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Growth and Instability of Futures Trading in Select Agricultural Commodities

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A B S T R A C T

This paper is an attempt to estimate growth and instability of futures trading in terms of quantity and value of selected agricultural commodities i.e. maize, chilli and Bengal gram which were traded in NCDEX. Results showed that growth and instability of maize was observed maximum positive compound growth rates in both quantity (38.91%) and value (43.67%) in 2006. Maximum positive compound growth rates of chilli in both quantity (18.45%) and value (20.78%) were observed in 2009. Maximum positive compound growth rates of Bengal gram were observed in both quantity (30.62%) and value (34.20%) in 2005.

Key words: Growth, Instability, Trade, Maize, Chilli, Bengal gram

Sustainable growth of the Indian economy depends on the agriculture sector. Even today, agriculture plays a very important role in the economic development as nearly half of the rural population depends on agriculture for their livelihood. But over the years, Indian agriculture sector is exhibiting sluggish growth rate due to various risks challenging the sector. The primary objectives of any producer are to maximize profit and minimize risks. Falling prices associated with good harvest during peak season is a major concern and so farmers are forced to sell at lower prices (distress sale) that reduces their potential gain. Even if farmers defer the sales of farm produce at future favorable prices by storing, they face the problem of storage loss. Further, markets in India are highly fragmented and location specific, consisting of a long chain of intermediaries. Besides this, regional players play a dominant role in these spot markets and presence of international players in domestic markets is a major threat in post globalization. Such market imperfections lead to exploitation of the farmers and hence they do not realize the potential gain from product sale which negatively affects their income and livelihood security. A well-developed and effective commodity futures market facilitates offsetting the transactions without impacting on physical goods until the expiry of a contract. Futures market keep on minimizing risk as it attracts hedgers who minimize their risks, and encourages competition from other traders who possess market information and price judgment. While hedgers have long-term perspective of the market, the traders, or arbitragers as they are often called, hold an immediate view of the market. Another positive aspect of futures market is that it enables participation of a large number of different market players in buying and selling activities in the market. It is based on diverse domestic and global information such as price, demand and supply, climatic conditions and other market related information. Because of the economic importance of the futures trading in agricultural commodities the present study is taken to examine the growth and instability of futures trading in selected agricultural commodities.

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MATERIALS AND METHODS

The basic data used for this study consisted of daily price histories for the near- month futures contract of the selected commodities and their respective spot prices which were collected from the specialized markets that have commodity exchanges in NCDEX. For the present study, the selected agricultural commodities were viz. maize, Bengal gram and chili i.e. one each from cereals, pulses and spices.

Analytical techniques

Compound growth rate (CGR)

The following functional form was used to estimate the compound growth in traded quantity and value.

$$Y_t = Y_0 (1 + r)^t \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The logarithmic transformation of this equation is given as,

$$\text{Ln } Y_t = \ln Y_0 + t \ln (1+r) \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where,

Y_t is the variable for which growth is calculated,

r is the compound growth rate and

ln is the natural logarithm.

Now, let $\ln Y_0 = \beta_1$ and $\ln (1+r) = \beta_2$

then, the above equation becomes, $\ln Y_t = \beta_1 + \beta_2 t$

β_1 and β_2 were estimated by ordinary least square (OLS) method and the CGR is given by $r = (\text{antilog } \beta_2 - 1) \times 100$

Instability index (Coefficient of variation and Cuddy-Della Valle Index)

Instability in quantity and value of trade is estimated to examine the extent of risk involved in futures trading using the coefficient of variation for no time trend series and Cuddy-Della Valle instability index for the time trend series.

