

## Impact of Monsoon on India Inc.

*An empirical review of monsoon data on the Indian market*

C I A N S  
A N A L Y T I C S



September 2014

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# Executive Summary

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The Indian Meteorological Department (IMD) has predicted a below-normal monsoon for 2014 because of the ongoing 'El-Nino' effect — a phenomenon that takes place every 3–5 years due to the heating up of the ocean, which results in a below-normal monsoon. This phenomenon last occurred in 2009 and resulted in the worst ever rainfall in more than 3 decades. Keeping this in the background, we have tried to analyze the impact of monsoon on the overall Indian economy.

India is, presumably, an agrarian economy with roughly half of the total population depending on agriculture as its source of employment. Monsoon plays an indispensable role in the growth of the economy as nearly half of the net sown land in India is unirrigated and is dependent on monsoon.

We have divided our study into two groups: Relationship of monsoon with macro-economic indicators and Relationship of monsoon with the stock market. The following are some of the key findings:

- **Agricultural GDP:** Evidently, monsoon has a strong correlation with the agricultural GDP growth rates. On average, a bad monsoon pares down the agricultural GDP by roughly 5000bps. The long-term average since the 1950s suggests that the agricultural GDP decelerates by 1.5% during a below-normal monsoon year.
- **GDP:** With the focus of the economy slowly shifting towards the industrial and service sectors, the relationship between the overall GDP and rainfall has become frail. During 1950-80, bad monsoons had dented the GDP growth by an average of 4000bps. This has reduced to less than 50bps in the last decade. In fact, the GDP growth rates do not decelerate anymore like it used to in the past with below-normal monsoon.
- **Inflation:** Interestingly, the data between general inflation measured by CPI and rainfall does not depict any relationship. We believe an interplay of changing demand patterns, stability of production, and favorable policy making behind this weak relationship. When a good monsoon year is followed by a bad monsoon year, the impact isn't always significant as the water levels are maintained, which assist in irrigation at the start of the monsoon season. Furthermore, the impact of the government's intervention in the form of Minimum Support Price (MSP) is reduced, which plays a vital role in containing the level of food inflation.
- **Sensex:** The markets primarily remain decoupled to the movements of monsoon. While news of a poor monsoon lowers consumer sentiments, Sensex returns over 2 decades suggest that the markets completely disregard such concerns. We have further analyzed three sub-sectors with direct exposure to agriculture.
  - **Fertilizer sector:** Our study of 10-year data shows that the fertilizer stocks decline by roughly 6% during poor monsoons and hence should be avoided if IMD forecasts a weak monsoon.
  - **FMCG sector:** FMCG shares face demand side pressure on sales and cost price pressure on its margins. Their share price shows a direct relationship with a lead effect and declines by roughly 6% in anticipation of a weak monsoon. The sector earnings also show a positive correlation with a lag effect as low sales/high costs impact the profitability over time.
  - **Auto sector:** The auto sector has been diversifying its revenue base to rural consumption over the years. Despite its direct exposure, the sector remains insulated to the vagaries of monsoon and shows negative correlation, which is difficult to explain.

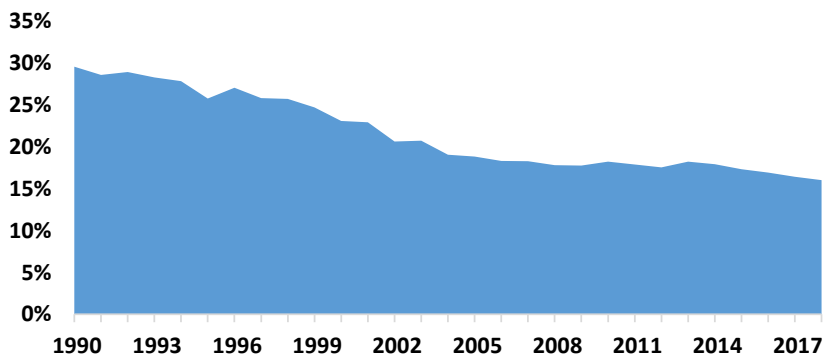
## India remains an agrarian economy at heart...

India is the 10<sup>th</sup> largest economy in the world, with agriculture being its most dominant sector. The dominance of agriculture is due to the fact that roughly half of the total working population in India — the majority residing in rural areas — is dependent on agriculture as its source of employment. Although

India's total productivity has been growing since the last few decades, the total contribution of agriculture to GDP has been falling, and is expected to further decline in the coming years (see Exhibit 1). This decline of share in the total contribution to GDP is mainly

**In India, half of the total working population is dependent on agriculture as its source of employment**

**Exhibit 1: Contribution of Agriculture to the Total GDP**



attributable to the economy's shift towards its industrial and service sectors.

