Brazil.

In the periods evaluated, the months that had the highest percentage of coffees with the first and second highest prices and the lowest price for coffee trading were listed, these being demonstrated in figures made in LibreOffice Calc.

Descriptive statistics were applied to the prices of Arabica, robusta, and futures coffee, using the Genes program and analyzing the prices of minimum, maximum, coefficient of variation, and Pearson's correlation at 5 and 1% (CRUZ, 2013).

Results and discussion

Descriptive statistics for arabica, robusta, and futures market

In the descriptive statistics, the (CV) arabica coffee variation coefficient (Table 1) varied between 2.84 and 95.03%, however, for more than 2.84%, referring to the year 2015, it is considered not very expressive, when analyzing the minimum and maximum price for that year, it would result in R$ 33.59 more per 60 kg bag in the highest month. So, this amount becomes significant in larger volumes of coffee, which can be the result of the enterprise's profit or loss.

For robusta coffee (Table 1) the CV ranged between 3.47 and 33.53%, but when observing the difference between the minimum and the maximum for the CV of 3.47% in 2007 and 33.53% in 2002 means that the choice of the moment with the highest quotation guarantees R$ 22.20 and R$ 111.6 more for each bag in the corresponding years.

For the futures market (Table 2) we found a CV ranging between 3.91 (1984) and 37.37% (1994). Even the CV of 3.91% being of small magnitude, when computing the values per cents of dollar per pound of minimum and maximum weight, in 1984, it would guarantee the producer a revenue of US$ 21.45 per coffee bag with choosing the correct month for the lock.

Farias, Moura and Santos (2012) highlighted that the futures market is very volatile, as demonstrated in the futures market (Table 1), although, when operating in it, the producer reduces risks when compared to the physical market.

Araújo et al. (2018) found that between the years 2007 and 2017 for the coffee prices in the physical and futures market, the asymmetry and kurtosis measures varied greatly according to the years, alternating between positive and negative values. The authors also relate the average increase in coffee prices to the gradual expansion of domestic and foreign consumption. It was verified that in 2011 it obtained the highest maximum and minimum values between the prices on the futures market obtained from BM&F-BOVESPA and cash provided by Center for Advanced Studies in Applied Economics - CEPEA (ARAÚJO et al., 2018).

In table 1 for the period from 2007 to 2017, the CV ranged from 3.06 to 13.77 and from 6.04 to 21.37 respectively for Arabica coffee in the physical and futures market. This was an expressive variation considering that in the year with the highest CV for these two types of marketing, the difference between the minimum and maximum prices of coffees per bag was R$ 191.83 in 2014 and 111.45 (dollar cents per pound) in 2010 (Table 1), partly corroborating the results of Araújo et al. (2018).

History analysis of arabica coffee prices

The stratified analysis of prices for the years 2018 to 2009, 2018 to 1999, 2018 to 1989, and 2018 to 1981 shows that December is the month with the highest coffee prices, respectively, at 40, 40, 43.33, and 52.63% times, thus maintaining over the years the most opportune time to trade arabica coffee (Figure 1), regardless of changes in coffee marketing rules, political scenario, exchange rate, oil price. Maurice and Davis (2012), analyzing the volatility of coffee and

Table 1 – Minimum, maximum, and coefficient of variation values for arabica and robusta coffee in the physical market and arabica in the futures market.