The Cuddy-Della Valle index (Cuddy and Della Valle 1978) is computed as: $I = CV \times \sqrt{(1 - R^{-2})}$

Where,

I is the instability index in per cent

CV is the coefficient of variation in per cent and

R^2 is the coefficient of determination from a time trend regression

The formula for the coefficient of variation is:

Coefficient of Variation = (S.D. / Mean) × 100

In symbols: $CV = (SD / \bar{X}) \times 100$

RESULTS AND DISCUSSION

Share of agricultural commodities traded in exchanges during 2017-18

The share of agricultural commodities in different exchanges in terms of volume is presented in (Table 1, Fig 1). The results indicated that among the three agricultural commodity exchanges major share of agricultural commodities was in favour of National Commodity and Derivatives Exchange (NCDEX) i.e. 82.82 per cent. The share of Multi Commodity Exchange (MCX) and National Multi Commodities Exchange (NMCE) was 10.37 and 6.81 per cent, respectively.

Table 1 Share of agricultural commodities traded in different exchanges during 2017-18

Particulars	Volume (in '000 tonnes)	Value (in ₹ crore)
MCX	6481.9 (10.37)	58939.5 (18.19)
NCDEX	51772.5 (82.82)	245743.9 (75.83)
NMCE	4257.4 (6.81)	19369.6 (5.98)
Total	62511.8 (100)	324053 (100)

Figures in parentheses indicate percentages to total.
Source: MCX, NCDEX, NMCE

The share of agricultural commodities in terms of value indicated that among the three agricultural commodity exchanges, major share of agricultural commodities was taken by National Commodity and Derivatives Exchange (NCDEX) i.e. 75.83 per cent. The share of Multi Commodity Exchange (MCX) and National Multi Commodities Exchange (NMCE) was 18.19 and 5.98 per cent, respectively (Fig 2).

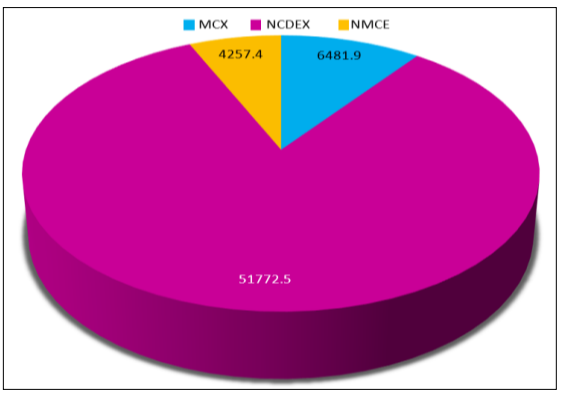

Fig 1 Share of agricultural commodity's volume traded in exchanges during 2017-18