## ...where dependence on monsoon is difficult to ignore

Monsoon is vital for the success/failure of an agrarian economy like India. A delay in monsoon — at least in theory — could adversely affect businesses in India, slowing down the agricultural GDP growth and even leading to high inflation.

Nearly half of the net sown land in India is unirrigated and is dependent on monsoon. Out of the last 24 years since 1990, eight were bad/below-normal monsoon years, three were above-normal monsoon years, and the remaining were normal monsoon years (see Table 1). The Indian Meteorological Department (IMD) has predicted a below-average monsoon for the 2014 south-west season, mainly due to the ongoing 'El-Nino' effect that occurs due to the heating up of the ocean. The El-Nino phenomenon occurs every 3–5 years and can last for up to 18 months. It last occurred in 2009, resulting in the country's worst drought ever in almost 3 decades.

**Monsoon plays a vital role in the success/failure of the Indian economy... since 1990, out of 24 years, eight were bad/below-normal monsoon years**

**Table 1: All India Area Weighted Rainfall (in mm)**

Year	Actual	Normal	Departure% from Normal	Monsoon Type
1990	972.3	915.5	6.2%	Above Normal
1991	828.3	913.2	-9.3%	Below Normal
1992	831.7	891.4	-6.7%	Below Normal
1993	905.7	913.9	-0.9%	Normal
1994	1001.2	890.0	12.5%	Above Normal
1995	900.3	917.7	-1.9%	Normal
1996	935.1	904.4	3.4%	Normal
1997	927.3	907.3	2.2%	Normal
1998	943.1	906.8	4.0%	Normal
1999	863.1	902.8	-4.4%	Normal
2000	833.7	904.2	-7.8%	Below Normal
2001	821.9	891.4	-7.8%	Below Normal
2002	737.3	912.5	-19.2%	Below Normal
2003	919.5	898.8	2.3%	Normal
2004	774.2	898.1	-13.8%	Below Normal
2005	881.8	892.5	-1.2%	Normal
2006	886.6	892.2	-0.6%	Normal
2007	944.6	892.2	5.9%	Above Normal
2008	877.4	892.2	-1.7%	Normal
2009	698.1	892.2	-21.8%	Drought
2010	910.6	893.2	1.9%	Normal
2011	901.2	886.9	1.6%	Normal
2012	823.6	892.2	-7.7%	Below Normal
2013	937.4	892.2	5.1%	Above Normal
2014**	613.4	727.6	-15.7%	Below Normal
<b>Mean</b>			<b>-3.0%</b>	
<b>Median</b>			<b>-1.2%</b>	
<i>Source: IMD</i>				
<i>Notes * Updated till 2nd September 2014</i>				

# Hypothesis

For an economy where agriculture contributes roughly 15% to GDP, employs roughly half of its workforce, and has about 50% unirrigated net sown area, a 4-month-long monsoon spell that contributes roughly 70% to its total rainfall holds sufficient weightage to move the needle of the economy. Any news that indicates rain deficiency impacts the industry as well as the overall economy. To state the obvious, we believe the impact of monsoon includes the following:

1. Impact on GDP due to a lower agricultural output
2. Impact on the food pricing trends that translate into higher general inflation
3. Impact on companies with direct exposure to the agricultural sector like fertilizer manufacturers, seed traders as well as tractor and agricultural equipment manufacturers
4. Impact on the sectors that depend on agricultural raw materials for their processed/manufactured goods or products like the FMCG and textile sectors
5. Impact on the sectors with a reasonable or an increasing rural consumption demand like the telecom and auto sectors

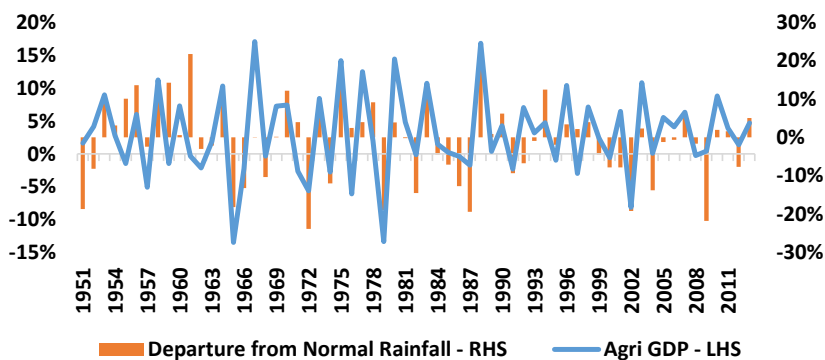
The general belief is that monsoon impacts the economy as well as the sectors with exposure to companies selling agricultural goods, buying agricultural raw materials to manufacture goods, and exposure to the rural consumption demand