Period		Arábica coffee* (60 kg bag)			Arabica coffee future market (US cents per pound)			Robusta coffee * (60 kg bag R$)		
Year	months	Minimum	Maximum	CV**	Minimum	Maximum	CV**	Minimum	Maximum	CV**
2018	12	410.42	474.96	4.40	98.10	123.70	8.05	376.80	429.60	4.78
2017	12	437.82	514.21	5.38	124.05	149.55	6.04	381.00	459.60	5.37
2016	12	478.52	549.46	3.85	112.65	164.15	11.86	373.20	457.80	7.09
2015	12	440.97	474.56	2.84	116.90	161.90	9.23	341.40	424.20	6.91
2014	12	275.47	467.30	13.77	125.20	203.50	11.26	276.00	347.40	7.15
2013	12	234.43	331.71	9.84	105.40	146.95	11.40	241.80	290.40	5.32
2012	12	334.27	473.80	9.99	142.10	2015.05	12.59	229.20	287.40	8.14
2011	12	405.52	506.52	6.08	226.85	299.35	9.72	223.80	260.40	4.75
2010	12	258.50	345.01	8.28	129.05	240.50	21.37	158.40	210.60	9.79
2009	12	245.34	273.78	3.06	109.45	141.75	8.40	158.40	252.00	16.62
2008	12	244.31	274.19	4.01	112.05	164.60	11.74	233.40	274.80	5.54
2007	12	227.94	268.28	4.79	103.15	136.20	7.87	213.00	235.20	3.47
2006	12	214.53	278.20	7.87	98.95	126.20	7.93	167.40	220.80	10.85
2005	12	237.58	320.03	9.20	93.00	126.40	11.12	130.80	190.80	12.08
2004	12	184.15	230.88	7.90	66.45	103.75	14.41	120.00	165.00	9.25
2003	12	152.82	184.75	5.30	56.85	68.25	5.93	129.60	193.80	14.32
2002	12	95.83	169.42	21.80	44.75	66.60	14.28	71.40	183.00	33.53
2001	12	90.68	125.68	10.57	42.60	63.90	14.27	76.80	91.20	4.75
2000	12	120.71	215.77	18.06	65.55	111.10	16.76	79.20	126.60	13.36
1999	12	143.04	245.61	14.85	82.45	130.35	14.29	147.00	200.40	9.88
1998	12	113.77	235.89	28.30	105.15	174.70	17.17	118.20	137.40	4.35
1997	12	154.38	221.56	9.31	139.40	276.40	20.69	92.40	132.00	9.28
1996	12	101.63	149.81	12.99	102.95	128.60	6.87	86.40	126.00	10.95
1995	12	112.82	151.06	8.51	94.90	181.00	18.90	118.80	173.40	10.1
1994	12	10.45	195.14	66.87	72.35	208.85	37.37	-	-	-
1993	12	1147.00	970.87	31.95	58.30	79.30	11.67	-	-	-
1992	12	64935.00	867005.00	95.03	52.90	77.55	12.45	-	-	-
1991	12	11882.00	44367.00	43.43	77.70	94.70	5.71	-	-	-
1990	12	1197.00	9658.00	42.57	79.99	99.65	6.13	-	-	-
1989	12	93.55	598.37	71.87	74.11	134.70	25.38	-	-	-
1988	12	3999.00	67768.00	94.55	123.25	159.34	7.26	-	-	-
1987	12	1812.00	3067.00	18.52	100.04	127.00	8.39	-	-	-
1986	12	2140.34	388133.00	13.19	136.83	246.41	18.55	-	-	-
1985	12	1282990.00	2449053.00	53.25	133.49	241.29	19.10	-	-	-
1984	12	66626.00	258899.00	44.89	135.95	152.20	3.91	-	-	-
1983	12	24664.00	54951.00	24.70	122.91	150.78	6.71	-	-	-
1982	12	10751.00	24461.00	24.81	126.81	153.98	5.93	-	-	-
1981	12	6207.00	10055.00	16.38	93.62	141.12	11.91	-	-	-
1980	12	-	-	-	114.75	194.05	18.09	-	-	-

* Currency used in the periods: 1981 to 1986 - Cruzeiro novo; 1986 to 1988 - Cruzado; 1989 - Cruzado novo; 1990 to 1993 - Cruzeiro; 1994 to 2018 – Real. CV** Variation Coefficient.

Source (Authors, 2019).

cocoa prices, between the years 1990 to 2010, showed an uneven impact of the price of oil with coffee, which varies depending on the nature of the market. cocoa was the only commodity that showed an equilibrium relationship with oil.

