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CONTENTS

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Socio Economic Background of Mutual Funds Investors and its Relationship with Buying Factors and Attitudes

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Abstract

A mutual fund is an investment company that pools the resources from a large number of investors, who share common investment goals, and then diversifies its investment into the securities of different industrial sectors and companies in order to realize potential returns with reasonable safety. In the era of globalization, rapid price fluctuations are occurring in financial assets like equity shares, bonds and also in physical assets like real estate, gold silver etc. Therefore, an individual investor finds it difficult to keep track of ownership of his assets, investments, brokerage dues and bank transaction, etc. Thus, mutual funds have emerged as a better alternative investment avenue. This study focuses on the significance of socio economic factors such as gender, age, education, occupation, marital status, annual income, annual savings and family size over elements of investment in mutual funds in semi urban and rural area of Rayalaseema region of Andhra Pradesh. It also highlights that there is significant relationship between factors influencing investment in mutual fund schemes, source of information, experience in mutual fund investments and, the attitudes towards safety of the various investment avenues and socioeconomic factors.

Key words: Mutual funds, Socio economic factors, Rayalaseema region, Investment avenues

Introduction

Mutual funds are the most suitable investment for a common man as it offers an opportunity to invest in a diversified, professionally managed portfolio at a relatively low cost. Anybody with an investible surplus of a few hundred rupees can invest in mutual funds. Changes in the economic scenario, falling interest rates of bank deposits, volatile nature of capital market and recent bitter experience of investors in making direct investment in capital market instruments led to the increasing importance of mutual funds. They have been playing a significant role in financial inter-mediation, development of capital markets and growth of the financial sector as a whole. The active involvement of mutual funds in economic development can be seen by their dominant presence in the money and capital market.

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Mutual fund industry started in India with the establishment of Unit Trust of India (1964), which was the only player in the industry up to 1987. In 1987, the government allowed public sector banks and financial institutions to join the fray. From 1993 onwards the industry was open for private sector and foreign players who started setting up mutual funds in India since then.

Review of Literature

Saha and Rama Murthy (1994) identified that return, liquidity, safety and capital appreciation played an important role in the preference of the schemes by investors. The study suggested that, fund managers could adopt portfolio selection techniques to make more informed judgments rather than making investments on an intuition basis.

Rajeshwari and Rama Moorthy (2001) studied the financial behaviour and factors influencing fund/scheme selection of retail investors. The survey revealed that the most preferred investment vehicle is bank deposits and that the scheme selection decision is made by the respondents themselves. Newspapers and magazines, brokers and agents, television, suggestions from friends and direct mail in that order are the other sources influencing the choice of a mutual fund scheme.

Vyas (2012) evaluated the forms of investment, mode of investment preferred by investors. He has also examined the investor's knowledge of risk and preference over switching of funds by using Chi-Square test, Pearson's correlation, mean and median. The study found that it has a significant relationship between occupation of investors and mode of investment. Majority of the investors have the knowledge of risk factors in mutual funds.

Sharma (2012) attempted to examine the reasons responsible for lesser recognition of mutual fund as a prime investment option.

Jani, Patel & Jain (2012) studied how different demographical factors have influenced the perception of customers. Majority of consumers of valsad city have positive perception towards mutual fund. The demographic factors (i.e. age, gender, income, education etc.) have influence on investors' perception.

Prasad and Srinivas (2012) in their study identified that the selection of mutual fund schemes by the investor are affected by different factors. The identified factors are infrastructure, reputation of fund, flexibility, transparency, additional facilities, and brand name. The Overall Mean Score value towards financial instruments (8.638 per cent) is greater in all financial instruments except shares and gold.

Rathnamani (2013) observed that many investors prefer to invest in mutual funds in order to have high return at low level of risk, safety and liquidity. In the demographic profile most of the investors are willing to invest only 10 per cent in their annual personal income; around 39 per cent investors belong to age group of 31 to 40 years. Investors showed willingness to take moderate and low level risk. The study concluded that most of the investors belong to moderate investment style.

Jani & Jain (2014) in their study attempted to examine the buying behaviour of rural investors for financial assets specifically focused on mutual fund. The study found that there is significant impact of demographical factors like age, gender, occupation, education and income on the decision making process of buying the mutual funds.

Khitoliya (2014) in his study conducted in Delhi found that only 49 per cent of respondents were aware of mutual funds despite the fact that 60 percent of respondents were post- graduates and 34 per cent were graduates from a metropolitan city. Of the 95 respondents who are aware of mutual funds only 57 had invested in mutual funds.

Chaturvedi, Singh and Singh (2014) concluded that investors are seen to primarily invest in the mutual fund without knowing the entire working of the investment. The customers normally tend to invest in those areas where they have faith and hence building of faith is very important.

Gaglani and Rao (2014) conducted a study on the impact of various demographic factors on investors' attitude towards investment in mutual fund in Nagpur district of Maharashtra state. The study revealed that demographic factors - age, gender, qualification, income and occupation have significant influence on the investors' attitude towards mutual funds investment.

Rajkumar and Venkatramaraju (2014) in their study analysed whether investors have chosen their funds based on liquidity rather than having chosen them on the basis of the level of safety. The study concluded that investors' preference for liquidity is possible through mutual funds and that open ended funds offer more liquidity.

Sharma and Agrawal (2015) in their research on buying behaviour of mutual fund investors, sources investors rely more while making investment and preferable mode to invest in mutual funds.

Objectives of the study

- To analyze the relationship between the socio economic background of investors of mutual funds and their buying factors.

Research Design and Methodology

The study is based on both primary and secondary data. The primary data has been collected from individual investors through a structured questionnaire. The total sample size is 400 individual investors of semi-urban and rural areas from the four districts of Rayalaseema region - Chittoor, Anantapuram, Kurnool and YSR Kadapa. A sample of 100 individual investors each from the above four districts is used for this purpose. The secondary data has been collected from various investment periodicals, such as *Dalal Street, Capital Market, RBI Bulletin, RBI Reports*, the *SEBI Reports* and *SEBI Bulletins*, business newspapers like *Business Standard, Business Line, Economic Times* and *Financial Express* to know the risk and return of various mutual funds. Statistical inferences have been drawn using statistical package for social science (SPSS). ANOVA and Chi-square test are used in the study.

Results and Discussion

Table 1: Socio Economic Profile of Investors in Four Districts

Profile particulars	Total Number of respondents	Ananta-puram	Chittoor	Kurnool	YSR Kadapa
Gender					
Male	346 (86.50)	86 (86.00)	86 (86.00)	90 (90.00)	84 (84.00)
Female	54 (13.50)	14 (14.00)	14 (14.00)	54 (10.00)	16 (16.00)
Age					
Below 30	208 (52.00)	49 (49.00)	51 (51.00)	54 (54.00)	54 (54.00)
31-40	119 (29.80)	27 (27.80)	33 (33.00)	34 (34.00)	25 (25.00)
41-50	38 (9.50)	12 (12.00)	9 (9.00)	6 (6.00)	11 (11.00)
51-60	27 (6.80)	09 (9.00)	4 (4.00)	6 (6.00)	8 (8.00)
(Above 60	8 (2.00)	3 (3.00)	3 (3.00)	0 (0.00)	2 (2.00)

Level of Education					
Below Graduate	42 (10.50)	7 (7.00)	16 (16.00)	12 (12.00)	7 (7.00)
Under Graduate	224 (56.00)	51 (51.00)	55 (55.00)	65 (65.00)	53 (53.00)
Post-Graduate	110 (27.50)	32 (32.00)	28 (28.00)	20 (20.0)	30 (30.00)
Professional	15 (3.80)	6 (6.000)	1 (1.00)	2 (2.00)	6 (6.00)
Any other	9 (2.30)	4 (4.00)	0 (0.00)	6 (6.00)	4 (4.00)
Marital Status					
Married	298 (74.50)	79 (79.00)	68 (68.00)	72 (72.00)	79 (79.00)
Single	102 (25.50)	21 (21.00)	32 (32.00)	28 (28.00)	21 (21.00)
Occupation					
Agriculture	43 (10.80)	9 (9.00)	13 (13.00)	12 (10.80)	9 (9.00)
Salaried	79 (19.80)	21 (21.00)	14 (14.00)	20 (19.80)	24 (24.00)
Business	181 (45.30)	42 (42.00)	53 (53.00)	46 (46.00)	40 (40.00)
Professionals	71 (17.80)	21 (21.00)	13 (13.00)	19 (19.00)	18 (18.00)
Retired	26 (6.50)	7 (7.00)	7 (7.00)	3 (3.00)	9 (9.00)

Annual income (in Rs.)					
Up to 2,00,000	181 (45.30)	43 (43.00)	38 (38.00)	50 (50.00)	50 (50.00)
2,00,001-3,00,000	115 (28.80)	23 (23.00)	36 (36)	34 (34.00)	22 (22.00)
3,00,001-4,00,000	61 (15.30)	14 (14.00)	21 (21)	14 (14.00)	12 (12.00)
4,00,001-5,00,000	15 (3.80)	4 (4.00)	5 (5.00)	2 (2.00)	4 (4.00)
5,00,001-6,00,000	17 (4.30)	9 (9.00)	0 (0.00)	0 (0.00)	8 (8.00)
Above 6,00,000	11 (2.80)	7 (7.00)	0 (0.00)	0 (0.00)	4 (4.00)
Annual Savings					
Up to 1,00,000	289 (72.30)	65 (65.00)	73 (73.00)	80 (80.00)	71 (71.00)
1,00,001-1,50,000	80 (20.00)	19 (19.00)	25 (25.00)	20 (20.00)	16 (16.00)
1,50,001-2,00,000	20 (5.00)	10 (10.00)	2 (2.00)	0 (5.00)	8 (8.00)
2,00,001-2,50,000	7 (1.80)	4 (4.00)	0 (0.00)	0 (0.00)	3 (3.00)
2,50,001-3,00,000	4 (1.00)	2 (2.00)	0 (0.00)	0 (0.00)	2 (2.00)

Source: Computed from primary data

Note: Figures in parenthesis denote percentages

The socio economic characteristics of 400 respondents of Rayalaseema region in Table 1 shows that most of the respondents are males (86.5 per cent) and the respondents who are married constitute 74.5 per cent and unmarried are 25.5 per cent. 52 per cent of mutual funds investors are in the age group of below 30 years, followed by 29.8 per cent from 31-40 years and 9.5 per cent from 41-50 years of age. Thus, most of the respondents are found to be relatively young. The educational level of the respondents shows that 56 per cent are undergraduates, 27.5 per cent are postgraduates and 10.5 per cent are below under- graduates.

The dominant occupational background of the respondents is: business group (45.3 per cent), followed by 19.8 per cent from salaried group, and professionals are 17.8 per cent. The annual income among respondents are up to Rs. 2,00,000 (45.3 per cent); 2,00,001 to 3,00,000 (28.8 per cent); and family size of the respondents is found to be 3 to 4 members in a family.

The relationship between various socio economic factors and investment patterns is analysed with the help of Chi-square test.

Factors Influencing Investment in Mutual Fund Schemes

Table 2 shows the factors influencing investment in mutual funds by the respondents from four districts of Rayalaseema region. Out of 400 respondents, 74.3 per cent of the respondents invested in mutual funds due to good returns, followed by safety of investment (58 per cent). Respondents felt that their investment in mutual funds was safe and not risky. The other reason for investing in mutual funds was capital appreciation (46 per cent). Only 33 per cent of the respondents prefer mutual funds due to diversification benefit provided by them.