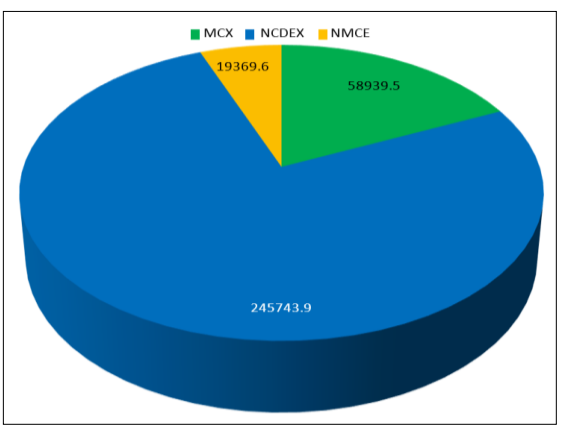

Fig 2 Share value of agricultural commodities traded in exchanges during 2017-18

Growth and instability of maize traded in NCDEX

From (Table 2-3) the results showed that the maximum positive compound growth rates were observed in both quantity (38.91%) and value (43.67%) in 2006 and maximum negative compound growth rates were found both in quantity (-23.85%) and value of maize traded in NCDEX (-23.46%) in 2008. Positive growth rates in quantity and value were observed in 2005, 2009, 2012, 2014, 2015, 2016 and 2017. Negative growth rates both in quantity and value were observed in 2007, 2008, 2010, 2011 and 2013. Maize futures trade showed very high variation in 2005 in terms quantity (132.61%) and in 2017 in terms of value (112.59%). Futures trade showed least variation in quantity (25.84%) in 2010 and in value (27.10%) in 2011. A positive skewed distribution was exhibited in quantity in the all years except 2010 and 2015 and in terms of value all the years demonstrated positive skewness. All the years showed a playti kurtic (flat or short tailed) probability in quantity except in 2005, 2006 and 2007 in which it was leptokurtic (10.26), (5.49) and (7.52), respectively. In terms of maize value, all the years showed platy kurtic i.e. less than 3 except in 2006, 2007 and 2016 in which it was lepto kurtic (6.42), (7.08) and (3.37), respectively.

Table 2 Growth, instability and descriptive statistics for maize (quantity) traded in NCDEX from 2005-2017

Year	CGR (%)	S.D	Mean	C.V (%)	Instability (%)	Skewness	Kurtosis
2005	19.31*** (0.014)	416681.28	241053.85	172.86	132.61	3.10	10.26
2006	38.91*** (0.00085)	625367.17	445030.83	140.52	82.36	2.20	5.49
2007	-10.72*** (0.0035)	172686.94	231551.67	74.58	50.19	2.62	7.52
2008	-23.85*** (0.00000084)	209624.65	229645.83	91.28	34.06	1.35	2.02
2009	9.71	41915.63	43187.50	97.05	92.68	1.77	2.01
2010	-4.50* (0.089)	29623.31	103328.33	28.67	25.84	-0.30	-0.48
2011	-5.01** (0.05)	50614.79	157590.00	32.12	27.63	0.58	-0.03
2012	20.61*** (0.0015)	420195.84	565500.00	74.31	46.11	0.59	-1.09
2013	-10.45	333141.10	406708.33	81.91	79.88	0.86	-0.07
2014	2.40	119940.92	163935.00	73.16	76.39	0.53	-1.27
2015	21.68** (0.024)	43503.92	75685.00	57.48	46.31	-0.22	-1.06
2016	10.02	103096.14	115625.00	89.16	88.28	1.58	2.61
2017	20.20	24533.28	22672.00	108.21	111.89	0.63	-1.38

*, ** and *** indicate the significance respectively at 10, 5 and 1 per cent level of probability. Figures in parentheses indicate P value

Table 3 Growth, instability and descriptive statistics for maize (Value) traded in NCDEX from 2005-2017

Year	CGR (%)	S.D	Mean	C.V (%)	Instability (%)	Skewness	Kurtosis
2005	19.49***	6842.88	7082.42	96.62	73.02	1.30	0.24
2006	43.67*** (0.00062)	50500.00	33021.75	152.93	87.00	2.39	6.42
2007	-11.26*** (0.0025)	13463.92	17657.83	76.25	49.72	2.54	7.08
2008	-23.46*** (0.000032)	17529.94	19726.92	88.86	37.89	1.18	1.42
2009	11.55	4279.96	4105.42	104.25	96.55	1.84	2.21
2010	-2.94	2862.65	10109.25	28.32	27.68	0.25	-0.19
2011	-5.52** (0.041)	5991.05	18654.83	32.12	27.10	0.12	-0.58
2012	22.83*** (0.0017)	64485.11	79050.58	81.57	51.32	0.71	-0.86
2013	-10.91	46061.39	54458.42	84.58	82.04	0.95	0.28
2014	2.01	14046.11	19049.75	73.73	77.09	0.53	-1.34
2015	25.40*** (0.010)	6228.58	10041.08	62.03	46.34	0.04	-1.03
2016	10.35	16118.00	16962.08	95.02	93.90	1.78	3.37
2017	18.73	3259.74	3005.20	108.47	112.59	0.64	-1.32

Table 4 Growth, instability and descriptive statistics for chilli (quantity) traded in NCDEX from 2005-2017