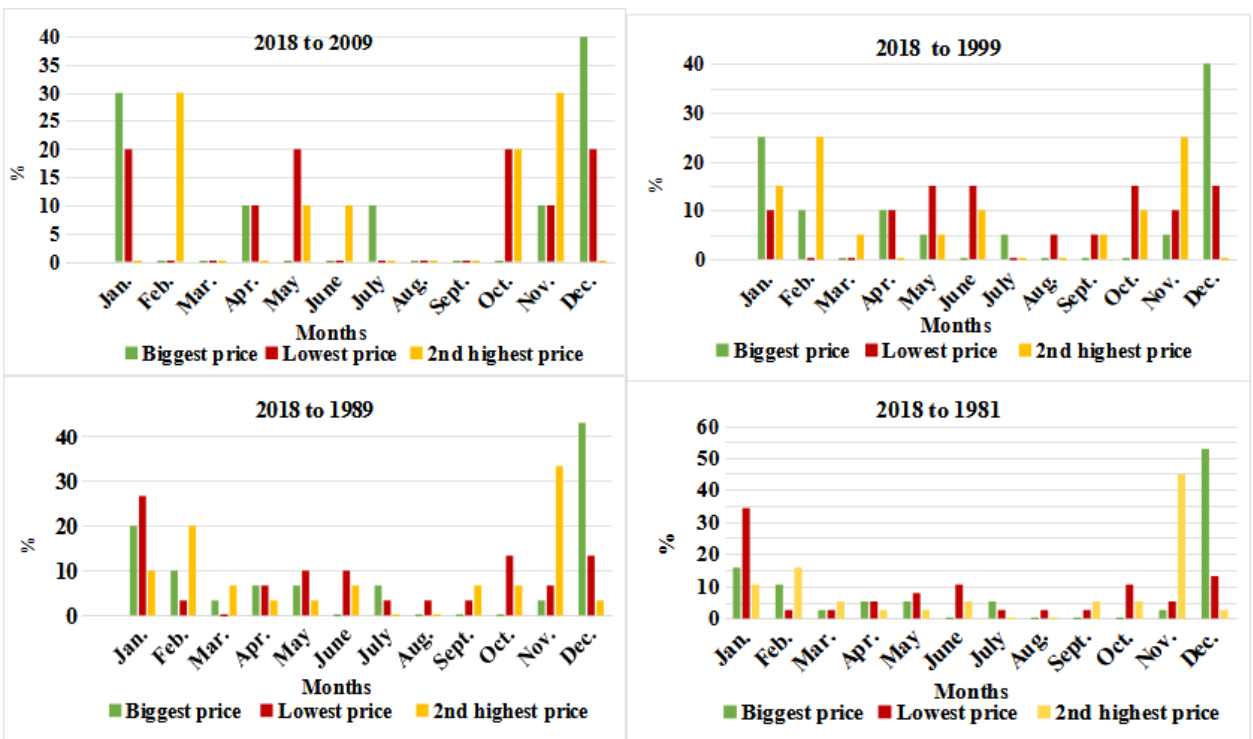
So, even considering the market conditions that can influence the coffee price, in the present research the observed periods of high activity are very consistent for the cash prices of this commodity, allowing us to safely predict the most opportune moment for trading.

The second-best month for coffee sales was February and November in 30% of the occasions between 2018 and 2009; February and November with 25% in the interstice from 2018 to 1999; November in 33.33% of the observations between 2018-1989 and during the years 2018 to 1981 November with 44.74% of the time as the second-best time (Figure 1). It is verified through these observations that there is consistency throughout the analyses, as November remains the second-best option for trading Arabica coffee (Figure 1), regardless of the biennial production.

The months with the lowest values for Arabica coffee were January, May, October, and December 20% of the time during the years 2018 to 2009, highlighting that in this period low prices were present in 1/4 of the year, which can have contributed to the low coffee sales, reducing the profitability of producers. For the years between 2018 and 1999, the months that had the biggest drop in prices were 15% of the time in May, June, October, and December (Figure 1).

In the period between 2018 and 1989, the month of January concentrated in 26.67% of cases as the least favorable month for the coffee sale. In the price analysis in the years 2018 to 1981, the month that presented the highest percentage of low prices was January with 34.21% of the observations. When analyzing

Figure 1 – Price analysis of 60 kg bag of Arabica coffee from 2018 to 2009; 2018 to 1999; 2018 to 1989; 2019 to 1981.