Table 2: Factors Influencing Investment in Mutual Fund Schemes

Districts	Safety		Liquidity		Flexibility		Good Return		Capital appreciation		Professional Management		Tax benefits		Diversification	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Anantapuram	48 (48.0)	52 (52.0)	61 (61.0)	39 (39.0)	65 (65.0)	35 (35.0)	30 (30.0)	70 (70.0)	52 (52.0)	48 (48.0)	57 (57.0)	43 (43.0)	54 (54.0)	46 (46.0)	68 (68.0)	32 (32.0)
Chittoor	43 (43.0)	57 (57.0)	57 (57.0)	43 (43.0)	59 (59.0)	41 (41.0)	22 (22.0)	78 (78.0)	59 (59.0)	41 (41.0)	51 (51.0)	49 (49.0)	55 (55.0)	45 (45.0)	64 (64.0)	36 (36.0)
Kurnool	38 (38.0)	62 (62.0)	55 (55.0)	45 (45.0)	63 (63.0)	37 (37.0)	22 (22.0)	78 (78.0)	54 (54.0)	46 (46.0)	60 (60.0)	40 (40.0)	54 (54.0)	46 (46.0)	70 (70.0)	30 (30.0)
YSR Kadapa	39 (39.0)	61 (61.0)	61 (61.0)	39 (39.0)	68 (68.0)	32 (32.0)	29 (29.0)	71 (71.0)	51 (51.0)	49 (49.0)	58 (58.0)	42 (42.0)	57 (57.0)	43 (43.0)	66 (66.0)	34 (34.0)
Total	**168 (42.0)**	**232 (58.0)**	**234 (58.5)**	**166 (41.5)**	**255 (63.8)**	**145 (36.3)**	**103 (25.8)**	**297 (74.3)**	**216 (54.0)**	**184 (46.0)**	**226 (56.5)**	**174 (43.5)**	**220 (55.0)**	**180 (45.0)**	**268 (67.0)**	**132 (33.0)**

Source: Computed from primary data
Note: Figures in parenthesis denote percentages

Table 3: Relationship between Socio Economic Factors and the Factors that Influence Investment in Mutual Funds

Socio economic factors	F value	Sig. Value	Sig or not sig
Gender	0.24	0.887	Not significant
Age	2.912	0.021	Significant
Marital status	1.684	0.195	Not significant
Education	8.672	0.000	Significant
Occupation	7.001	0.000	Significant
Annual income	6.026	0.000	Significant
Annual savings	5.295	0.000	Significant
Family size	3.227	0.013	Significant

ANOVA test has been applied to find if there is any significant relationship between socio economic factors of the investors and factors influencing investment in mutual funds. It is clear, from Table 3, that except for gender and marital status of the investors, other socio economic factors have a significant relationship with the investor's attitude with regard to the factors that influence investment in mutual funds.

Experience in Mutual Fund Investments

Experience of investors in investment is an important factor for successful investing. The experience of investors in the field of investment brings out changes in investment attitude and their preference towards investment avenues and the extent of diversification in investment. Lengthy years of experience helps investors understand the complex behaviour of the market and to implement suitable strategy for investment. The level of experience is confined to less than one year, 2 to 5 years, 6 to 10 years, 11 to 15 years and more than 15 years (Table 4).

Table 4: Experience in Mutual Fund Investment (District-wise)

Districts	Experience in Mutual Fund Investments					Total
	1 year and below	2 to 5 years	6 to 10 years	11 to 15 years	15 years or more	
Anantapuram	35 (35.0)	39 (39.0)	14 (14.0)	5 (5.0)	7 (7.0)	100 (100.0)
Chittoor	32 (32.0)	50 (50.0)	17 (17.0)	0 (0.0)	1 (1.0)	100 (100.0)
Kurnool	40 (40.0)	46 (46.0)	13 (13.0)	1 (1.0)	0 (0.0)	100 (100.0)
YSR Kadapa	38 (38.0)	38 (38.0)	11 (11.0)	6 (6.0)	7 (7.0)	100 (100.0)
Total	**145 (36.3)**	**173 (43.3)**	**55 (13.8)**	**12 (3.0)**	**15 (3.8)**	**400 (100.0)**

Source: Computed from primary data

The years of experience among the investors of Rayalaseema region are two to five years, and below one year which constitute 43.3 and 36.3 per cent. The numbers of investors who have six to ten years of experience are 13.8 per cent to the total. One significant observation from the table is that only 3 per cent of investors have 11 to 15 years of experience in investing in mutual funds.

Table 5: Relationship between the Socio Economic Factors and Experience in Mutual Fund Investment

Socio economic factor	F value	DF	Table value	Sign. value	Sig or not sig
Gender	25.054	4	9.49	4.000	Significant
Age	60.082	16	26.3	0.000	Significant
Marital status	16.100	4	9.49	0.003	Significant
Education	59.749	16	26.3	0.000	Significant
Occupation	51.791	16	26.3	0.000	Significant
Annual income	128.061	20	31.4	0.000	Significant
Annual savings	45.368	16	26.3	0.000	Significant
Family size	28.232	16	26.3	0.030	Significant

Chi-Square Test, at 5% significance level, has been applied on the data collected to find whether these socio economic factors have significant relationship with the period of investment. The result of the test is given in Table 5. The test clearly revealed that all the socio economic factors have significant relationship with the period of investment.

Source of Information on Mutual Funds

The sources from where one can acquire awareness would also be a crucial element in the process of investment decision making. The degree of information may vary from source to source. Brokers/Agents, Prospectus, Advertisements, Annual reports, Newspapers, Magazines and Friends & Relatives are identified as different sources to create awareness on mutual funds.

Table 6 reveals that the sources of information on mutual funds were almost similar for respondents of all four districts of Rayalaseema region. Out of 400 respondents, 229 (57.3 per cent) got the information from newspapers, 196 respondents (49 per cent) from brokers/agents, 136 respondents got the information from magazines, and only 58 respondents collected the information from prospectus (14.5 per cent).

Table 6: Source of Information on Mutual Funds

Districts	Brokers/ Agents		Prospectus		Advertise ments		Annual Reports		Newspapers		Magazines		Friends and Relatives	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Anantapuram	57	43	89	11	83	17	73	27	46	54	60	40	79	21
	57.0%	43.0%	89.0%	11.0%	83.0%	17.0%	73.0%	27.0%	46.0%	54.0%	60.0%	40.0%	79.0%	21.0%
Chittoor	46	54	79	21	81	19	67	33	40	60	70	30	79	21
	46.0%	54.0%	79.0%	21.0%	81.0%	19.0%	67.0%	33.0%	40.0%	60.0%	70.0%	30.0%	79.0%	21.0%
Kurnool	47	53	84	16	86	14	76	24	41	59	73	27	86	14
	47.0%	53.0%	84.0%	16.0%	86.0%	14.0%	76.0%	24.0%	41.0%	59.0%	73.0%	27.0%	86.0%	14.0%
YSR Kadapa	54	46	90	10	83	17	76	24	44	56	61	39	80	20
	54.0%	46.0%	90.0%	10.0%	83.0%	17.0%	76.0%	24.0%	44.0%	56.0%	61.0%	39.0%	80.0%	20.0%
Total	204	196	342	58	333	67	292	108	171	229	264	136	324	76
	51.0%	49.0%	85.5%	14.5%	83.3%	16.8%	73.0%	27.0%	42.8%	57.3%	66.0%	34.0%	81.0%	19.0%

Source: Computed from primary data

ANOVA test has been applied to find if there is any significant relationship between socio economic factors of the investors and the source of information on mutual funds. It is clear from Table 7, that all the socio economic factors (except age) have a significant relationship with the source of information on mutual funds.

Table 7: Relationship between Socio Economic Factors and Sources of Information on Mutual Funds

Socio economic factors	F value	Sig. Value	Sig or not sig
Gender	13.503	0	significant
Age	1.533	0.192	Not Significant
Marital status	22.659	0	significant
Education	3.179	0.014	Significant
Occupation	4.333	0.002	Significant
Annual income	3.825	0.002	Significant
Annual savings	4.004	0.003	Significant
Family size	2.949	0.02	Significant

Attitudes towards various Investment Avenues

It is observed from Table 8, that 90.5 per cent of respondents are having positive attitude towards safety of bank deposits, postal deposits (65.25 per cent) and Public Provident Fund (53 per cent). Another significant observation is that 39.75 per cent respondents are feeling reasonably safe with investment in gold, followed by mutual funds (36 per cent), Public Provident Fund (30.25 per cent), shares (25.5 per cent), Insurance (23.25 per cent) and Real estate (19.25 per cent). On the other hand, 153 respondents (38.25 per cent) found that investment in real estate is not safe, followed by shares (26.00 per cent), insurance (12.25 per cent), gold (12.00 per cent) and mutual funds (10.75 per cent).

Table 8: Attitude towards various Investment Avenues

Sl. No	Financial Assets	Absolutely safe	Reasonable safe	Somewhat Safe	Not Safe	Don't Know	Total
1	Saving Bank/Fixed Deposit	362 (90.5)	36 (9.00)	2 (0.5)	0 (0)	0 (0)	400 (100)
2	Gold/Silver	83 (20.75)	159 (39.75)	100 (25.00)	48 (12)	10 (2.5)	400 (100)
3	Shares/Debentures	12 (3.00)	102 (25.50)	158 (39.50)	104 (26.00)	24 (6.00)	400 (100)
4	Postal savings	261 (65.25)	88 (22.00)	26 (6.5)	18 (4.5)	7 (1.75)	400 (100)
5	Mutual funds	93 (23.25)	144 (36.00)	120 (30.00)	43 (10.75)	0 (0.00)	400 (100)
6	Real estate	36 (9.00)	77 (19.25)	100 (25.00)	153 (38.25)	34 (8.5)	400 (100)
7	Insurance	151 (37.75)	93 (23.25)	98 (24.50)	49 (12.25)	9 (2.25)	400 (100)
8	P.P.F/G.P.F	212 (53.00)	121 (30.25)	24 (6)	6 (1.5)	37 (9.25)	400 (100)

Source: Computed from primary data

Note: figures in parenthesis denote percentages

Table 9: Relationship between Socio Economic Factors and Attitude towards various Investment Avenues

Socio economic Factor	F value	Sig. Value	Sig / not sig
Gender	5.064	0.025	significant
Age	0.801	0.525	Not Significant
Marital status	0.433	0.101	Not Significant
Education	6.375	0	Significant
Occupation	0.491	0.742	Not Significant
Annual income	4.342	0	Significant
Annual savings	6.02	0	Significant
Family size	2.949	0.02	Significant

ANOVA Test, at 5% significance level, has been applied on the data collected to find whether these socio economic factors have significant relationship with the attitudes toward various investment Avenues. The test (Table 9) reveals that most of the socio economic factors such as gender, education, annual income, annual savings and family size have a significant relationship with the attitudes toward various investment avenues. On the other hand, socio economic factors like age, marital status and occupation have no significant relationship with the attitude towards various investment Avenues.