Year	CGR (%)	S.D	Mean	C.V (%)	Instability (%)	Skewness	Kurtosis
2005	16.24* (0.071)	74914.71	140976.00	53.14	45.47	0.52	0.93
2006	13.79*** (0.0094)	270706.55	543120.83	49.84	36.74	0.27	0.58
2007	-22.66*** (0.0015)	248899.31	312322.92	79.69	49.50	0.83	0.10
2008	-21.75	34244.87	49214.17	69.58	34.29	0.16	-1.40
2009	18.45*** (0.001)	17860.80	23175.42	77.07	46.46	1.13	-0.04
2010	8.05** (0.05)	29557.72	53311.67	55.44	47.76	1.64	3.03
2011	-12.96*** (0.001)	69058.79	149495.83	46.19	28.77	-0.50	-1.00
2012	7.61	79485.59	130102.08	61.09	56.59	1.47	1.54
2013	-10.19*** (0.0025)	59587.66	158495.83	37.60	24.44	-0.50	-0.40
2014	-40.87*** (0.0013)	3030.10	2575.56	117.65	67.34	0.95	-0.89
2015	0.72	7349.70	6020.83	122.07	130.47	2.17	5.73
2016	-10.55	1.05	5.00	21.08	15.63	1.02	0.07
2017	15.47	2.89	18.33	15.75	11.13	-1.73	-1.83

Growth and instability of chilli traded in NCDEX

From (Table 4-5) it is clear that the maximum positive compound growth rates of chilli in both quantity (18.45%) and value (20.78%) were observed to be significant at 1 per cent level in 2009 and maximum negative compound growth rates were observed in both quantity (-40.87%) and value of chilli traded in NCDEX (-41.19%) in 2014. Positive growth rate in quantity and value were observed in 2005, 2006, 2009, 2010, 2012, 2015 and 2017. Negative growth rates both in quantity and value were observed in 2007, 2008, 2011, 2013, 2014 and 2016. Instability of chilli futures trade showed very high variation in 2015 in terms quantity (130.47%) and in terms of value (123.32%). Instability in futures trade showed very less variation in quantity (11.13%) and in value (14.86%) during 2017. A positive skewed distribution was exhibited in quantity and value in the all years except 2011, 2013 and 2017 during which negative skewness was noticed. All the years showed a playti kurtic (flat or short tailed) probability in quantity except in 2010 and 2015 in which it was leptokurtic (3.03) and (5.73), respectively. In terms of chilli value, in all the years it was platy kurtic i.e. less than 3 except in 2010 and 2015, in which it was leptokurtic (8.41) and (4.82), respectively.

Table 5 Growth, instability and descriptive statistics for chilli (Value) traded in NCDEX from 2005-2017

Year	CGR (%)	S.D	Mean	C.V (%)	Instability (%)	Skewness	Kurtosis
2005	19.99** (0.026)	23119.79	36675.20	63.04	48.30	1.01	1.26
2006	20.08*** (0.0031)	176801.96	289341.75	61.10	40.57	0.79	1.58
2007	-23.75*** (0.0020)	132496.34	148446.92	89.26	56.86	1.20	0.90
2008	-19.78*** (0.0010)	16079.54	23714.83	67.80	40.57	0.16	-1.43
2009	20.78*** (0.00096)	11121.88	13006.75	85.51	50.74	1.20	0.08
2010	9.47** (0.04)	21426.15	27523.50	77.85	66.30	2.75	8.41
2011	-15.35*** (0.0006)	70582.88	134186.92	52.60	30.15	-0.18	-0.89
2012	7.46	46154.22	71681.00	64.39	59.92	1.63	2.03
2013	-10.57*** (0.0020)	41322.28	99589.08	41.49	26.41	-0.08	-0.68
2014	-41.19*** (0.0031)	2951.54	2506.44	117.76	64.86	0.97	-0.76
2015	3.31	6253.99	5398.25	115.85	123.32	1.98	4.82
2016	-13.55	1.41	5.00	28.28	24.37	1.41	1.50
2017	14.35	2.65	16.00	16.54	14.86	-1.46	-1.35