Source: (Authors, 2019)

the consistency of prices over the research period, we found that January remains the least favorable month for selling Arabica coffee in the physical market.

It should be noted that not necessarily when December is the best period for selling coffee, January will be the most unfavorable, because, in this high condition, there is a tendency for a small oscillation in market values in the following month. So, January only happens to be the most unfavorable month when there is a downward trend in the months that precede it.

The increase in prices at the end of the year can be explained by the arrival of winter in Europe, which starts on December 22nd, and, according to Neves (1997), it is estimated that there may be a difference in coffee consumption between the winter months. and summer of 27%, so, with the arrival of the cold season, there is a greater demand for hot drinks such as coffee, increasing demand and then its price at the end of the year, with this price being able to extend to the following year.

As it is preferable to guarantee the coffee supply until December in this continent, the month of January becomes unstable, being able to have ups and downs allied to the supplying countries' supply levels, since January was 34.21% times the least favorable month for sales and 15.78% times the best sales month between 2018 and 1981 (Figure 1).

It is noticed that there is a paradox in the Arabica coffee trading, making these operations even riskier, given that at the end or beginning of the year are the favorable and unfavorable months for trading in the physical market (Figure 1).

Caixeta (2011), researching cash sales of coffee, from January to December 2011, identified that the most opportune moments for cash payments are January to early April; the end of April and end of May; from the second half of August to the beginning of October; mid-November to late December.

Santos et al. (2007), conducting research on the best period for the commercialization of coffee between the years 1996 to 2006, concluded that the months before the harvest are the most favorable, highlighting February, March, and January and the months of July, August and September as the worst period. Silva and Reis (2013) highlighted those possible contradictions about the most favorable months for coffee trading are associated with the methods used to assess profitability, the different proposed analysis periods, therefore deserving more robust analyzes for longer periods of analysis such as those that were made in the present research considering a period of 38 years for arabica coffee.

The fluctuations in the prices of agricultural products verified are inherent to market laws, climatic conditions, and productivity unpredictability. There are currently some debates about the extent to which futures and physical market trading impact this volatility (MAURICE; DAVIS, 2012).

Barreto and Zugaib (2016), researching the coffee price in the period between 1964/5 to 2014/15, observed a moderate relationship between coffee prices and stocks, with a 10% increase in stocks, there is a drop of 1 .2% in prices, leaving the coffee growers to carry out a more in-depth analysis of the opportune moment for negotiation, which must be analyzed together with other variables.

Covindassamy, Wallen and Robe (2017) reported that the uncertainties of the coffee and sugar markets are related to the physical market side by global macroeconomic conditions, such as current consumption demand, preventive demand through physical inventories, extreme weather episodes, outbreaks of diseases, etc.

To reduce market uncertainty, coffee growers can adopt the sale of this commodity in installments as a strategy for trading Arabica coffee, exploring other means such as the futures market and the barter, which are options for locking prices to the farmer.

