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IMPACT OF MACROECONOMIC VARIABLES ON SELECTED AGRICULTURAL COMMODITIES IN MCX

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ABSTRACT

Macroeconomic variables play a vital role in the economic performance of any country. In many analyses, macroeconomic variables help in predicting the time series of stock market. Similarly, this paper tries to analyse the impact of macroeconomic variables on selected agricultural sector in commodity market. This research studies the pattern of inflation rate, IIP and exchange rate in India for the period of 10 years between 2011 -2021 while also analysing the impact of macroeconomic variables on CPO, mentha oil, cardamom and cotton in India. The econometric tools like descriptive statistics, correlation, stepwise regression and unit root test are used in this analysis.

Keywords: CPO, Mentha Oil, Cardamom, Cotton, Inflation Rate, IIP, Exchange Rate.

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INTRODUCTION

he interconnection between macroeconomic variables and commodity pricing has been an interesting topic starting from a common man, economist, financial analyst and macroeconomist for a longer duration of time (Jaya & Gopinath, 2020). A few studies had been made to study the relationship between the macroeconomic variables and the stock market.

From the previous studies by Fama and Schwer (1977) and Jaffeand Mandelkar (1976), it had been evident that the macroeconomic variables play a key role in predicting the timeseries of stock returns.

Despite the previous studies, even though the commodity market had originated a way back, research studies relating to macroeconomic variables and commodity price is meagre with respect to developing countries (Pavithran *et al*., 2018). Considering this, the subject of commodity markets in developing countries still need further analysis and deeper research heed. This study focusses on agricultural product, especially cpo, menthaoil, cotton and cardamom (Saminathan *et al*., 2020a; Kavitha & Gopinath, 2020).

Table 1 commodities selected for the study and their respective period and spot market

Sl.No	Commodity	Data Period	Spot Market
1	Cardamom	1st April 2011 to 31st March 2021	Vandanmedu– Kerala
2	Mentha Oil	1st April 2011 to 31st March 2021	Chandausi–UttarPradesh
3	Cotton	1st April 2011 to 31st March 2021	Rajkot – Gujarat
4	CPO	1st April 2011 to 31st March 2021	Kandla – Gujarat

REVIEW OF LITERATURE

Sampath (2011) studied the impact of macroeconomic variables on the stock prices in the post-liberalization period in India for the period of 07 years. Exchange rate, WPI, IIP are the macroeconomic variables selected for the study. ARDL approach is employed to estimate the long-run relationship between the variables. The study concludes that there is a positive relationship between stock price and economic growth.

Tripathi (2014) examines the long-term relationship between selected macroeconomic variables and different sectoral indices at NSE. Exchange rate, Crude oil prices, Foreign Institutional Investments, Current account balance and foreign exchange reserves are macroeconomic variables selected for the study. The period of study covers from April 2005 to March 2013.The study reveals that only Foreign Institutional Investments affects all sectoral indices whereas rest of macroeconomic variables selectively affect different sectoral indices in India.

Sarika Keswani & Bharti Wadhwa (2017) attempted to examine the impact of macroeconomic variables on stock market. The result concludes that the Market price, Inflation, IPP, CPI, Money supply, Treasury bill rate and GDP saving has positive relationship with stock price. Among the macroeconomic variables, National income has negative impact on stock price. Consumption, Oil prices, Exchange rate and Interest rate have no significant effect on Share price.

OBJECTIVE OF THE STUDY

1. To study the pattern of inflation rate, exchange rate and IIP in India between 2011 - 2021.
2. To study the impact of macroeconomic variables on selected agricultural commodities in India.

RESEARCH METHODOLOGY

In this study monthly data from 2011 to 2021 had been collected for the inflation rate, IIP and exchange rate from the RBI bulletin. The daily closing price of CPO, cotton, mentha oil and cardamom had been collected from MCX. Data has been analysed using econometric tools. Descriptive statistics, correlation, regression analysis and unit root test had been used in the study.

Initially, the variables are converted into logarithmic form to minimize the heteroskedasticity of the variables. If the data is nonstationary, the time series is subjected to spurious regression. to check the stationarity of the data, a unit root test is performed. If the data is found non-stationary, the series is converted to first difference to make it stationary.