Conclusions

Mutual funds have emerged as an appropriate investment vehicle and a preferred investment destination. Retail/ small investors used to rely more on investment avenues like bank deposits, post office savings etc., which provide liquidity, assured returns and tax benefits. But these avenues do not offer the benefit of investing in capital market and the real purchasing power of the investors is likely to decline with these investments when the rate of inflation rises. Further, the interest rates on these avenues have been slashed down from time to time with a view to channelize the savings to capital market and thereby regain the confidence of investors which they have lost since 1992 due to stock market crises/ debacle in 1992, 2001 and 2008.

It also revealed that except for gender and marital status of the investors, other socio economic factors have a significant relationship with the investor's attitude with regard to the factors that influence investment in mutual funds. All the socio economic factors have a significant relationship with the period of investment whereas with age, marital status and occupation there is no significant relationship with the attitude towards various investment avenues.

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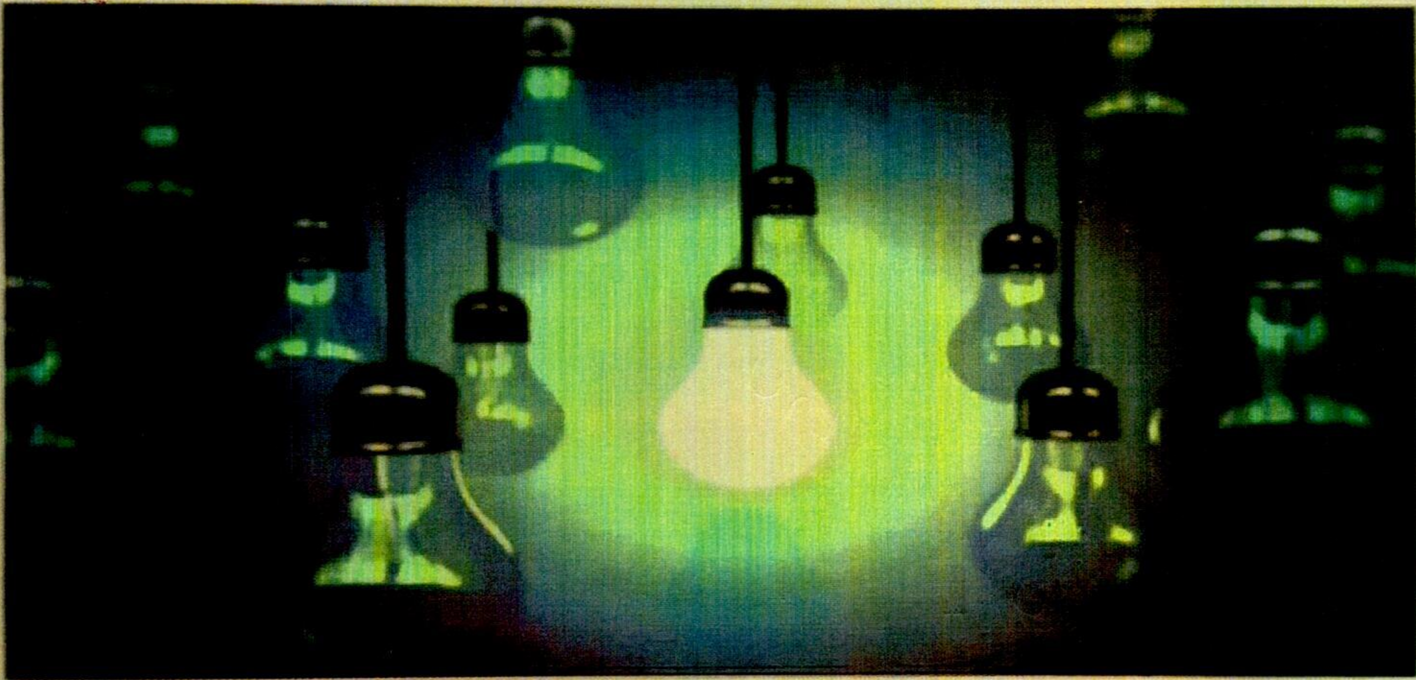

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CONTENTS

Dynamics of Price Discovery of Selected Agricultural Commodities in India

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Abstract

The purpose of the study is to investigate the relationship between Spot and Futures of selected commodities Guar Seed, Jeera, Soya bean and Turmeric . The study is used the tests like Augmented Dickey-Fuller (ADF) test , Phillips-Perron test, Kwiatkowski-Phillips-Schmidt-Shin test, Granger Causality test , Johansen co-integration test, Vector error correction Model (VECM) and diagnostic test, to seek the relationship between Guar Seed, Jeera, Soya bean and Turmeric Spot and futures for data between 1st March, 2014 to 31st March 2017. The results derived by the econometric tools reveal that the unit root test, Augmented Dickey Fuller test (ADF), Phillips-Perron (PP) Test, Kwiatkowski-Phillips-Schmidt-Shin test shows that the spot and futures prices were found to be stationary at first difference. The results of Granger causality test reveals that returns of spot price lead to the futures price and vice versa. Johansen's co-integration test and Vector Error Correction Model (VECM) proved that there is a relation between spot and futures prices of the selected commodities for the study period.

Key words: Causal Relationship and Granger causality test

Introduction:

The Indian agricultural production system has undergone profound changes over the few decades due to adoption of green revolution technologies coupled with price support policy of the Government of India. After independence, various policy initiatives undertaken by GOI for protecting agriculture sector affected the growth in agricultural commodities markets adversely. The Essential Commodities Act 1955 envisaged price and movement protection applicable to various agricultural commodities, particularly food grains such as paddy, wheat, coarse grains and pulses to protect the interests of producers as well as of consumers. During the process of economic liberalization, it was felt that there is a need to reorient policies and regulations in agricultural commodities. Act 1952 to bring fairness and efficiency in futures trading operations. The National Agriculture Policy announced in July 2000 envisaged external and domestic market reforms by putting in place a mechanism of futures trade/market and dismantling of all control and regulations in agricultural commodity market. As a result, the Government of India issued notifications on April 1, 2003 and permitted futures trading (except options trading) for a wide range of agricultural commodities.

Futures contracts help in performing two important management functions, i.e. price discovery and price risk management for the specific commodity. Price discovery is the process of revealing information about future spot prices through the future markets. It is useful for producers as they get a fair idea about the prices likely to prevail at a future point of time and hence, can allocate their limited available resources among various competing commodities for optimizing their profits.

It also provides food processors and consumers an idea about prices at which the specific commodity would be available at a future point of time. Although futures trading in a large number of agricultural commodities were re-introduced in India in the year 2003, government is always skeptical about its efficiency and likely impact on the price movement of agricultural commodities. The influence of one market on the other and role of each market segment in price discovery is the central question in market microstructure design and has become an increasingly important research issue among academicians, regulators and practitioners alike as it provides an idea about the market efficiency, volatility, hedging effectiveness and arbitrage opportunities, if any. The essence of the price discovery function hinges on whether new information is reflected first in changes of future prices or changes of spot prices. Hence, there exists lead-lag relationship between spot and futures market by information dissemination. All the information available in the market place is immediately incorporated in the prices of assets in an efficient market. So, new information disseminating into the market should be reflected immediately in spot and futures prices simultaneously. This will lead to perfect positive contemporaneous co movement between the prices of those markets and there will be no systematic lagged response and therefore no arbitrage opportunity

Review of Literature

Kumar and Sunil (2004) examined the price discovery in six Indian commodity exchanges for five commodities. They used the daily futures and spot price and also engaged the ratio of standard deviations of spot and future rates for empirical testing of ability of futures markets to incorporate information efficiently. The study concluded that inability of future market to fully incorporate information and confirmed inefficiency of future market. However, the paper also concluded that the Indian agricultural commodities future markets are not yet mature and efficient.

Kushankur Dey, Debasish Maitra (2012) in their study on "Price Discovery in Indian Commodity Futures Market: An Empirical Exercise", found that there was a unidirectional causality from Futures to Spot prices in the pepper Futures market.

Jabir Ali, Kriti Bardhan Gupta (2011) observed the long-term relationship between Futures and Spot Prices for the selected Agricultural Commodities are Maize, Chickpea, Black Lentil, Pepper, Castor Seed, Soybean and Sugar. The study found that there was also a short-term relationship between them and the Futures markets had ability to predict spot prices for Chickpea, Castor Seed, Soybean and Sugar. The study also concluded that there was a bi-directional relationship in the short run among the Maize, Black Lentil and Pepper.

R. Salvadi and P. Ramasundaram (2008) in their study entitled "Whether Commodity Futures Market in Agriculture is Efficient in Price Discovery? - An Economics Analysis" examined. The results showed the inefficiency of agricultural commodity futures market in terms of price discovery due to the non integration of futures and the spot market. The study also revealed that the implementation of Government driven policy measures to raise the commodity futures market as a vibrant segment for price risk management in Indian Agriculture sector.

Kumar, Singh and Pandey (2008), studied the hedging effectiveness of futures contract on a financial asset and commodities in Indian markets by applying different time series models and is found that there is presence of necessary co-integration between the spot and derivatives markets and also that both stock market and commodity derivatives markets in India provide a reasonably high level of hedging effectiveness.

Jabir and Kriti (2007), the study on analysis on the effectiveness of commodity futures market through regression analysis by taking both spot and future prices of commodities showed high level of volatility in both spot and futures prices of commodities. Positive coefficients for agricultural commodities in dissimilar equations supported the effectiveness of commodity market in hedging the price risk.

Raizada and Sahi (2006), studied the efficiency of Indian futures market and observed that the wheat futures market is even weak-form inefficient and fails to play the role of spot price discovery. Spot market has found to capture the market information faster and therefore expected to play the leading role. This inefficiency of the futures market may be attributed to the lack of necessary data to truly capture the actual lead-lag relationship between the spot and futures market. It is also suggested that the trading volume in commodity futures market, along with other factors, have a significant impact on country's inflationary pressure.

Objective of the Study

- To test the stationary of the selected agricultural commodities in Spot and Futures Markets
- To examine directional effect among the selected commodities of Spot and Futures
- To examine the relationship between the selected commodities of Spot and Futures movement of NCDEX in India.

Data and Methodology

The present study is aimed towards analysing the dynamics of price discovery between Spot and Futures of Guar Seed, Jeera, Soya bean and Turmeric commodities. The frequency of data is kept at daily level and time span of the study is between 1st March, 2014 to 31st March 2017. The results from daily data are more precise and are better able to capture the dynamics between Spot and Futures of Guar Seed, Jeera, Soya bean and Turmeric commodities. Both the price series have been collected from the website of National Commodity and Derivative Exchange (NCDEX). In this study, the techniques used for analysis are panel unit root test which is Augmented DickeyFuller (ADF) test or Phillips-Perron (PP) test, KPPS Test, Johansen Co-integration test and Regression Model pertaining to analyzing the relationship between Spot and Future Markets of Price discovery of commodities market.

Following Econometric Models were Used for Analysis

- Unit root test,
- Granger causality test, and
- Johansen co-integration test
- Vector error correction Model (VECM)
- Diagnostic test

Unit Root Tests

Augmented Dickey-Fuller (ADF) Test

The standard DF test is carried out by estimating the following Equation after subtracting yt-1 from both sides of the equation:
Dyt = ayt – 1 + xt ¢d + et,
where a = r – 1. The null and alternative hypotheses may be written as,
H0: a = 0
H1: a < 0

The Phillips – Perron test

The Phillips – Perron test is carried out by estimating the following equation

$$\nabla y_t = \nabla y_{t-1} + u_t$$

Where yt is the time series data under consideration.