History analysis of robusta coffee prices

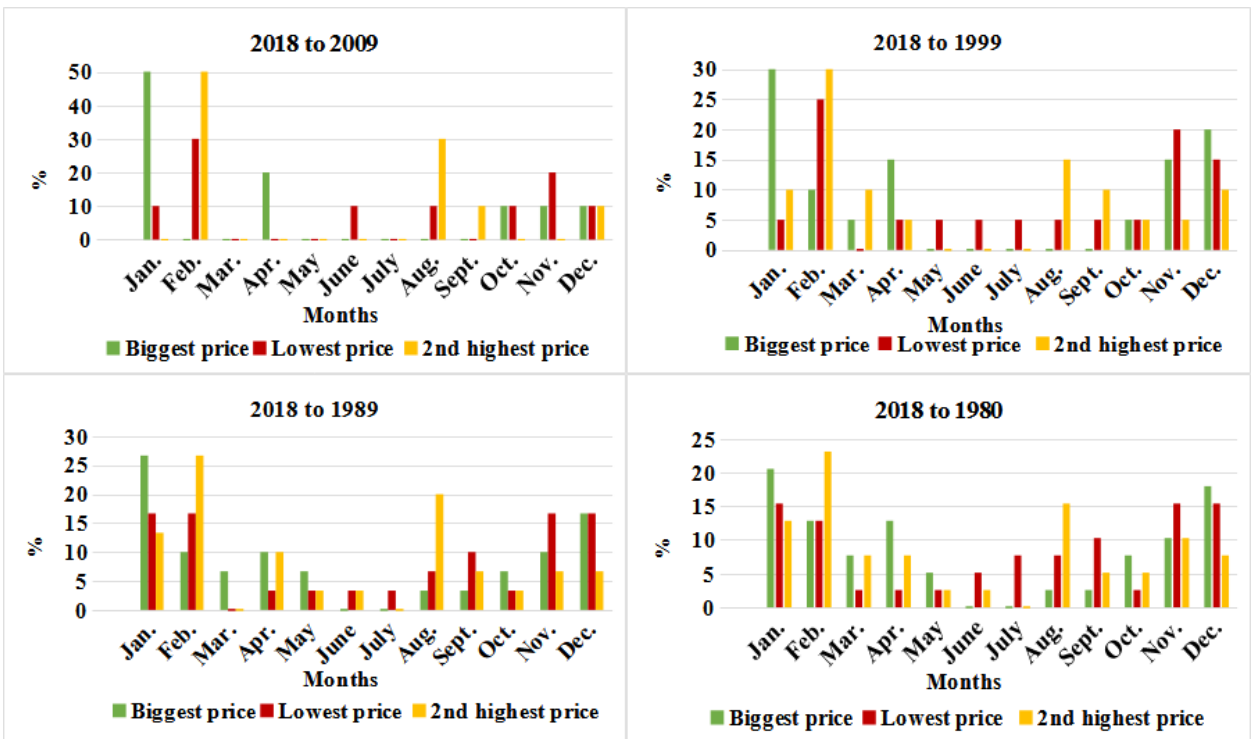
For the evaluation carried out between 2018 and 2009, 20% of the time January and December are the months with the highest increase for robusta coffee. In the analysis of the period between 2018 to 1999 and 2018 to 1995, it was found that 25 and 20.83% of June was the best month for sales of this type of coffee (Figure 2).

Over the years that the research was carried out, it is possible to identify a break in the month consistency with the highest sales price only in the decade between 2018 and 2009, as January and December become the most opportune time for this operation, while that June in this period accumulates 10% of the opportunities for the best time to market (Figure 2).

Between the years 2018 to 2009, the second place for the months with the best opportunity for robusta coffee trading was 20% in June, July and November. In the analysis of the period between 2018 and 1999, November was 20% the second-best time. In the years between 2018 and 1995, May and November were 16.67 times in the second position to sell robusta coffee (Figure 2).

Between the years of 2018 to 2009, the second place for the months with the best opportunity for robusta coffee trading was 20% in June, July and November. In the analysis of the period between 2018 and 1999, November was 20% the second best time. In the years between 2018 and 1995, May and November were 16.67 times in the second position to sell robusta coffee (Figure 2).

Figure 3 – Analysis of prices in US cents per pound of arabica coffee in the futures market from 2018 to 2009, 2018 to 1999 and 2018 to 1989, and 2018 to 1980.



Source: (Authors, 2019)

The most unfavorable month to market this type of coffee between the years 2018 to 2009, 2018 to 1999, and 2018 to 1995 was January, respectively, 50; 40 and 37.5% of the findings (Figure 2), showing the same result for arabica coffee, except for the period from 2018 to 1999 (Figure 1).

Wulandari et al. (2019), carrying out research from January 2011 to June 2014, on the impact of price volatility on the Indonesian coffee futures market, concluded that for Arabica coffee, price volatility is impacted by the futures market price, inflation, and exchange rate. For canephora coffee, this volatility is associated only with the futures market and the exchange rate.