RESULTS AND DISCUSSION

Table 2 Descriptive Statistics of selected macroeconomic variable

	N	Min.	Max.	Mean	Std. Deviation	Variance	Skewness	Kurtosis
EXCHANGE RATE	132	44.65	76.23	60.407	9.240	85.381	-.395	-.927
INFLATION RATE	132	3.33	11.99	6.850	2.908	8.455	.456	-1.175
IIP	132	114.70	176.90	149.873	22.821	520.796	-.327	-1.593

Descriptive statistics for the selected macroeconomic variables are calculated and the standard deviation of IIP (22.821) is found high among all the variables, which portrays nothing but that is dispersed around its mean value by 22.821. From the skewness measure, we deduced that the inflation rate is positively skewed, whereas the exchange rate and IIP are negatively skewed, implying a high risk. Simultaneously in kurtosis, all the variables are negatively skewed and hence platykurtic. Whereas the inflation rate is positively skewed.

Table 3 Correlation matrix of selected macroeconomic variables

	Inflation rate	Exchange rate	IIP
Inflation Rate	1	-0.724	0.052
Exchange rate	-0.724	1	-0.071
IIP	0.052	-0.071	1

In the above table there is a positive correlation between theinflation rate – IIP and IIP – inflation rate. Similarly, there is a negative correlation between inflation rate – exchange rate, exchange rate – inflation rate, exchange rate – IIP and IIP – exchange rate. IIP – inflation rate is the only variable that is significant at a 0.05 level of significance.

Table 4 Regression equation with IIP as dependant variable :

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
	(Constant)	5.456	2.629		2.075	0.04
	Cardamom	-0.002	0	-0.359	-4.285	0
	Mentha	0.001	0.001	0.095	0.996	0.322
	Cotton	-7.43E-06	0	-0.007	-0.082	0.935
	CPO	0.002	0.003	0.066	0.738	0.462
a. Dependent Variable: IIP						

From the above table we can formulate the regression equation Y =a+bx where in Y is the dependent variable (IIP) and X is the independent variables (cardamom, mentha oil, cotton and CPO). Hence, we arrive at the regression equation IIP =5.456 – 0.002 (cardamom) + 0.001 (mentha oil) - 7.43E-06 (cotton) + 0.002 (CPO). By applying this regression equation to the entire entries, we find out the predicted values of IIP. We find that the predicted values in all the cases are nearer to the $\pm$ 1 % of the observed values from the year 2011 to 2021, which indicates that there is a significant impact of the independent variables on IIP.

Table 5 Regression equation with inflation rate as dependant variable

Co-efficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	Std. Error	Beta		
	(Constant)	8.511	1.902		4.475	0
	Cardamom	0.001	0	0.183	4.148	0
	Mentha oil	-0.001	0	-0.152	-3.037	0.003
	Cotton	-9.18E-05	0	-0.066	-1.396	0.166
	CPO	0.004	0.002	0.078	1.643	0.103
a. Dependent Variable: Inflation Rate						

From the above table, we can formulate the regression equation Y =a+bx where in Y is the dependent variable (inflation rate) and X is the independent variables (cardamom, mentha oil, cotton, CPO, nickel, lead, zinc, copper, gold, silver, and crude oil). Hence, we arrive at the regression equation IIP =8.511 +0.001 (cardamom) - 0.001 (mentha oil) - 9.18E-05 (cotton) + 0.004(CPO). By applying this regression equation to the entire entries, we find out the predicted values of the inflation rate. we find that the predicted values in all the cases are nearer to the $\pm$ 1 % of the observed values from the year 2011 to 2021, which indicates that there is a significant impact of the independent variables on the inflation rate.