The KPPS (1992) Test is based on the residuals (εt) from an ordinary least square regression of the variable of interest on the exogenous variable(s) as follows:

Yt = X′ t β+ εt (2)

where Yt is the variable of interest (... ... of exogenous variable(s). The Lagrange Multiplier (LM) statistic used in the test as follows:

$TM = T^{-2}\sum_{i=1}^{t} S(t)^2/fo$

where T is the sample size, S(t) is the partial sum of residuals which is calculated as

$$S(t) = \sum_{i=1}^{t} Sr$$

Here εt is the estimated residual from (3.1). f0 is an estimator of the residual spectrum at frequency zero. This statistic has to be compared with KPSS et al. (1992) critical values.

Granger causality test

The test was carried out to identify the directional effect of selected indices. To test for Granger causality, the following two equations were estimated.

$$Y_t = \sum_{i=1}^{m} \alpha_i Y_{t-i} + \sum_{i=1}^{m} \beta_i X_{t-i} + u_t$$

$$X_t = \sum_{i=1}^{m} \gamma_i Y_{t-i} + \sum_{i=1}^{m} \delta_i X_{t-i} + e_t$$

Johansen cointegration test

The condition for testing Johansen cointegration test for any time series data is that the data should be non stationary at their level i.e. the natural logarithm of time series data should be non stationary and the first difference in the data should be stationary. If the return indices of different markets are correlated, the value may rise or fall. On the other hand, if the time series data are co-integrated, then the series in the long run will come to equilibrium point.

Empirical Results

Table 1: Out of Descriptive statistics of Selected commodities for the period from 01-04-2014 to 31-3-2017

Statistical Measures	Guar Seed		Jeera		Soya Bean		Turmeric	
	Spot	Futures	Spot	Futures	Spot	Futures	Spot	Futures
Mean	4085.26	4106.58	15620.02	15216.59	3582.26	3625.06	7598.94	7746.79
Median	3800.00	3807.00	16417.93	15955.00	3482.00	3645.00	7591.65	7488.00
Maximum	6740.00	6265.00	19585.70	20380.00	4832.00	4863.00	9823.80	10706.00
Minimum	2982.70	3005.00	10246.90	10340.00	2855.00	2862.00	5708.70	5870.00
Std.Dev.	842.72	845.068	2606.40	2533.34	414.28	431.275	965.038	1047.77
Skweness	0.64614	0.74157	-0.72453	-0.36662	0.66096	0.41340	0.04889	0.6295
Kurtosis	2.20031	2.26958	2.24538	2.099386	2.9226	2.70820	2.60631	2.70657
Jarque-Bera	68.4189	80.9709	80.0765	40.4627	52.6040	23.0624	4.57333	46.4501
Probability	0.0000	0.00000	0.00000	0.00000	0.00000	0.00000	0.10161	0.00000

The variables considered in the scope of the study are examined in the table 1 reveals that the average values of variables are found to be Spot prices of Guar Seed (4085.26), and Futures prices of Guar Seed (4106.58), standard deviation values are found as Spot prices of Guar Seed (842.72), and Futures prices of Guar Seed (845.068), Spot prices of Jeera (15620.02), and Futures prices of Jeera (15216.59), standard deviation values are found as Spot prices of Jeera (2606.40), and Futures prices of Jeera (2533.34), Spot prices of Soya Bean (3582.26), and Futures prices of Soya Bean (3625.06), standard deviation values are found as Spot prices of Soya bean (414.28), and Futures prices of Soya Bean

(431.27) and Spot prices of Turmeric (7591.65), and Futures prices of Turmeric (7488.00), standard deviation values are found as Spot prices of Turmeric (965.04), and Futures prices of Turmeric (1047.77). When average values of the variables are considered in terms of the data very close to normal distribution as the median values of variables are very close to average values.

Regarding whether series are distributed normally or not; skewness, kurtosis and Jarque-Bera statistics were considered. If kurtosis value of relevant variables is bigger than three, it indicates that series is sharp, if it is smaller than three, it indicates that series is oblate. In consideration of skewness values, if skewness value is equal to zero, it indicates that series has normal distribution, if the skewness value is bigger than zero; it means that series is skew in the positive direction, if skewness value is smaller than zero; it indicates that series is skew in the negative direction.

Following values were found: skewness value of Spot price of Guard Seed (0.64614), kurtosis value (2.2003), Jarque-Bera value (68.4189) and skewness value of price of Guard Seed futures (0.74157), kurtosis value (2.2696), Jarque-Bera value (80.9709). Skewness value of Spot price of Jeera (-0.7245), kurtosis value (2.2454), Jarque-Bera value (80.076) and skewness value of price of Jeera futures (-0.3666), kurtosis value (2.09939), Jarque-Bera value (40.463). Skewness value of Spot price of Soya Bean (0.66096), kurtosis value (2.9226), Jarque-Bera value (52.604) and skewness value of price of Soya Bean futures (0.413400), kurtosis value (2.7082), Jarque-Bera value (23.0624). Skewness value of Spot price of Turmeric (0.04889), kurtosis value (2.6063), Jarque-Bera value (4.5733) and skewness value of price of Turmeric futures (0.6295), kurtosis value (2.7066), Jarque-Bera value (46.4501).It has been found that Spot and Future price of selected commodities are oblate and except Jeera other three commodities are in the positive direction.

Tables 2 presents the results of the unit root test of augmented Dickey Fuller Test , Phillips-Perron (P-P) Test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. The variables of Spot and Futures Price of selected five Commodities non-stationary at their level and stationary at first differencing I(1). The results indicate that the null hypothesis of a unit root cannot be accepted for the given variable as none of the ADF value, PP value and KPSS test is smaller than the critical t-value at 5% level of significance.

Table 2: Unit Root Test Results of selected Commodities Gaur Seed, Jeera, Soya bean and Turmeric at NCDEX

Series		ADF unit root test - statistic		Phillips-Perron test statistic		KPSS	
		With intercept	critical values at 5% level = -2.88	With intercept	critical values at 5% level = -2.88	With intercept	critical values at 5% level = -2.88
Daily spot closing price of Gaur Seed	At level	-1.84523	Not Stationary	-1.6612	Not Stationary	2.45267	Not Stationary
	At 1st	-25.751 (0.000)	Stationary	-26.080	Stationary	0.071782	Stationary
Daily Future closing price of Gaur Seed	At level	-1.85668	Not Stationary	-1.8692	Not Stationary	2.33761	Not Stationary
	At 1st	-26.237	Stationary	-26.251	Stationary	0.074496	Stationary
Daily spot	At	-1.92021	Not	-1.9140	Not	2.20063	Not

closing price of Jeera	level		Stationary		Stationary		Stationary
	At 1st	-12.6010	Stationary	-25.731	Stationary	0.20915	Stationary
Daily Future closing price of Jeera	At level	-1.8233	Not Stationary	-1.8259	Not Stationary	1.96220	Not Stationary
	At 1st	-26.6242	Stationary	-26.624	Stationary	0.08265	Stationary
Daily spot closing price of Soya bean	At level	-1.7623	Not Stationary	-1.7465	Not Stationary	0.06596	Not Stationary
	At 1st	-26.8374	Stationary	-26.837	Stationary	0.07450	Stationary
Daily Future closing price of Soya bean	At level	-1.8216	Not Stationary	-1.9093	Not Stationary	0.71949	Not Stationary
	At 1st	-17.8566	Stationary	-23.084	Stationary	0.095801	Stationary
Daily spot closing price of Turmeric	At level	-1.4243	Not Stationary	-1.6204	Not Stationary	0.082061	Not Stationary
	At 1st	-21.3031	Stationary	-21.795	Stationary	0.29279	Stationary
Daily Future closing price of Turmeric	At level	-1.96248	Not Stationary	-2.1088	Not Stationary	0.58529	Not Stationary
	At 1st	-23.5276	stationary	-23.528	stationary	0.15906	Stationary

Granger Causality Test

Table 3 shows the results of Pairwise granger causality test between Spot and Futures price of four selected commodities i.e., Guar Seed, Jeera, Soya bean and Turmeric. It is revealed from the test that the F-value of Guar Seed is 16.7546 and the probability value is 8.E-08 (0.08 per cent), which suggests that spot returns granger causes the futures returns at 5 per cent level of significance. The F-value of Jeera Spot is 8.50127 and the probability value is 0.0002 per cent, which also suggests that spot returns granger causes the spot price at 5 per cent level of significance. The F-value of Soya bean 9.22211 and the probability value is 0.0001 per cent, which suggests that spot returns granger causes the futures price at 5 per cent level of significance and the F-value of Turmeric is 4.74626 and the probability value is 0.0090 per cent, which further suggests that spot returns granger causes the Spot price at 5 per cent level of significance. It is also observed that F-statistics value is 1.54623 (Jeera) and 2.71052 (Soya bean)) its probability values are 0.2138 and 0.0672 respectively, which indicate that the futures price do not cause the spot price. Therefore spot price leads future price and vice versa.

Table 3: showing the Granger causality test results of selected commodities

Null Hypothesis:	**F-Statistic**	**Prob.**	**Decision**
Future Price of Gaur Seed not Granger Cause Spot Price of Gaur Seed	16.7546	8.E-08	Causality
Spot Price of Gaur Seed not Granger Cause Future Price of Gaur Seed	3.48427	0.0312	Causality

Future Price of Jeera not Granger Cause Spot Price of Jeera	1.54623	0.2138	No Causality
Spot Price of Jeera not Granger Cause Future Price of Jeera	8.50127	0.0002	Causality
Future Price of Soya Bean not Granger Cause Spot Price of Soya Bean	9.22211	0.0001	Causality
Spot Price of Soya Bean not Granger Cause Future Price of Soya Bean	2.71052	0.0672	No Causality
Future Price of Turmeric not Granger Cause Spot Price of Turmeric	0.09565	0.9088	No Causality
Spot Price of Turmeric not Granger Cause Future Price of Turmeric	4.74626	0.0090	Causality

Source: Computed of Data

Table 4 presents the results of Johansen's (1991) maximum likelihood co-integration test results which examines whether the Spot and Futures price of selected commodities are co-integrated. The result shows that first null hypothesis is 'none' which means that there is no co-integration equation among the variables. The value of the trace-statistics is more than critical value we can reject null hypothesis. Here the value of trace statistics of Guar Seed (40.1551), Jeera (22.0177), Soya Bean (27.4024), Turmeric (15.3402) and critical value at 5 per cent is 15.4947. Thus the trace statistics of the selected commodities are more than the critical value that means we can reject the null hypothesis. Here the probability value is very small that is less than 0.05 so the study rejects the null hypothesis of 'none' (H0: r=0). The second null hypothesis is 'atmost 1'. It means that there is one co-integration model. Here the trace statistics of Guar Seed (3.25839), Soya Bean (3.41286), Turmeric (2.44941) and the critical value is 3.84147 which is more than the trace value which means that the study reject the null hypothesis and that there exists one co-integration model. Again the p-value is 0.000 which is less than 0.05 which indicates the rejected the null hypothesis of both 'none' and 'atmost 1'. Thus the selected commodities of the study have long run equilibrium relationship between them.