History analysis of arabica coffee prices on the futures market

In the stratified research of Arabica coffee prices in the futures market with contracts expiring in May between the years 2018 to 2009, 2018 to 1999, 2018 to 1989, and 2018 to 1980, it shows that January was the best month for hedging operations, respectively. at 50; 30; 26.67 and 20.51% of the occasions (Figure 3).

The second-best time to trade Arabica coffee on the futures market was February, regardless of any speculation, weather conditions, or other events that may have occurred. This was verified at 50, 30, 26.67, and 23.08% respectively for the interstices from 2018 to 2009, 2018 to 1999, 2018 to 1989, and 2018 to 1980 (Figure 3).

Huchet and Fam (2016) stated that speculation through futures contracts positively affects changes in commodity prices. Speculation in the futures market, mainly for coffee and sugar, has an impact on the physical markets due to the installments purchased.

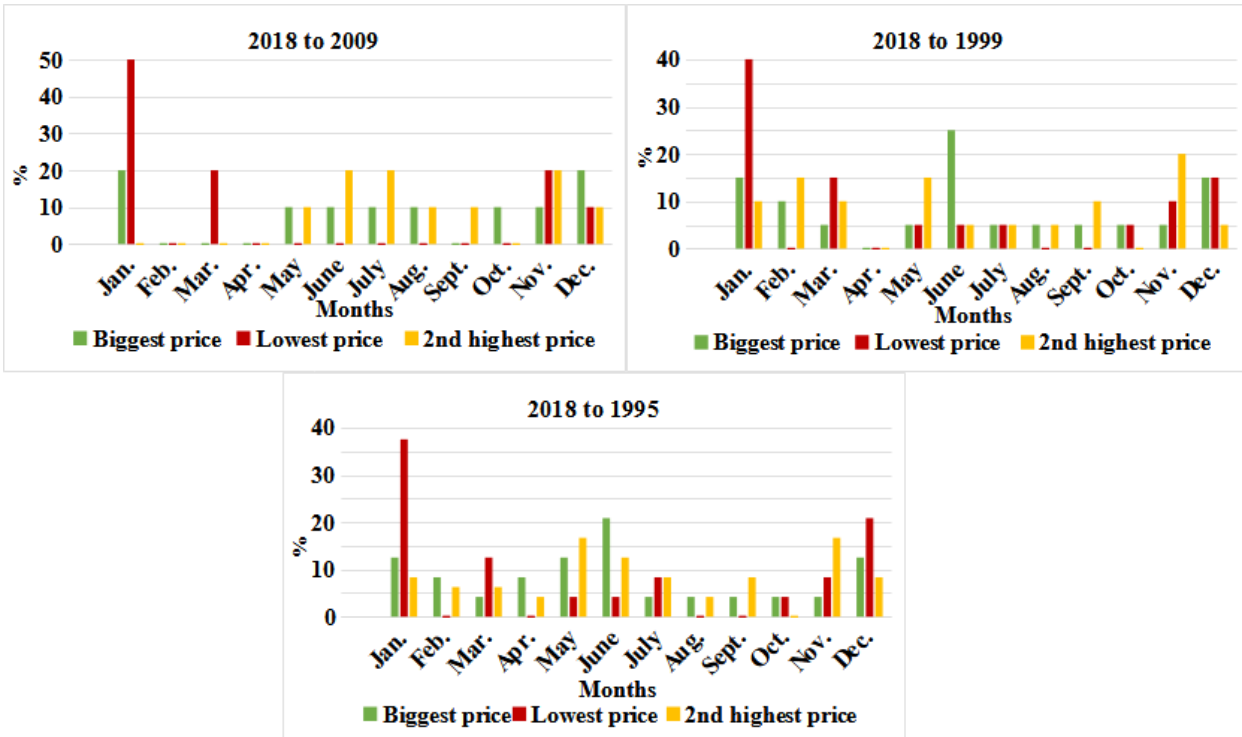
Wulandari et al. (2019) stated that the futures market in Indonesia plays a key role in the predictability of spot coffee prices, and local futures and spot prices are heavily influenced by the volatility of prices abroad. In the present research, it was observed that January was the best month to trade coffee in the futures market and, paradoxically, in the physical market this was the most unfavorable month for the period from 2018 to 1981 (FIGURE 1).