In the next few sections, we have tried to gauge the strength of the above relationships to understand the effect of a deficient monsoon on the Indian economy and stocks in general. While a negative sentiment may drive the stocks down, the idea of the study is to understand the impact over a long period. The observations provide insights to the reader as the high-level analysis focuses mainly on the broad parameters (for instance, we analyzed the FMCG sector as a whole but did not map the impact per company, analyzed the agricultural GDP but did not incorporate the change in productivity which likely offsets the impact of a bad monsoon, and analyzed the overall inflation but not the fiscal deficit burden due to an increase in fiscal expenditure that results in higher inflation).

## Relationship between Monsoon and GDP

As discussed above, a delay in monsoon directly impacts the growth of the agricultural GDP as it lowers the production of summer crops (also called Kharif crops), which are sown before or at the advent of the monsoon season. Hence, the output of the Kharif crops declines with a weaker monsoon.

Exhibit 2: Agricultural GDP vs. Rainfall



We analyzed the agricultural GDP growth data from 1950s to establish its link with monsoon. We observed a positive correlation of 0.6 between the agricultural GDP growth rate and the rainfall departure (see Exhibit 2). Clearly, rainfall deficiency impacts the agricultural output.

The correlation between monsoon and agricultural GDP stands at 0.6

We further categorized the monsoon deficiency to gauge the average change in the agricultural GDP growth over a long term. A below-normal rainfall, on average, impacts the GDP growth rate by roughly -5% while an above-normal rainfall causes an average uptick of 5.1% (see Table 2). While a long-term agricultural GDP growth due to a bad monsoon decelerates to 1.5%, interestingly, the impact has been waning over the years. Since the 1980s, the agricultural sector has been growing (albeit negligible at 0.2%) despite weak/bad monsoon.

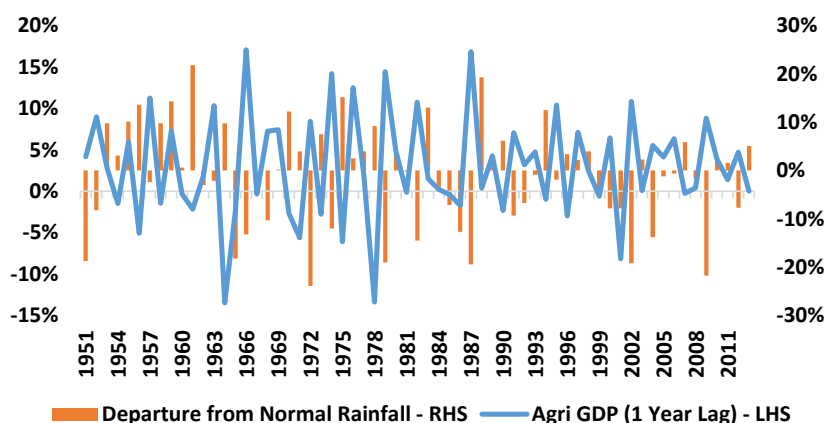
Long-term averages since the 1950s indicate that agricultural GDP decelerates by 1.5% in a weak monsoon year. Interestingly, the impact has disappeared over the years

**Table 2: Agricultural GDP vs. Rainfall**

	Average of Change in Agri GDP %	Average of Agri GDP Growth %
Above Normal	5.1%	7.1%
Below Normal	-4.9%	-1.5%
Normal	0.6%	4.1%

*\*Average for the period from 1952-2013*

**Exhibit 3: Agricultural GDP (1 Year Lag) vs. Rainfall**



We further analyzed the impact of monsoon on the agricultural GDP by a lag effect. Seemingly, the relationship is negative and shows that a bad monsoon year is generally followed by a good harvest and hence higher growth due to a low base effect (see Exhibit 3).