Table 4: showing the Johnasen cointegration test result (lags interval: 2)

Co-integration between	Hypothesized No.of CE(s)	Eigen Value	Trace Test			Maximum Eigen Value test		
			Test Sta.	P. Value**	Critical value at 5%	Test Sta.	P. Value **	Critical value at 5%
Daily Spot closing and Daily future closing of Gaur Seed	H0:r=0(None)	0.058951	40.1551	0.0001	15.4947	42.8967	0.0001	14.2646
	H1:r≤1 At Most 1	0.004605	3.25839	0.0000	3.84147	3.25839	0.0000	3.84147
Daily Spot closing and Daily future closing of Jeera	H0:r=0(None)	0.024410	22.0177	0.0001	15.4947	17.6698	0.0001	14.2646
	H1:r≤1 At Most 1	0.006063	4.38011	0.0000	3.84147	4.34801	0.0000	3.84147
Daily Spot closing and Daily future closing of Soya Bean	H0:r=0(None)	0.032995	27.4024	0.0001	15.4947	23.9895	0.0001	14.2646
	H1:r≤1 At Most 1	0.04762	3.41286	0.0000	3.84147	3.41286	0.0000	3.84147
Daily Spot	H0:r=0(None)	0.019284	15.3402	0.0001	15.4947	12.8908	0.0001	14.2646

Data: Computed of Data

Table 9: Diagnostic Testing of VECM model for Turmeric

Wald Test			
Test Statistic	Value	Df	Probability
F-Statistic	22.43034	(1658)	0.0000
Chi-Square	22.43034	1	0.0000
Residual Diagnostics : Breusch-Godfrey Serial Correlation LM Test			
F-Statistic	2.452596	Prob.F(2987)	0.0869
Obs*R-squared	4.928160	Prob.Chi-Square(2)	0.0851
HeteroskedasticityF Test- Breusch-Pagan-Godfrey			
F-Statistic	0.582061	Prob.F(3,459)	0.7448
Obs*R-squared	3.510911	Prob.Chi-Square(3)	0.7425
Scaled explained SS	148.3694	Prob.Chi-Square	0.0000

Data: Computed of Data

CONCLUSIONS:

The future markets of agricultural commodity depends on the transparency and efficiency of its functioning in terms of price risk management, price discovery, flexible contact specification, controlling unfair speculation, commodity delivery system, coverage, infrastructural support, etc. Empirically the study examines the market which reacts first in agricultural commodity markets in India by assessing the relationship between the spot and future prices of Guar Seed, Jeera, Soya bean and Turmeric traded in NCDEX. The techniques used for analysis are panel unit root test which is Augmented DickeyFuller (ADF) test or Phillips-Perron (PP) test, KPPS Test, Johansen Co-integration test and Regression Model pertaining to analyzing the relationship between Spot and Future Markets of Price discovery of commodities market. The frequency of data is kept at daily level and time span of the study is between 1st March, 2014 to 31st March 2017. The unit root test clarified that the selected commodities Spot price and Futures prices are stationary at the first differences. Johansen's co-integration test and Vector Error Correction Model (VECM) showed that there is a relation between Spot and Futures prices of the commodities in the long run period. The results of Granger causality test concluded that prices of spot market lead to the prices of futures market and vice versa.

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A STUDY ON VOLATILITY PATTERNS OF STOCK RETURNS IN BSE SENSEX AND NASDAQ

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ABSTRACT

This paper investigates the dynamic linkages between BSE Sensex in India and NASDAQ Composite in US during the recent 2013-2017 period using daily closing price data. The study carries out a comprehensive analysis from correlation to Granger causality and then to application of GARCH models to examine the co movement and volatility transmission between US and Indian stock markets. Specifically, the study employs a two stage GARCH model and an ARMA-GARCH model to capture the mechanism by which NASDAQ Composite returns and volatility have an impact on not only the mean but also on the conditional volatility of BSE Sensex returns. It is found that on an average the effect of NASDAQ return volatility shocks on BSE Sensex return volatility and that of BSE Sensex return is a mere 0.5%. In out of sample forecasts, however, the found that by including the information revealed by NASDAQ provides only better forecasts of the level of Sensex returns but not its volatility.

Key words: Volatility; Sensex; NASDAQ, returns

INTRODUCTION

In recent years, globalization of capital flows has led to the growing relevance of emerging capital markets and India is one of the countries with an expanding stock market that is increasing attracting funds from the FIIs. Deregulation and market liberalization measures, rapid developments in communication technology and computerized trading systems, and increasing activities of multinational corporations have accelerated the growth of Indian capital market, which is now slowly moving towards global financial integration. In the year 1999 onwards, Indian firms are raising capital from the US market by listing themselves in US exchanges. There are 12 Indian companies have issued ADRs and are cross-listed in US exchanges and many more companies are planning to cross list in the near future. Moreover as per the Economic Survey 1999-2000, 23% of Indian exports go to US and 10% of total Indian imports are from US making US the major trading partner of India. Thus it will be interesting to examine the co-movement of Indian stock markets with US markets and the

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mechanism through which the price changes and volatility are transmitted at the wake of lifting restrictions on capital flows and foreign ownership.

The objective of this paper is to empirically examine the short run inter linkages between the US and Indian stock markets. In investigating these issues, we take BSE Sensex as the core barometer of the Indian stock market as it captures the major chunk of Indian stock market. On the other hand, NASDAQ Composite Index has been taken as a representative of US market as it is a pacesetter of the global stock market having a bearing on national markets worldwide including India, its mecca status among technology stocks, volume lead, no. of listed companies and its star attraction as a unique source of capital even in exchange of a small equity stake. The exercise has been simultaneously carried out for the competing representative of US stock market, namely S & P 500 index. The study carries out a comprehensive analysis from correlation to Granger causality and then to application of GARCH models to examine the co movement and volatility transmission between US and Indian stock markets. The study found unidirectional granger causality running from NASDAQ Composite to BSE Sensex.

REVIEW OF LITERATURE

The links between national markets have been of heightened interest in the wake of the October 1987 international market crash that saw large, correlated price movements across most stock markets: Eun & Shim (1989), Von Furstenberg and Jeon (1989); King and Wadhwani (1990); Schwert (1990); King et.al. (1994); Longin & Solnik (1995), to name a few. These Analysis, Simple Regression, ARCH models etc. and report several empirical features: (i) the correlations across the stock markets are time-varying (ii) when volatility is high, the price changes in major markets tend to become highly correlated (iii) correlations in volatility and prices appear to be causal from the US market which is the most influential market and none of the other market explains US stock market movements. The literature concentrated mostly on well-developed equity markets in the U.S., Japan, and Europe, and do not pay much attention to other stock markets. To capture the dynamic inter-linkages between the markets, which have non-overlapping trading hours, the literature largely applied a Two Stage GARCH model with intra-daily data that define overnight and daytime returns.

Sharma & Kennedy (1977) emphasis the price behavior of Indian market with US and London markets. In the runs analysis of and expected distribution of runs length turns out to be very similar, with probability equal to 0.5 for rise or fall. Further, the spectral densities, estimated for the first difference series (raw and log transformed) of each index, confirmed the randomness of the series, with no evidence of systematic cyclical component or periodicity was present. Their study concluded that stocks on the Bombay Stock Exchange obey a random walk and are equivalent in this sense to the behavior of stock prices in the markets of advanced industrialized countries, like UK and US.

OBJECTIVE OF THE STUDY

To Analyse the Volatility Patterns of Stock returns in BSE Sensex and NASDAQ

To examine directional effect among the selected Stock indices.

To understand the effect of Long term relationship among the selected market.

Methodology and Data source

The present study is directed towards analysing the dynamics between Sensex returns and NASDAQ returns Indices. The frequency of data is kept at daily level and time span of the study is taken from 1st January, 2013 to 31st December, 2017. The results from daily data are more precise and are better able to capture the dynamics between Sensex returns and NASDAQ returns. The data for these indices were collected from the website www. Finance-yahoo.com.

Daily Sensex returns have been calculated by taking the natural logarithm of the daily closing price of sprelatives, i.e. r = ln P(t)/P(t-1) ,where P(t) is the closing price of the day. Likewise, natural logarithm of the daily Nasdaq returns of have been computed as ln E(t)/E(t-1). Line plots of the two, so obtained, normalized series are shown in Fig 1 and 2 respectively.

FOLLOWING ECONOMETRIC MODELS WERE USED FOR ANALYSIS

- ✓ Granger causality test
- ✓ Johansen co-integration test

Granger causality test

The test was carried out to identify the directional effect of selected indices. To test for Granger causality, the following two equations were estimated.

$$Y_t = \sum_{i=1}^{m} \alpha_i Y_{t-i} + \sum_{i=1}^{m} \beta_i X_{t-i} + u_t$$

$$X_t = \sum_{i=1}^{m} \gamma_i Y_{t-i} + \sum_{i=1}^{m} \delta_i X_{t-i} + e_t$$

Johansen cointegration test

The condition for testing Johansen cointegration test for any time series data is that the data should be non stationary at their level i.e. the natural logarithm of time series data should be non stationary and the first difference in the data should be stationary. If the return indices of different markets are correlated, the value may rise or fall. On the other hand, if the time series data are cointegreted, then the series in the long run will come to equilibrium point.

Heteroskedasticity (ARCH-LM) Test

ARCH-LM Test: ARCH-LM test was used for testing the error term of the ARMA model for the presence of ARCH effects. This is a Lagrange multiplier (LM) test for autoregressive conditional heteroskedasticity (ARCH) in the residuals. It works on the null hypothesis that there is no ARCH effect up to order q in the residuals. After running usual ARMA model (mean equation), obtained residuals are checked for the presence of ARCH effects.

Symmetric Model: The Generalized Autoregressive Conditional Heteroskedasticity (GARCH) Model

The GARCH model was developed independently by Bollerslev (1986) and Taylor (1986). The GARCH model allows the conditional variance to be dependent upon previous own lags. The simplest model specification is the GARCH (1,1) model:

Mean Equation

$rt = \mu + \varepsilon t$

Variance Equation t 2

$w r$ $\omega>0$ $and \alpha 1 \geq 0$ and $1 \geq 0,$

$andrt$ =r $turnoft$ ass $tattim$ t

=av rag r $turn$

t =r $sidualr$ $turns, d$ fin das:

$t = tzt$

Where zt is standardized residual returns (i.e. iid random variable with zero mean and variance 1), and α2t is conditional variance. For GARCH (1, 1), the constraints $\alpha \geq 0$ and $\beta 1 \geq 0$are needed to ensure α2t is strictly positive. In this model, the mean equation is written as a function of constant with an error term. Since α2t is the one –period ahead forecast variance based on past information, it is called the conditional variance. The conditional variance equation specified as a function of three terms:

A constant term :ω

News about volatility from the previous period, measured as the lag of the squared residual from the mean equation: $2t-1$ (the ARCH term)

Last period forecast variance: $2t-1$ (the GARCH term)

The stationary condition for GARCH (1, 1) is $\alpha + \beta < 1$. If this condition is fulfilled, it means the conditional variance is finite. A straightforward interpretation of the estimated coefficient in above equation is that the constant ω is long – term average volatility where $\alpha 1$ and $\beta 1$ represent how the volatility is affected by current news and past information regarding volatility, respectively.

EMPIRICAL RESULTS

Descriptive statistics results:

Figure 1 and 2 reveals that the variables considered in the scope of the study are examined, the average values of variables were found to be Sensex returns (0.00048) and Nasdaq (0.000681) and standard deviation values are found as Sensex returns (0.009027) and Nasdaq (0.008834). When average values of the variables are considered in terms of the case that data normal distribution as the median values of variables are very close to average values. Following values were found: skewness value of Sensex returns (-0.320562), kurtosis value (5.785365), Jarque-Bera value (414.254) and Nasdaq returns (-0.480187), kurtosis value (5.238442), Jarque-Bera value (304.5576) It has been found that Sensex and Nasdaq variables are skew (inclined) and sharp in the negative direction.