Growth and instability of Bengal gram traded in NCDEX

The results presented in (Tables 6-7) showed that maximum positive and significant compound growth rates of Bengal gram were observed in both quantity (30.62%) and value (34.20%) in 2005 and maximum negative compound growth rates were observed in both quantity (-45.73%) and value (-39.31%) in 2016. Positive growth rates in quantity and value were observed in 2005, 2009, 2011, 2013 and 2017. Negative growth rates both in quantity and value were evident in 2006, 2007, 2008, 2010, 2012, 2014, 2015 and 2016. Instability analysis of futures trade showed very high variation in 2008 in terms of value (65.2%) and in quantity (61.62%) in 2016. The same analysis in futures trade showed very less variation in quantity (16.38%) in 2007 and in value (16.83%) in 2007. A positive skewed distribution was noticed in all years except in 2008, 2015 and 2017 in both quantity and value of bengal gram. All the years showed a playti kurtic (flat or short tailed) probability in quantity and value except in 2017, where in it was lepto kurtic i.e. (4.71) and (3.17), respectively.

Table 6 Growth, instability and descriptive statistics for chilli (Value) traded in NCDEX from 2005-2017

Year	CGR (%)	S.D	Mean	C.V (%)	Instability (%)	Skewness	Kurtosis
2005	30.62*** (0.000003)	5704690	7420342	76.88	25.89	0.45	-0.94
2006	-7.10*** (0.0067)	3387309	10168866	33.31	23.79	0.11	-0.49
2007	-13.80*** (0.0000019)	1754118	3450998	50.83	16.38	0.33	-1.45
2008	-35.35	1845358	2432955	75.85	58.64	-0.02	-2.29
2009	15.64*** (0.00034)	1622332	2995320	54.16	29.06	0.29	-1.46
2010	-1.75	837562	3753590	22.31	22.28	1.15	0.66
2011	7.77*** (0.010)	2529527	6459288	39.16	29.10	0.75	-0.36
2012	-7.89*** (0.0084)	1841771	4444361	41.44	30.22	0.94	0.85
2013	8.54*** (0.021)	1352588	3230306	41.87	33.28	0.44	-0.23
2014	-1.75	593739	2641813	22.47	22.64	0.13	-1.41
2015	-10.15** (0.05)	1631536	3444730	47.36	40.96	-0.48	-0.85
2016	-45.73	555303	751228.6	73.92	61.62	0.23	-1.31
2017	20.67	477091	1415913	33.69	26.89	-2.09	4.71

As it is evident from (Tables 8-9), all the three commodities have recorded negative significant annual growth in quantity traded as well in value terms. The growth rates for maize, chilli and Bengal gram were -9.23, -47.97 and -13.87 and -2.55, -42.95 and -7.23 per cent for physical quantities traded and equivalent value terms, respectively. The instability analysis of Bengal gram showed that it was 56.75 per cent in quantity and 60.13 per cent in terms of value. Positive skewness in both value and quantity in bengal gram from inception of trading in NCDEX was observed and its showed platy kurtic both in quantity and value i.e. 1.00 and -0.42, respectively.