We have tried to identify the impact of monsoon on the broader GDP. Similar to our observation on the agricultural GDP, the average impact of bad monsoon has, in fact, waned over the years, with the average impact falling for every subsequent period from the 1950s. For example, a weaker monsoon led to a negative impact on GDP by -2% since the 1950s compared to -4% during 1952-1980 (see Table 3). The reason could be due to the improving agricultural productivity, increasing use of seeds that require less rainfall, and low sowing of food grains during the Kharif season which partially offsets the effect of a weak monsoon. As shown in Table 4, the average GDP grows even during years of a weak monsoon and does not decelerate as was the case in the past.

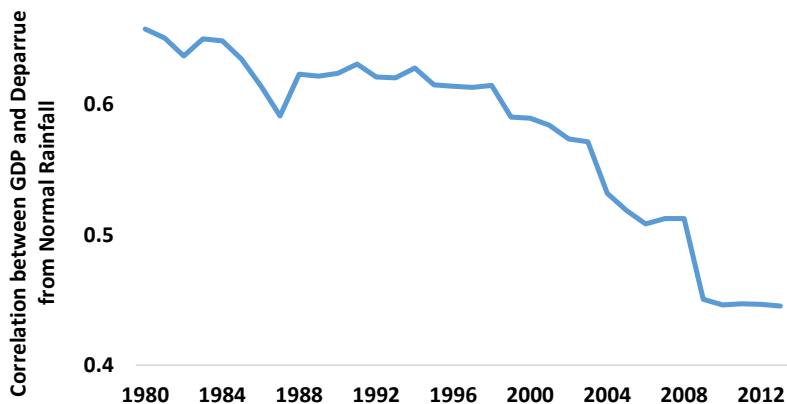
**Table 3: Average Change in GDP vs. Rainfall**

Avg. Change in GDP	Above Normal	Below Normal	Normal
1952-1980	1.8%	-4.2%	1.4%
1981-2000	2.7%	-1.0%	-0.8%
2001-2013	0.4%	-0.4%	-0.4%
Average	1.6%	-1.9%	0.1%

**Table 4: Average Growth in GDP vs. Rainfall**

Average GDP Growth %	Above Normal	Below Normal	Normal
1952-1980	5.6%	-0.1%	4.6%
1981-2000	7.3%	4.0%	6.0%
2001-2013	7.4%	5.4%	7.9%
Average	6.8%	3.1%	6.2%

**Exhibit 4: Correlation between GDP and Rainfall**

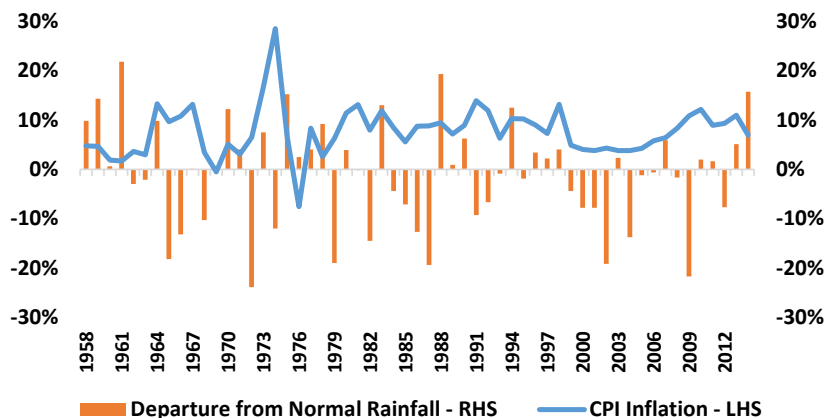


The reason behind the weak relationship between GDP and monsoon could be due to the falling contribution of agriculture to India’s total GDP. Following the introduction of the liberalization policy in 1991 by the Indian government, the country has posted positive growth in the industrial and service sectors and

hence its reliance on agriculture has since been declining. Until the mid-1990s, there used to be a strong correlation between GDP and the rainfall data; however, the relationship has waned over the years (see Exhibit 4). Hence, we believe a bad monsoon does not materially impact the nation’s output.