Figure 1: Descriptive Statistics of Daily returns of BSE Sensex

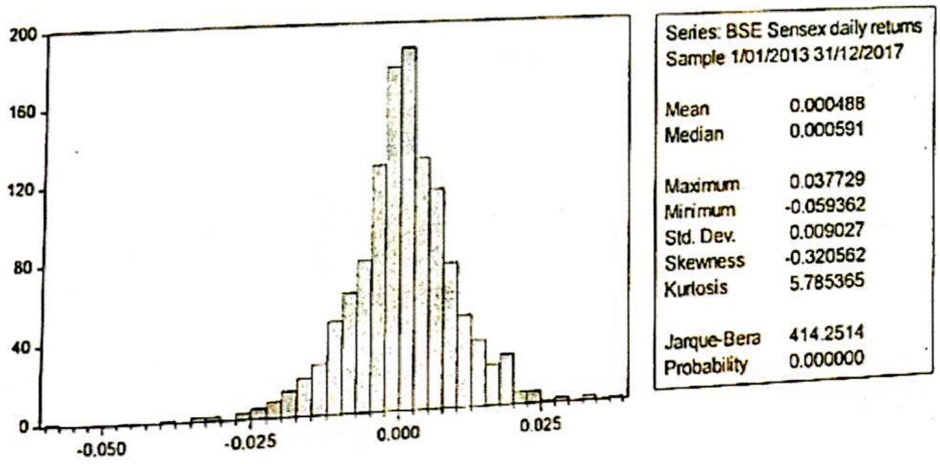

Figure 2: Descriptive Statistics of Daily returns of NASDAQ

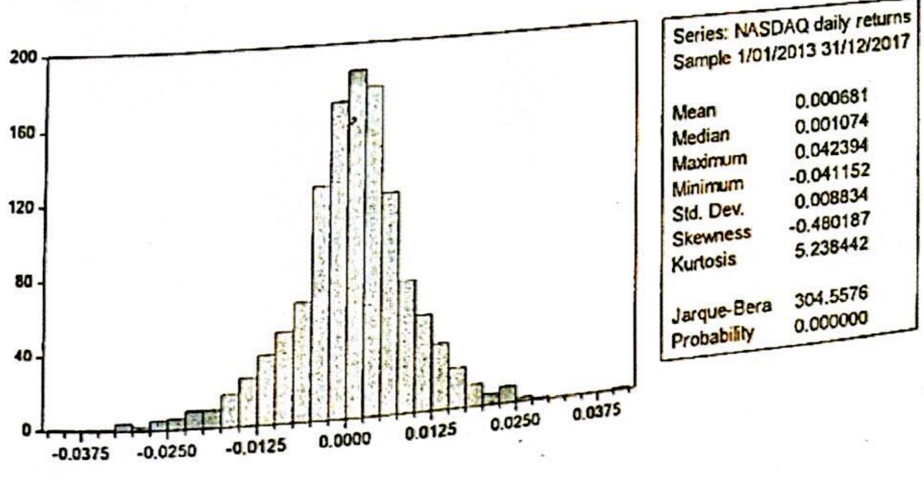

Table 1: Granger Causality Test-Results

Pairwise Granger Causality Tests
Date: 03/20/18 Time: 23:31
Sample: 1/02/2013 12/29/2017
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
NAS_R does not Granger Cause SEN_R	1202	1.61421	0.1995
SEN_R does not Granger Cause NAS_R		0.80046	0.4494

Table 1 shows the results of Pairwise granger causality test between Sensex returns and NASDAQ returns. It is revealed from the test that the F-value is 1.61421 and the probability value is 0.1995 (19.95) which shows that Nasdaq returns do not granger causes the Sensex returns at 5 per cent level of significance. It is also observed that F-statistics value is 0.80046 and its probability value is 0.4494 (44.94), which indicate that the Sensex returns do not cause the NASDAQ returns.

Table 2: Johansen Cointegration Test Results (Lags Interval: 1 to 4)

Variable	Hypothesized No.of CE(s)	Eigen Value	Trace Test			Maximum Eigen Value test		
			Test Sta.	P. Value**	Critical value at 5%	Test Sta.	P. Value **	Critical value at 5%
Sensex Returns & Nasdaq Returns	H0:r=0(None)	0.195392	479.8374	0.0001	15.4947	256.7490	0.0001	14.2646
	H1:r≤1 At Most 1	0.172129	223.0884	0.0000	3.84147	223.0884	0.0000	3.84147

Note: Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 2 presents the results of Johansen's (1991) maximum likelihood co-integration test results which examines whether the Sensex returns and Nasdaq returns are co-integrated. The results shows that first null hypothesis is 'H0:r=0(None)' which means that there is no co-integration equation among the variables. The value of series of the trace-statistics is more than critical value the study reject null hypothesis. Here the value of trace statistics is

479.8374 critical value at 5% is 15.49471. Thus the trace statistics is more than the critical value means that we can reject the null hypothesis. Here the probability value is very small that is less than 0.05 so we can reject the null hypothesis of 'H0:r=0(None)'.

The 2nd null hypothesis is 'H1:r≤1 At Most 1'. It means that there is one co-integration model. Here the trace statistics is 223.0884 the critical value is 3.841466 which is less than the trace value which means that we can also reject the null hypothesis that there no exists one co-integration model. Again the p-value is 0.001 which is less than 0.05 which indicates the reject of the null hypothesis of both 'none' and 'atmost 1'. Thus the three variables of the study have no long run equilibrium relationship between them.

ARCH-LM Test of Residuals of Sensex Returns

Heteroskedasticity Test: ARCH

F-statistic	1.770075	Prob. F(1,1229)	0.1836
Obs*R-squared	1.770406	Prob. Chi-Square(1)	0.1833

High quantity of autocorrelation in residuals suggested for applying the ARCH family of models. The ARCH family of models requires the presence of ARCH effect in the residuals. To test the presence of ARCH effect, the Lagrange Multiplier (LM) test for exchange rate returns series was used. The results of Lagrange Multiplier test are presented in above figure. The very high p-value showed that it is not significant at 1% level. Results indicated the presence of ARCH not effect in the residuals. So, the null hypothesis that there is a ARCH effect in the Sensex returns was accepted.

ARCH-LM Test of Residuals of NASDAQ Returns

Heteroskedasticity Test: ARCH

F-statistic	0.732789	Prob. F(1,1229)	0.3921
Obs*R-squared	0.733544	Prob. Chi-Square(1)	0.3917

The results of Lagrange Multiplier test are presented in above figure. The very high p-value showed that it is not significant at 1% level. Results indicated the presence of ARCH not effect in the residuals. So, the null hypothesis that there is a ARCH effect in the Nasdaq returns was accepted.

GARCH models of BSE Sensex Returns and Nasdaq Returns

The characteristics of Sensex return series satisfies the assumptions of ARCH family of models. So it will be appropriate to fit the GARCH models for the return series of Sensex.

Analysis of GARCH (1, 1) Model for Sensex Returns for the Period Jan 2013 to Dec 2017

Dependent Variable: SEN R
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 03/21/18 Time: 00:12
Sample (adjusted): 1/03/2013 12/29/2017
Included observations: 1232 after adjustments
Convergence achieved after 26 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000610	0.000236	2.583649	0.0098
		Variance Equation		
C	1.29E-06	4.51E-07	2.869247	0.0041
RESID(-1)^2	0.047916	0.010074	4.756184	0.0000
GARCH(-1)	0.937189	0.013189	71.05874	0.0000
R-squared	-0.000195	Mean dependent var		0.000485
Adjusted R-squared	-0.000195	S.D. dependent var		0.009022
S.E. of regression	0.009023	Akaike info criterion		-6.664276
Sum squared resid	0.100221	Schwarz criterion		-6.647664
Log likelihood	4109.194	Hannan-Quinn criter.		-6.658027
Durbin-Watson stat	1.813378			

Analysis of GARCH (2, 1) Model for Sensex Returns for the Period Jan 2013 to Dec 2017

Dependent Variable: SEN R
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 03/21/18 Time: 00:12
Sample (adjusted): 1/03/2013 12/29/2017
Included observations: 1232 after adjustments
Convergence achieved after 32 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*RESID(-2)^2 + C(5)
*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000630	0.000234	2.693201	0.0071
		Variance Equation		
C	1.68E-06	5.94E-07	2.829509	0.0047
RESID(-1)^2	0.003122	0.011867	0.263054	0.7925
RESID(-2)^2	0.058090	0.016150	3.596801	0.0003
GARCH(-1)	0.919515	0.017103	53.76387	0.0000
R-squared	-0.000261	Mean dependent var		0.000485
Adjusted R-squared	-0.000261	S.D. dependent var		0.009022
S.E. of regression	0.009023	Akaike info criterion		-6.667940
Sum squared resid	0.100228	Schwarz criterion		-6.647175
Log likelihood	4112.451	Hannan-Quinn criter.		-6.660128
Durbin-Watson stat	1.813257			

Analysis of GARCH (1, 1) Model for NASDAQ Returns for the Period Jan 2013 to Dec 2017.

Dependent Variable: NAS_R
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 03/21/18 Time: 00:00
Sample (adjusted): 1/03/2013 12/29/2017
Included observations: 1232 after adjustments
Convergence achieved after 20 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000828	0.000231	3.588418	0.0003
		Variance Equation		
C	7.62E-06	1.42E-06	5.367798	0.0000
RESID(-1)^2	0.131975	0.020631	6.396965	0.0000
GARCH(-1)	0.768046	0.034369	22.34706	0.0000

R-squared	-0.000275	Mean dependent var	0.000681
Adjusted R-squared	-0.000275	S.D. dependent var	0.008834
S.E. of regression	0.008835	Akaike info criterion	-6.747599
Sum squared resid	0.096083	Schwarz criterion	-6.730987
Log likelihood	4160.521	Hannan-Quinn criter.	-6.741349
Durbin-Watson stat	1.991726		

Analysis of GARCH (2, 1) Model for NASDAQ Returns for the Period Jan 2013 to Dec 2017

Dependent Variable: NAS_R
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 03/20/18 Time: 23:54
Sample (adjusted): 1/03/2013 12/29/2017
Included observations: 1232 after adjustments
Convergence achieved after 20 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000828	0.000231	3.588418	0.0003
		Variance Equation		
C	7.62E-06	1.42E-06	5.367798	0.0000
RESID(-1)^2	0.131975	0.020631	6.396965	0.0000
GARCH(-1)	0.768046	0.034369	22.34706	0.0000

R-squared	-0.000275	Mean dependent var	0.000681
Adjusted R-squared	-0.000275	S.D. dependent var	0.008834
S.E. of regression	0.008835	Akaike info criterion	-6.747599
Sum squared resid	0.096083	Schwarz criterion	-6.730987
Log likelihood	4160.521	Hannan-Quinn criter.	-6.741349
Durbin-Watson stat	1.991726		

CONCLUSION

It is worth noted that bidirectional causality effect took place among the Sensex and NASDAQ indices. The result obtained through cointegration test proved exists long run equilibrium between the Sensex and NASDAQ indices. Due to this cointegration prices in different markets cannot move away far from each other and therefore the investor community cannot get abnormal gain due to the price difference among the markets. The Study examined no casual relationship between Sensex and NASDAQ vice versa. The study employs Two- stage GARCH model and a simple univariate ARMA-GARCH model to capture the mechanism by which NASDAQ Composite daily returns and volatility have an impact on not only the conditional returns but also on the conditional volatility of Sensex returns. The study also found that the simple ARMA-GARCH model performs better than the more complex Two Stage GARCH model suggested in the literature.