The months with the highest drop for arabica coffee in the futures market were February between 2018 and 2009 and 2018 and 1999 in 30 and 25% of the opportunities. For the interval between 2018 and 1989, January, February, November, and December were in the lead with 16.67% of observations as the least favorable months for market locks. The analysis of the years 2018 and 1980 revealed that January, November, and December are 15.38% of the situations as the months with the highest drop for coffee in this trading modality (Figure 3).

In the evaluations for the stratified periods, there is a consistency in January and February as the months of the year, most favorable for the Arabica coffee trading in the futures market, presenting the first- and second-best seasons for this operation. In the opposite situation, demonstrating the instability of the market, February presents an unfavorable scenario for selling coffee in the stratified period between 1989 and 2018. This scenario becomes even more critical when analyzed between 2009 and 2018, in which 30% of the time February had the lowest quotation for arabica coffee on the futures market (Figure 3).

Futures market operations have contract maturity for March, May, July, September, and December; in this way, these operations involve choosing the most suitable month for crashing, in addition to the most opportune month for contract expiry. Marques et al. (2006) point out that the choice of expiry months must involve a joint analysis of the harvest, the inter-harvest period, and the proximity to contract maturities, as this

Figure 2 – Price analysis of 60 kg bag of robusta coffee from 2018 to 2009; 2018 to 1999; 2018 to 1995.



Source (Authors, 2019)

proximity generally contributes to devaluing the price of the commodity.

Regardless of the way coffee is sold, this is a risky market, given the fluctuations observed throughout each year (Table 1), however, associating the criterion of the most favorable months for the commercialization of coffee is a strategy that can be used to reduce market uncertainties, provided that other variables are also used. The stages of commercialization of coffee must be planned and carried out using the various possibilities that the market offers.

Hedge sales transactions end up being a very interesting alternative, as long as the producer bears in mind all the costs involved in producing each bag of coffee. Based on these costs, it is up to the producer to define the profit margin that suits him to lock the market at the most appropriate time (MARQUES et al., 2006).

Araújo et al. (2018), analyzing a time series, between 2007 and 2017, of the averages for each year of the spot coffee price and in the futures market, found that the future sale on the closing date always presents a higher value of coffee when compared to the market cash and that this operation is advantageous when the contract expires in March.

Correlation analysis in coffee trading

Through the analysis of Pearson's correlation coefficient (Table 2), the prices of Arabica and Robusta coffee have a significant positive correlation, that is, the prices of Robusta tend to increase or decrease according to the prices of Arabica coffee.

On the other hand, prices between robusta coffee and the futures market have a significant positive correlation, however weak (COHEN, 1988), not being an analysis strategy that can guarantee the relations between these markets.

The correlation of Arabica coffee with the futures market is not significant, indicating, then,

Table 2 - Pearson's correlations of evaluated prices in the physical and futures markets of Arabica Coffee and Robusta coffee in the physical market.

	PRICES		
	ROBUSTA	**ARÁBICA**	**FUTURE MARKET**
ROBUSTA	-	0.899**	0.307**
ARÁBICA	-	-	- 0.067

** 1% probability **Source:** Authors (2019)

that in the month chosen to lock the futures market, the analysis of the physical market does not become relevant.

Caixeta (2015) emphasizes that future market observations are relevant to predict physical market prices, given that in 2011 the author observed that there is a high relation in the prices of the two forms of Arabica coffee trading. Araújo et al. (2018) analyzing the efficiency in the futures market between the years 2007 and 2017 showed the role of physical market prices in the determination and formation of futures prices, these being unbiased estimators of physical prices.

Wulandari et al. (2019) observed that in Indonesia for Robusta coffee, its volatility in the cash price influences prices in the futures market, with monetary factors tending to have less impact on cash and futures prices.

Conclusions

In the physical market for arabica coffee, December is the most favorable, and January is the least favorable for trading.

For robusta coffee, June has the highest value per bag, and January is considered the least favorable month for trading.

In the Arabica coffee futures market, the most favorable month for trading is January, with February being the most unfavorable month for this type of operation.

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