## Relationship between Monsoon and Inflation

**Exhibit 5: CPI Inflation vs. Rainfall**



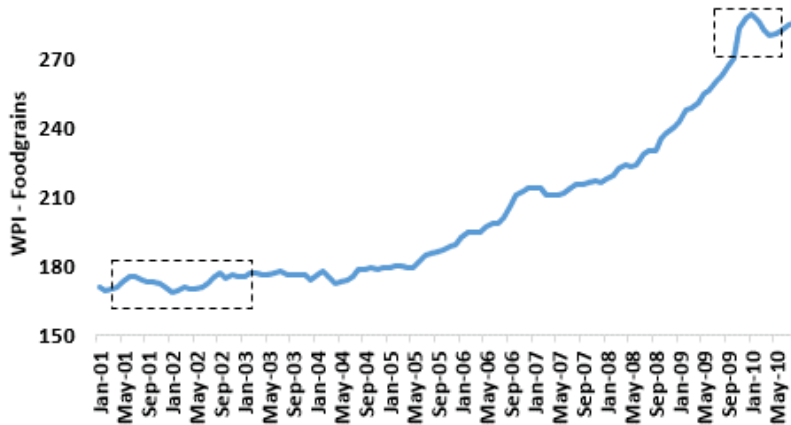
A bad monsoon causes a shortfall in the food grain production, which generally leads to a high food inflation. We tried to analyze this relationship by studying the historical inflation data and whether any hike was seen in the food prices during the bad monsoon years. In India, food constitutes roughly 45% of the CPI Index and

hence, this index should move inversely with the rainfall departure percentage. But that is not the case as shown in Exhibit 5.

Theoretically, an inverse relationship exists between monsoon and the food grain production; however, the relationship isn’t very strong. This weak relationship can be due to the fact that when a good

monsoon year is followed by a bad monsoon year, the impact isn't significant as the water levels are maintained, which assist in irrigation at the start of the monsoon season. In 2009, when drought occurred, and even the previous year's rainfall wasn't very promising, a spike was seen in food inflation rates. This

**Exhibit 6: Spike in Food Inflation**



wasn't the case in 2004, which was also a bad monsoon year, but was preceded by a year of normal monsoon.

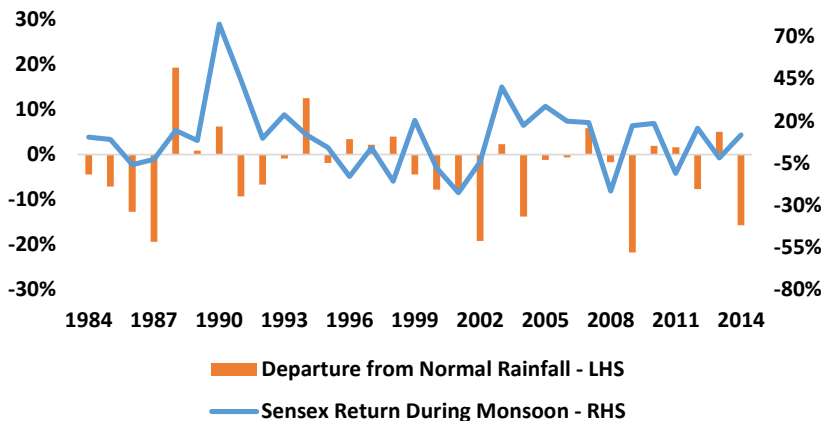
**The weak relationship with inflation is partly due to the improving agricultural productivity and less government intervention with hikes in MSPs during weak monsoon years**

Another reason for the low impact of a bad monsoon on food inflation is because of the government's intervention in the form of hikes in the minimum support prices (MSPs). Food inflation is impacted more by the hike in MSPs than a bad monsoon year. For example, in 2009, a combined effect of a bad monsoon year and a hike in MSPs of various Kharif products led to a spike in food inflation. However, the years 2001 and 2002 — which also recorded bad monsoons — saw a comparatively lesser hike in their MSPs, which caused a much lesser impact on the food inflation rates (see Exhibit 6).

## Relationship between Monsoon and Sensex

As per our study, there exists no direct relationship between monsoon and the stock market. In 2009, when the economy was experiencing drought conditions, Sensex returned roughly 17% during the monsoon period. On the other hand, in 2013, when the country had the best monsoon spell in almost 6

**Exhibit 7: Monsoon vs. BSE SENSEX**



years, Sensex returns were negative (see Exhibit 7). At present, with the economy on the bend and market sentiments positive due to the newly elected NDA government and improving stats like GDP growth rate of 5.7% for 1Q' FY15 vs. consensus estimate of 5.4%, a downside in the economic growth seems less likely.

**The impact on Sensex is more bark than bite. The current Sensex level has seemingly disregarded any impact of low rainfall estimates**

While the current rainfall deficiency is comparable to 2009, the market seems to be disregarding the rainfall-related concerns as Sensex recently touched the 27,000 mark — its highest ever.