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About the Book

Financial integration refers to financial liberalization and the increasing integration ofdomestic financial market with the global financial markets. By the process of financial integration, India being the one of the fastest developing countries has become increasingly attractive destination for international investors who are seeking a higher return than what is available in the developed economies, while diversifying their risk. Diversifying into emerging markets provides the scope to accentuate this benefit further, if the correlation of emerging markets with developed markets is lower than what is known in the context of developed markets. An attempt is made in this book to explore the various issues and challenges of Financial Integration in the Indian context.

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CONTENTS

Dynamics of Price Discovery of Selected Agricultural Commodities in India

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Abstract

The purpose of the study is to investigate the relationship between Spot and Futures of selected commodities Guar Seed, Jeera, Soya bean and Turmeric. The study is used the tests like Augmented Dickey-Fuller (ADF) test, Phillips-Perron test, Kwiatkowski-Phillips-Schmidt-Shin test, Granger Causality test, Johansen co-integration test, Vector error correction Model (VECM) and diagnostic test, to seek the relationship between Guar Seed, Jeera, Soya bean and Turmeric Spot and futures for data between 1st March, 2014 to 31st March 2017. The results derived by the econometric tools reveal that the unit root test, Augmented Dickey Fuller test (ADF), Phillips-Perron (PP) Test, Kwiatkowski-Phillips-Schmidt-Shin test shows that the spot and futures prices were found to be stationary at first difference. The results of Granger causality test reveals that returns of spot price lead to the futures price and vice versa. Johansen's co-integration test and Vector Error Correction Model (VECM) proved that there is a relation between spot and futures prices of the selected commodities for the study period.

Key words: Causal Relationship and Granger causality test

Introduction:

The Indian agricultural production system has undergone profound changes over the few decades due to adoption of green revolution technologies coupled with price support policy of the Government of India. After independence, various policy initiatives undertaken by GOI for protecting agriculture sector affected the growth in agricultural commodities markets adversely. The Essential Commodities Act 1955 envisaged price and movement protection applicable to various agricultural commodities, particularly food grains such as paddy, wheat, coarse grains and pulses to protect the interests of producers as well as of consumers. During the process of economic liberalization, it was felt that there is a need to reorient policies and regulations in agricultural commodities. Act 1952 to bring fairness and efficiency in futures trading operations. The National Agriculture Policy announced in July 2000 envisaged external and domestic market reforms by putting in place a mechanism of futures trade/market and dismantling of all control and regulations in agricultural commodity market. As a result, the Government of India issued notifications on April 1, 2003 and permitted futures trading (except options trading) for a wide range of agricultural commodities.

Futures contracts help in performing two important management functions, i.e. price discovery and price risk management for the specific commodity. Price discovery is the process of revealing information about future spot prices through the future markets. It is useful for producers as they get a fair idea about the prices likely to prevail at a future point of time and hence, can allocate their limited available resources among various competing commodities for optimizing their profits.

It also provides food processors and consumers an idea about prices at which the specific commodity would be available at a future point of time. Although futures trading in a large number of agricultural commodities were re-introduced in India in the year 2003, government is always skeptical about its efficiency and likely impact on the price movement of agricultural commodities. The influence of one market on the other and role of each market segment in price discovery is the central question in market microstructure design and has become an increasingly important research issue among academicians, regulators and practitioners alike as it provides an idea about the market efficiency, volatility, hedging effectiveness and arbitrage opportunities, if any. The essence of the price discovery function hinges on whether new information is reflected first in changes of future prices or changes of spot prices. Hence, there exists lead-lag relationship between spot and futures market by information dissemination. All the information available in the market place is immediately incorporated in the prices of assets in an efficient market. So, new information disseminating into the market should be reflected immediately in spot and futures prices simultaneously. This will lead to perfect positive contemporaneous co movement between the prices of those markets and there will be no systematic lagged response and therefore no arbitrage opportunity

Review of Literature

Kumar and Sunil (2004) examined the price discovery in six Indian commodity exchanges for five commodities. They used the daily futures and spot price and also engaged the ratio of standard deviations of spot and future rates for empirical testing of ability of futures markets to incorporate information efficiently. The study concluded that inability of future market to fully incorporate information and confirmed inefficiency of future market. However, the paper also concluded that the Indian agricultural commodities future markets are not yet mature and efficient.

Kushankur Dey, Debasish Maitra (2012) in their study on "Price Discovery in Indian Commodity Futures Market: An Empirical Exercise", found that there was a unidirectional causality from Futures to Spot prices in the pepper Futures market.

Jabir Ali, Kriti Bardhan Gupta (2011) observed the long-term relationship between Futures and Spot Prices for the selected Agricultural Commodities are Maize, Chickpea, Black Lentil, Pepper, Castor Seed, Soybean and Sugar. The study found that there was also a short-term relationship between them and the Futures markets had ability to predict spot prices for Chickpea, Castor Seed, Soybean and Sugar. The study also concluded that there was a bi-directional relationship in the short run among the Maize, Black Lentil and Pepper.

R. Salvadi and P. Ramasundaram (2008) in their study entitled "Whether Commodity Futures Market in Agriculture is Efficient in Price Discovery? - An Economics Analysis" examined. The results showed the inefficiency of agricultural commodity futures market in terms of price discovery due to the non integration of futures and the spot market. The study also revealed that the implementation of Government driven policy measures to raise the commodity futures market as a vibrant segment for price risk management in Indian Agriculture sector.

Kumar, Singh and Pandey (2008), studied the hedging effectiveness of futures contract on a financial asset and commodities in Indian markets by applying different time series models and is found that there is presence of necessary co-integration between the spot and derivatives markets and also that both stock market and commodity derivatives markets in India provide a reasonably high level of hedging effectiveness.

Jabir and Kriti (2007), the study on analysis on the effectiveness of commodity futures market through regression analysis by taking both spot and future prices of commodities showed high level of volatility in both spot and futures prices of commodities. Positive coefficients for agricultural commodities in dissimilar equations supported the effectiveness of commodity market in hedging the price risk.

Raizada and Sahi (2006), studied the efficiency of Indian futures market and observed that the wheat futures market is even weak-form inefficient and fails to play the role of spot price discovery. Spot market has found to capture the market information faster and therefore expected to play the leading role. This inefficiency of the futures market may be attributed to the lack of necessary data to truly capture the actual lead-lag relationship between the spot and futures market. It is also suggested that the trading volume in commodity futures market, along with other factors, have a significant impact on country's inflationary pressure.

Objective of the Study

- To test the stationary of the selected agricultural commodities in Spot and Futures Markets
- To examine directional effect among the selected commodities of Spot and Futures
- To examine the relationship between the selected commodities of Spot and Futures movement of NCDEX in India.

Data and Methodology

The present study is aimed towards analysing the dynamics of price discovery between Spot and Futures of Guar Seed, Jeera, Soya bean and Turmeric commodities. The frequency of data is kept at daily level and time span of the study is between 1st March, 2014 to 31st March 2017. The results from daily data are more precise and are better able to capture the dynamics between Spot and Futures of Guar Seed, Jeera, Soya bean and Turmeric commodities. Both the price series have been collected from the website of National Commodity and Derivative Exchange (NCDEX). In this study, the techniques used for analysis are panel unit root test which is Augmented DickeyFuller (ADF) test or Phillips-Perron (PP) test, KPPS Test, Johansen Co-integration test and Regression Model pertaining to analyzing the relationship between Spot and Future Markets of Price discovery of commodities market.

Following Econometric Models were Used for Analysis

- Unit root test,
- Granger causality test, and
- Johansen co-integration test
- Vector error correction Model (VECM)
- Diagnostic test

Unit Root Tests

Augmented Dickey-Fuller (ADF) Test

The standard DF test is carried out by estimating the following Equation after subtracting yt-1 from both sides of the equation:

Dyt = ayt – 1 + xt ed + et,

where a = r – 1. The null and alternative hypotheses may be written as,

H0: a = 0

H1: a < 0

The Phillips – Perron test

The Phillips – Perron test is carried out by estimating the following equation

$$\nabla y_t = \nabla y_{t-1} + u_t$$

Where yt is the time series data under consideration.

The KPPS (1992) Test is based on the residuals (εt) from an ordinary least square regression of the variable of interest on the exogenous variable(s) as follows:

Yt = X′ t β+ εt (2)

where Yt is the variable of interest (... of exogenous variable(s). The Lagrange Multiplier (LM) statistic used in the test as follows:

$TM = T^{-2}\sum_{i=1}^{t} S(t)^2/fo$

where T is the sample size, S(t) is the partial sum of residuals which is calculated as

$$S(t) = \sum_{i=1}^{t} Sr$$

Here εt is the estimated residual from (3.1). f0 is an estimator of the residual spectrum at frequency zero. This statistic has to be compared with KPSS et al. (1992) critical values.

Granger causality test

The test was carried out to identify the directional effect of selected indices. To test for Granger causality, the following two equations were estimated.

$$Y_t = \sum \alpha_i Y_{t-i} + \sum_{i=1} \beta_i X_{t-i} + u_t$$

$$X_t = \sum \gamma_i Y_{t-i} + \sum \delta_i X_{t-i} + e_t$$

Johansen cointegration test

The condition for testing Johansen cointegration test for any time series data is that the data should be non stationary at their level i.e. the natural logarithm of time series data should be non stationary and the first difference in the data should be stationary. If the return indices of different markets are correlated, the value may rise or fall. On the other hand, if the time series data are co-integrated, then the series in the long run will come to equilibrium point.

Empirical Results

Table 1: Out of Descriptive statistics of Selected commodities for the period from 01-04-2014 to 31-3-2017

Statistical Measures	Guar Seed		Jeera		Soya Bean		Turmeric	
	Spot	Futures	Spot	Futures	Spot	Futures	Spot	Futures
Mean	4085.26	4106.58	15620.02	15216.59	3582.26	3625.06	7598.94	7746.79
Median	3800.00	3807.00	16417.93	15955.00	3482.00	3645.00	7591.65	7488.00
Maximum	6740.00	6265.00	19585.70	20380.00	4832.00	4863.00	9823.80	10706.00
Minimum	2982.70	3005.00	10246.90	10340.00	2855.00	2862.00	5708.70	5870.00
Std.Dev	842.72	845.068	2606.40	2533.34	414.28	431.275	965.038	1047.77
Skweness	0.64614	0.74157	-0.72453	-0.36662	0.66096	0.41340	0.04889	0.6295
Kurtosis	2.20031	2.26958	2.24538	2.099386	2.9226	2.70820	2.60631	2.70657
Jarque-Bera	68.4189	80.9709	80.0765	40.4627	52.6040	23.0624	4.57333	46.4501
Probability	0.0000	0.00000	0.00000	0.00000	0.00000	0.00000	0.10161	0.00000

The variables considered in the scope of the study are examined in the table 1 reveals that the average values of variables are found to be Spot prices of Guar Seed (4085.26), and Futures prices of Guar Seed (4106.58), standard deviation values are found as Spot prices of Guar Seed (842.72), and Futures prices of Guar Seed (845.068), Spot prices of Jeera (15620.02), and Futures prices of Jeera (15216.59), standard deviation values are found as Spot prices of Jeera (2606.40), and Futures prices of Jeera (2533.34), Spot prices of Soya Bean (3582.26), and Futures prices of Soya Bean (3625.06), standard deviation values are found as Spot prices of Soya bean (414.28), and Futures prices of Soya Bean

(431.27) and Spot prices of Turmeric (7591.65), and Futures prices of Turmeric (7488.00), standard deviation values are found as Spot prices of Turmeric (965.04), and Futures prices of Turmeric (1047.77). When average values of the variables are considered in terms of the data very close to normal distribution as the median values of variables are very close to average values.