Table 7 Growth, instability and descriptive statistics for Bengal gram (Value) traded in NCDEX from 2005-2017

Year	CGR (%)	S.D	Mean	C.V (%)	Instability (%)	Skewness	Kurtosis
2005	34.20*** (0.0000032)	1153511.52	1399471.50	82.42	27.99	0.57	-0.67
2006	-3.06	836637.62	2466653.92	33.92	33.55	0.82	0.70
2007	-13.57*** (0.0000006)	390254.15	787990.00	49.53	16.83	0.26	-1.45
2008	-36.31	526225.45	651537.83	80.77	65.20	-0.10	-2.40
2009	17.21*** (0.00024)	427529.07	731713.00	58.43	30.31	0.34	-1.55
2010	-1.09	194150.64	870537.17	22.30	22.96	1.24	1.12
2011	11.21*** (0.0044)	992984.54	1964878.50	50.54	34.68	0.78	0.02
2012	-5.78* (0.063)	657751.49	1802218.83	36.50	31.95	0.48	0.50
2013	6.77** (0.03)	372169.83	1025347.67	36.30	30.48	0.20	-0.48

2014	-1.81	195542.19	803447.17	24.34	24.56	0.44	-0.81
2015	-7.15	734494.19	1494849.75	49.13	47.09	-0.27	-1.30
2016	-39.31	256881.63	366857.00	70.02	61.93	0.20	-0.86
2017	15.00	264415.40	724347.67	36.50	35.28	-1.36	3.17

The instability in chilli trade in quantity and value traded in terms of percentage showed that it was 100.34 and 106.44 per cent, respectively. It showed lepto kurtic in both quantity and value i.e. 4.09 and 3.22 from its inception. The instability analysis in maize showed that it was 77.47 per cent in quantity traded and 100.67 per cent in terms of value equivalence. Here reject null hypothesis and Positive skewness was found in both quantity and value while it showed platy kurtic in quantity and lepto kurtic in terms of value. Among the three selected agricultural commodities, chilli showed highest negative growth rate and instability in futures trading.

Table 8 Growth, instability and descriptive statistics for selected agricultural commodities (quantity) traded in NCDEX from the inception (2005-17)

Agril. commodity	CGR (%)	S.D	Mean	C.V (%)	Instability (%)	Skewness	Kurtosis
Maize	-9.23	2004622	2480540	80.81	77.47	1.10	0.30
Chilli	-47.97*** (0.013)	1875178	1425856	131.51	100.34	1.95	4.09
Bengal gram	-13.87*** (0.017)	33078845	46497475	71.14	56.75	1.02	1.00

** and *** indicate the significance respectively at 10, 5 and 1 per cent level of probability. Figures in parentheses indicate P value

Table 9 Growth, instability and descriptive statistics for selected agricultural commodities (value) traded in NCDEX from the Inception 2005-17

Agril. commodity	CGR (%)	S.D	Mean	C.V (%)	Instability (%)	Skewness	Kurtosis
Maize	-2.55	261606.3	269930.5	96.92	85.67	1.83	3.19
Chilli	-42.95** (0.028)	1017671	780311.2	130.41	106.44	1.76	3.22
Bengal gram	-7.23	8242983.58	13152969.4	62.67	60.13	0.61	-0.42

** and *** indicate the significance respectively at 10, 5 and 1 per cent level of probability. Figures in parentheses indicate P value

The present study revealed Instability analysis of maize futures trade showed very high variation in 2005 in terms quantity (132.61%) and in 2017 in terms of value (112.59%). Futures trading of maize showed least variation in quantity (25.84%) in 2010 and in value (27.10%) in 2011. Instability analysis of chilli futures trade showed very high variation in 2015 in terms quantity (130.47%) and in terms of value (123.32%) and least variation in quantity (11.13%) and in value (14.86%) during 2017. Instability analysis of futures trade of Bengal gram showed very high variation in 2008 in terms of value (65.2%) and in quantity (61.62%) in 2016. The same analysis in futures trade showed least variation in quantity (16.38%) in 2007 and in value (16.83%) in 2007. The overall analyses indicated that futures trading exhibited significant positive growth coupled with instability in agricultural commodity trade. A well-regulated and deep nationwide commodity futures market will accelerate the process of harmonization of commodity spot prices. Both government and non-government organizations should conduct awareness programs to remove the fear and encourages farmers to participate in futures trading of agricultural commodities.

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