Similar to our analysis on GDP, the average Sensex returns data since 1984 over monsoons (June-September) throws some interesting statistics. As shown in Table 5, on average, Sensex returned 5.8% during a bad monsoon year and showed an uptick of 24.1% during an above-normal monsoon — clearly showing that the upside is limited during a normal/below-normal monsoon as compared to the average Sensex return during an above-normal monsoon. Hence, despite a low impact on Sensex, the long-term average indicates that returns get capped during below-normal monsoon seasons.

However, this relationship has been slowly deteriorating over the recent years, with the contribution of agriculture to the total GDP going down. For example, the average Sensex return during 2000-2013 was higher for the normal monsoon periods (even higher than the above-normal monsoon period), showing that the markets do not get impacted by monsoon.

Despite a low impact on Sensex, the long-term average indicates that returns get capped during below-normal monsoon seasons

**Table 5:** Relationship between Monsoon and Sensex

1984-2013		2000-2013	
Monsoon Departure from Normal	Average Sensex Return	Monsoon Departure from Normal	Average Sensex Return
Above Normal	24.1%	Above Normal	8.5%
Below Normal	5.8%	Below Normal	1.7%
Normal	8.3%	Normal	12.3%
Average	12.7%	Average	7.5%
<i>*Average for the period from 1984-2013</i>		<i>*Average for the period from 2000-2013</i>	

However, it remains to be seen if any sub-sector is at the receiving end of deficient rains. In our hypotheses, we discussed the sectors that sell agricultural goods, use agricultural products as raw materials, and have an exposure to the rural demand consumption. We have tried to unmask the impact of monsoon on the following three sectors that fit into this analysis:

1. Fertilizer sector – Has a direct exposure to agricultural production/sentiment
2. FMCG sector – Purchases raw materials to manufacture/process products and a demand exposure to rural areas
3. Auto sector – A typical case of increasing exposure to the rural demand consumption

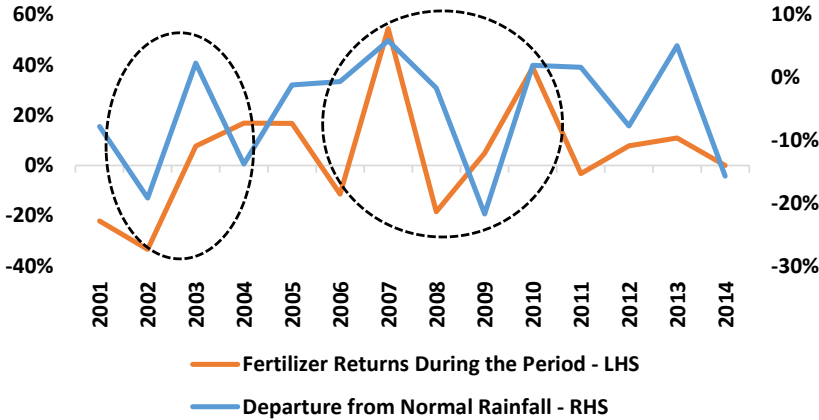
## Relationship between Monsoon and Fertilizer Companies

As fertilizer is a crucial farm input, fertilizer companies should have a direct relationship with monsoon. An analysis of the fertilizer sector's\* share prices for the past 10 years shows a good correlation between rainfall data and the share prices of fertilizer companies. Even in the current scenario, fertilizer companies have been underperforming as compared to the overall market due to the impact of the El Nino phenomenon. The co-movement of the fertilizer companies' crude index with monsoon has a healthy correlation of 0.5.

Fertilizer companies show a reasonable correlation of 0.5 with the rainfall departure from normal

*Notes: \*Coromandel International, Gujarat State Fertilizers & Chemicals, Rashtriya Chemicals & Fertilizers, Chambal Fertilizers & Chemicals, National Fertilizers, Deepak Fertilizers & Petrochemicals and Gujarat Narmada Valley Fertilizers & Chemicals*

**Exhibit 8: Monsoon vs. Fertilizer Companies**



Further analysis shows that fertilizer stocks, on average, fell 6.2% when the rainfall expectations are below the Long-Period Average (LPA) and increase by roughly 12% during a normal/above-normal monsoon. Clearly, it is better to avoid fertilizer stocks when IMD forecasts a bad/deficient monsoon.