Regarding whether series are distributed normally or not, skewness, kurtosis and Jarque-Bera statistics were considered. If kurtosis value of relevant variables is bigger than three, it indicates that series is sharp, if it is smaller than three, it indicates that series is oblate. In consideration of skewness values, if skewness value is equal to zero, it indicates that series has normal distribution, if the skewness value is bigger than zero, it means that series is skew in the positive direction, if skewness value is smaller than zero, it indicates that series is skew in the negative direction.

Following values were found: skewness value of Spot price of Guard Seed (0.64614), kurtosis value (2.2003), Jarque-Bera value (68.4189) and skewness value of price of Guard Seed futures (0.74157), kurtosis value (2.2696), Jarque-Bera value (80.9709). Skewness value of Spot price of Jeera (-0.7245), kurtosis value (2.2454), Jarque-Bera value (80.076) and skewness value of price of Jeera futures (-0.3666), kurtosis value (2.09939), Jarque-Bera value (40.463). Skewness value of Spot price of Soya Bean (0.66096), kurtosis value (2.9226), Jarque-Bera value (52.604) and skewness value of price of Soya Bean futures (0.413400), kurtosis value (2.7082), Jarque-Bera value (23.0624). Skewness value of Spot price of Turmeric (0.04889), kurtosis value (2.6063), Jarque-Bera value (4.5733) and skewness value of price of Turmeric futures (0.6295), kurtosis value (2.7066), Jarque-Bera value (46.4501).It has been found that Spot and Future price of selected commodities are oblate and except Jeera other three commodities are in the positive direction.

Tables 2 presents the results of the unit root test of augmented Dickey Fuller Test , Phillips-Perron (P-P) Test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. The variables of Spot and Futures Price of selected five Commodities non-stationary at their level and stationary at first differencing I(1). The results indicate that the null hypothesis of a unit root cannot be accepted for the given variable as none of the ADF value, PP value and KPSS test is smaller than the critical t-value at 5% level of significance.

Table 2: Unit Root Test Results of selected Commodities Gaur Seed, Jeera, Soya bean and Turmeric at NCDEX

Series		ADF unit root test - statistic		Phillips-Perron test statistic		KPSS	
		With intercept	critical values at 5% level = -2.88	With intercept	critical values at 5% level = -2.88	With intercept	critical values at 5% level = -2.88
Daily spot closing price of Gaur Seed	At level	-1.84523	Not Stationary	-1.6612	Not Stationary	2.45267	Not Stationary
	At 1st	-25.751 (0.000)	Stationary	-26.080	Stationary	0.071782	Stationary
Daily Future closing price of Gaur Seed	At level	-1.85668	Not Stationary	-1.8692	Not Stationary	2.33761	Not Stationary
	At 1st	-26.237	Stationary	-26.251	Stationary	0.074496	Stationary
Daily spot	At	-1.92021	Not	-1.9140	Not	2.20063	Not

	level		Stationary		Stationary		Stationary
closing price of Jeera	At 1st	-12.6010	Stationary	-25.731	Stationary	0.20915	Stationary
Daily Future closing price of Jeera	At level	-1.8233	Not Stationary	-1.8259	Not Stationary	1.96220	Not Stationary
	At 1st	-26.6242	Stationary	-26.624	Stationary	0.08265	Stationary
Daily spot closing price of Soya bean	At level	-1.7623	Not Stationary	-1.7465	Not Stationary	0.06596	Not Stationary
	At 1st	-26.8374	Stationary	-26.837	Stationary	0.07450	Stationary
Daily Future closing price of Soya bean	At level	-1.8216	Not Stationary	-1.9093	Not Stationary	0.71949	Not Stationary
	At 1st	-17.8566	Stationary	-23.084	Stationary	0.095801	Stationary
Daily spot closing price of Turmeric	At level	-1.4243	Not Stationary	-1.6204	Not Stationary	0.082061	Not Stationary
	At 1st	-21.3031	Stationary	-21.795	Stationary	0.29279	Stationary
Daily Future closing price of Turmeric	At level	-1.96248	Not Stationary	-2.1088	Not Stationary	0.58529	Not Stationary
	At 1st	-23.5276	stationary	-23.528	stationary	0.15906	Stationary

Granger Causality Test

Table 3 shows the results of Pairwise granger causality test between Spot and Futures price of four selected commodities i.e., Guar Seed, Jeera, Soya bean and Turmeric. It is revealed from the test that the F-value of Guar Seed is 16.7546 and the probability value is 8.E-08 (0.08 per cent), which suggests that spot returns granger causes the futures returns at 5 per cent level of significance. The F-value of Jeera Spot is 8.50127 and the probability value is 0.0002 per cent, which also suggests that spot returns granger causes the spot price at 5 per cent level of significance. The F-value of Soya bean 9.22211 and the probability value is 0.0001 per cent, which suggests that spot returns granger causes the futures price at 5 per cent level of significance and the F-value of Turmeric is 4.74626 and the probability value is 0.0090 per cent, which further suggests that spot returns granger causes the Spot price at 5 per cent level of significance. It is also observed that F-statistics value is 1.54623 (Jeera) and 2.71052 (Soya bean)) its probability values are 0.2138 and 0.0672 respectively, which indicate that the futures price do not cause the spot price. Therefore spot price leads future price and vice versa.

Table 3: showing the Granger causality test results of selected commodities

Null Hypothesis:	F-Statistic	Prob.	Decision
Future Price of Gaur Seed not Granger Cause Spot Price of Gaur Seed	16.7546	8.E-08	Causality
Spot Price of Gaur Seed not Granger Cause Future Price of Gaur Seed	3.48427	0.0312	Causality

Future Price of Jeera not Granger Cause Spot Price of Jeera	1.54623	0.2138	No Causality
Spot Price of Jeera not Granger Cause Future Price of Jeera	8.50127	0.0002	Causality
Future Price of Soya Bean not Granger Cause Spot Price of Soya Bean	9.22211	0.0001	Causality
Spot Price of Soya Bean not Granger Cause Future Price of Soya Bean	2.71052	0.0672	No Causality
Future Price of Turmeric not Granger Cause Spot Price of Turmeric	0.09565	0.9088	No Causality
Spot Price of Turmeric not Granger Cause Future Price of Turmeric	4.74626	0.0090	Causality

Source: Computed of Data

Table 4 presents the results of Johansen's (1991) maximum likelihood co-integration test results which examines whether the Spot and Futures price of selected commodities are co-integrated. The result shows that first null hypothesis is 'none' which means that there is no co-integration equation among the variables. The value of the trace-statistics is more than critical value we can reject null hypothesis. Here the value of trace statistics of Guar Seed (40.1551), Jeera (22.0177), Soya Bean (27.4024), Turmeric (15.3402) and critical value at 5 per cent is 15.4947. Thus the trace statistics of the selected commodities are more than the critical value that means we can reject the null hypothesis. Here the probability value is very small that is less than 0.05 so the study rejects the null hypothesis of 'none' (H0: r=0). The second null hypothesis is 'atmost 1'. It means that there is one co-integration model. Here the trace statistics of Guar Seed (3.25839), Soya Bean (3.41286), Turmeric (2.44941) and the critical value is 3.84147 which is more than the trace value which means that the study reject the null hypothesis and that there exists one co-integration model. Again the p-value is 0.000 which is less than 0.05 which indicates the rejected the null hypothesis of both 'none' and 'atmost 1'. Thus the selected commodities of the study have long run equilibrium relationship between them.

Table 4: showing the Johnasen cointegration test result (lags interval: 2)

Co-integration between	Hypothesized No.of CE(s)	Eigen Value	Trace Test			Maximum Eigen Value test		
			Test Sta.	P. Value**	Critical value at 5%	Test Sta.	P. Value **	Critical value at 5%
Daily Spot closing and Daily future closing of **Gaur Seed**	H0:r=0(None)	0.058951	40.1551	0.0001	15.4947	42.8967	0.0001	14.2646
	HI:r≤1 At Most 1	0.004605	3.25839	0.0000	3.84147	3.25839	0.0000	3.84147
Daily Spot closing and Daily future closing of **Jeera**	H0:r=0(None)	0.024410	22.0177	0.0001	15.4947	17.6698	0.0001	14.2646
	HI:r≤1 At Most 1	0.006063	4.38011	0.0000	3.84147	4.34801	0.0000	3.84147
Daily Spot closing and Daily future closing of **Soya Bean**	H0:r=0(None)	0.032995	27.4024	0.0001	15.4947	23.9895	0.0001	14.2646
	HI:r≤1 At Most 1	0.04762	3.41286	0.0000	3.84147	3.41286	0.0000	3.84147
Daily Spot	H0:r=0(None)	0.019284	15.3402	0.0001	15.4947	12.8908	0.0001	14.2646

Data: Computed of Data

Table 9: Diagnostic Testing of VECM model for Turmeric

Wald Test			
Test Statistic	Value	Df	Probability
F-Statistic	22.43034	(1658)	0.0000
Chi-Square	22.43034	1	0.0000
Residual Diagnostics : Breusch-Godfrey Serial Correlation LM Test			
F-Statistic	2.452596	Prob.F(2987)	0.0869
Obs*R-squared	4.928160	Prob.Chi-Square(2)	0.0851
HeteroskedasticityF Test- Breusch-Pagan-Godfrey			
F-Statistic	0.582061	Prob.F(3,459)	0.7448
Obs*R-squared	3.510911	Prob.Chi-Square(3)	0.7425
Scaled explained SS	148.3694	Prob.Chi-Square	0.0000

Data: Computed of Data

CONCLUSIONS:

The future markets of agricultural commodity depends on the transparency and efficiency of its functioning in terms of price risk management, price discovery, flexible contact specification, controlling unfair speculation, commodity delivery system, coverage, infrastructural support, etc. Empirically the study examines the market which reacts first in agricultural commodity markets in India by assessing the relationship between the spot and future prices of Guar Seed, Jeera, Soya bean and Turmeric traded in NCDEX. The techniques used for analysis are panel unit root test which is Augmented DickeyFuller (ADF) test or Phillips-Perron (PP) test, KPPS Test, Johansen Co-integration test and Regression Model pertaining to analyzing the relationship between Spot and Future Markets of Price discovery of commodities market. The frequency of data is kept at daily level and time span of the study is between 1st March, 2014 to 31st March 2017. The unit root test clarified that the selected commodities Spot price and Futures prices are stationary at the first differences. Johansen's co-integration test and Vector Error Correction Model (VECM) showed that there is a relation between Spot and Futures prices of the commodities in the long run period. The results of Granger causality test concluded that prices of spot market lead to the prices of futures market and vice versa.

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