**Table 6: Relationship between the Fertilizer Sector and Sensex**

Monsoon Departure from Normal	Average Fertilizer Company's Return	Average Sensex Return
Normal/Above Normal	12.0%	11.4%
Below Normal	-6.2%	3.2%
Average	2.9%	7.3%

*\*Average for the period from 2001-2014*

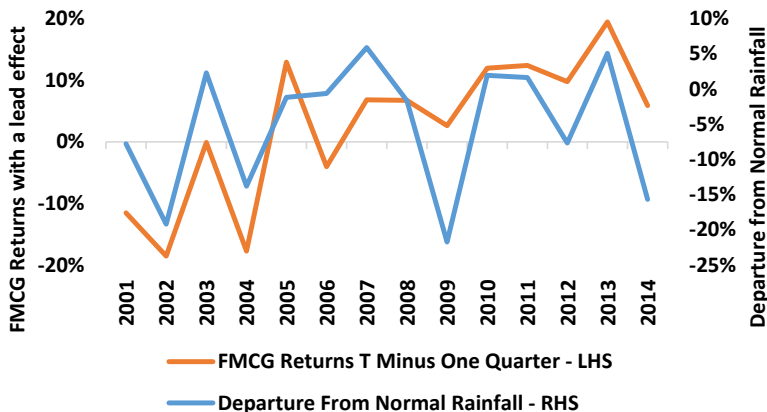
## Relationship between Monsoon and FMCG Companies

In India, the rural areas account for more than 50% of the FMCG sector's demand. As a result, FMCG companies are highly dependent on the rural population for their income. Companies like ITC and Dabur that have a rural focus are undoubtedly concerned about the monsoon deficiency percentage. After analyzing the returns for this sector since 2001, we saw a co-movement with a leading impact. There is a strong positive correlation between the T (Monsoon period) minus 1Q returns for this sector and the monsoon. This means that once the forward looking markets read into the monsoon estimates early (generally in May), it starts moving upwards/downwards in anticipation of the good/bad monsoon. The

**FMCG companies have significant exposure to the demand from rural areas... the stocks show a strong correlation with a leading impact**

correlation stands at 0.6 for the period under study.

**Exhibit 9: Monsoon vs. BSE FMCG**



Further breakdown of the data shows that the FMCG sector, on average, has moved by -6.4% since 2001 during the periods of rainfall below LPA compared to an increase of 8.3% during normal/above-normal rainfall. The impact of negative news is more

pronounced than the positive news when the returns are compared to Sensex. Thus, investors in the FMCG sector must closely follow the IMD announcement during May since the FMCG stocks start moving one quarter prior to the monsoon period.

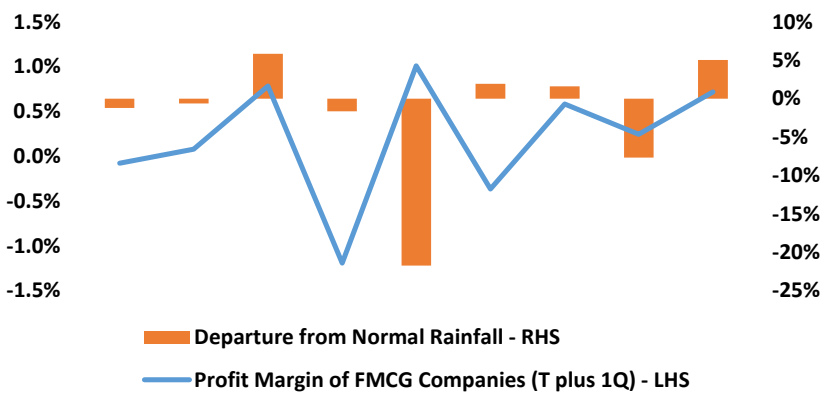
**Table 7:** Relationship between the FMCG Sector and Sensex

Monsoon Departure from Normal	Average FMCG Company's Return (T minus 1Q)	Average Sensex Return
Normal/Above Normal	8.3%	11.4%
Below Normal	-6.4%	3.2%
<b>Average</b>	<b>0.9%</b>	<b>7.3%</b>

*\*Average for the period from 2001-2014*

On average, FMCG stocks give a return of -6.4% in T minus 1Q due to weak monsoon estimates

**Exhibit 10:** Relationship of Rainfall Departure with FMCG Margins (T plus 1Q)



Incrementally, FMCG companies also face the heat of low monsoon at their cost line, which increases (even if for a short term) due to their dependence on agriculture for raw materials. If we exclude the impact of the change in profit margin for 2009 vs. 2008 (because of the global economic crisis), there exists a good

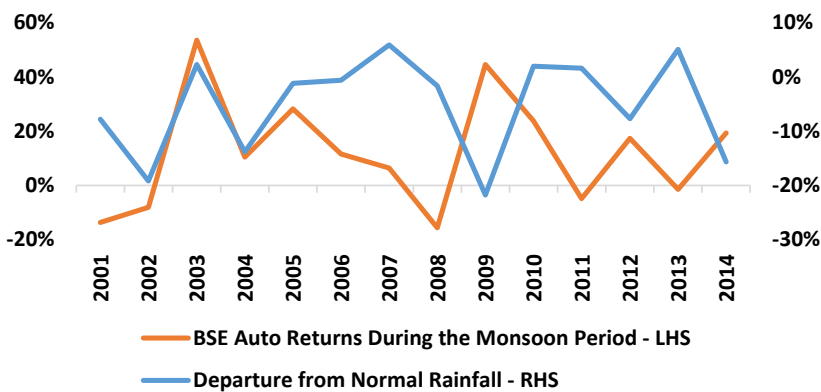
Impact on FMCG sector earnings show a positive correlation with a lag effect

correlation between the rainfall departure figures vs. the YoY change in the net profit margin of the FMCG companies (see Exhibit 10). Here, we have focused on the P&L of the T plus 1Q, assuming a lag impact on the increase in price trends and effect on earnings.

## Relationship between Monsoon and Auto Companies

Auto companies — mainly those producing two wheelers and small cars — seem to be significantly impacted by monsoon as they get a large chunk of their demand from the rural areas. However,

**Exhibit 11:** Relationship of Monsoon with Auto Companies



after comparing the movement of the auto companies' share prices with the monsoon data, there appears to be no relationship between the two (see Exhibit 11). The period after 2005 particularly shows a weak relationship with a

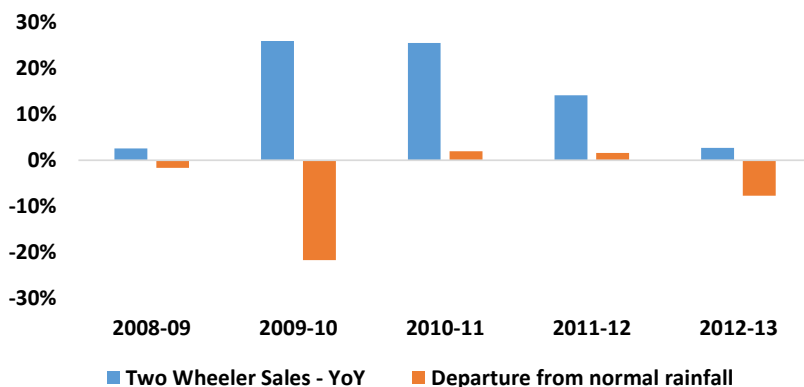
The auto sector is insulated from monsoons and in fact shows a negative correlation to rainfall, which is difficult to explain.

correlation of -0.7. The auto sector's relationship with monsoon is comparatively less significant compared to the other sectors that are also impacted by monsoon. The sector moved marginally by 2.4% in the above-normal rainfall years, and generated a return of roughly 5% during the below-normal rainfall years. We also analyzed the impact with both lead and lag effects but the results were similar.

**Table 8:** Relationship between the Auto Sector and Monsoon

Monsoon Departure from Normal	Average Auto Company's Return	Average Sensex Return
Above Normal	2.4%	8.5%
Normal	16.1%	12.3%
Below Normal	5.1%	3.2%
Average	7.9%	8.0%
<i>*Average for the period from 2001-2014</i>		

**Exhibit 12:** Relationship of Monsoon with Two Wheeler Sales



We further analyzed the sales trend of domestic two-wheeler companies. In FY 2009, which was the worst monsoon year in the past three decades, the two-wheeler sector posted positive growth (see Exhibit 12). This adds credibility to our analysis that monsoon has no significant impact on the auto sector.

## Conclusion

Clearly, the empirical test of our hypotheses on monsoon and its impact on the Indian economy as well as the market has failed to show any strength. The general premise that a weak monsoon could wreak havoc on the economy as well as on corporate earnings lack credibility. While our long-term averages show the impact of monsoon on the agricultural GDP as well as the FMCG and the fertilizer stocks, the degree of impact on the broader market and the economy has become non-significant over the years. The waning impact of monsoon is primarily attributable to the shift of GDP towards the industry and service sectors. Furthermore, the agricultural productivity is on the rise due to the declining dependence on summer-fed crops.