Table 6 Regression equation with exchange rate as dependant variable

Co-Efficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	61.914	5.273		11.742	0
	cardamom	-0.002	0.001	-0.057	-1.543	0.126
	mentha	0.001	0.001	0.059	1.313	0.192
	cotton	-8.09E-05	0	-0.022	-0.524	0.601
	CPO	0.005	0.005	0.039	0.896	0.372
a. Dependent Variable: Exchange rate						

From the above table we can formulate the regression equation Y =a+bx wherein Y is the dependent variable (exchange rate) and X is the independent variable (cardamom, mentha oil, cotton, CPO, nickel, lead, zinc, copper, gold, silver, and crude oil). Hence, we arrive at the regression equation exchange rate = 61.914 - 0.002 (cardamom) + 0.001 (mentha oil) -8.09E-05 (cotton) + 0.005 (CPO). By applying this regression equation to the entire we find out the predicted values of the exchange rate. We find that the predicted values in all the cases are nearer to the $\pm$ 1 % of the observed values from the year 2011 to 2021, which indicates that there is a significant impact of the independent variables on exchange rate.

Table 7 Growth, Instability and Descriptive statistics of spot and future price of selected agricultural commodities in the commodity market

	mentha oil		cardamom		Cotton		CPO	
	spot	future	spot	future	Spot	Future	spot	future
Mean	1145.58	1145.08	1241.11	1247.40	18745.26	19135.84	548.92	545.65
Std. error of mean	1061.65	1062.33	1058.10	1064.71	19110.00	19541.34	534.00	535.52
Std. deviation	332.50	333.83	630.15	630.46	2184.70	2219.41	127.89	118.32
Skewness	1.07	1.06	2.28	2.28	-0.10	-0.32	1.99	1.71
Std. error of skewness	0.21	0.21	0.21	0.21	0.23	0.21	0.21	0.21
Kurtosis	1.74	1.71	5.86	5.88	-1.16	-1.21	5.66	4.52
Std. error of kurtosis	0.42	0.42	0.42	0.42	0.45	0.42	0.42	0.42
Minimum	671.00	671.38	601.00	607.54	14360.00	14513.66	361.00	363.36
Maximum	2570.30	2572.14	3816.70	3825.72	22860.00	22819.95	1132.40	1078.74
Coefficient of variation	29.02%	29.15%	50.77%	50.54%	11.65%	11.60%	23.30%	21.68%
CAGR	1.94%	1.93%	0.54%	0.49%	1.31%	1.00%	8.59%	11.95%
Contango / Backwardation	Backwardation		Contango		Contango		Backwardation	

From the above table, the coefficient of variation of selected agricultural commodities reveals that cardamom is more variable, whereas cotton is found to be less volatile among the selected commodities. The CAGR analysis of agricultural commodities showed that the CPO has the highest growth rate of around 11.95 %. The future price of cardamom and cotton is expected to be higher than the spot price from the contango analysis (Bhawiya Roopa & Gopinath,2020).

Table 8 Result of ADF Test for Commodity Futures and Macroeconomic Variables

Name of the variable	Level	Test Statistics	First difference	Probability	Order of Autocorrelation
D (Exchange rate)	5%	-15.5498	-0.000	8.919e-037	First order
D (IIP)	5%	-15.6113	-0.000	5.931e-037	First order
D (Inflation rate)	5%	-15.5583	-0.000	8.43e-037	First order
D (Gold)	5%	-11.2339	0.000	3.31e-023	First order
D (Cardamom)	5%	-9.19358	0.016	1.193e-016	First order
D (Mentha oil)	5%	-9.81198	-0.036	1.327e-018	First order
D (Cotton)	5%	-10.7037	0.002	1.767e-021	First order
D (CPO)	5%	-10.1094	0.008	1.478e-019	First order

From the above table, the variables are stationary at first difference for the selected macroeconomic variables and agricultural commodities. To avoid spurious regression, unit root test is performed. at 5% significance level, all the variables are significant after doing the first difference.

Table 9 Result of stepwise regression of selected commodities and selected macroeconomic variables

	Inflation rate	Exchange rate	IIP	R Square	DW	JB
Cardamom	-.317**	-.488**		0.116***	1.77	3.86
Mentha	-		.353**	0.125***	1.83	3.63
cotton	-	.808**	.754**	0.154***	2.16	1.48
CPO	-.190*			0.138***	1.64	2.69

In the above table, multivariate step wise regression is used to avoid the problem of multicollinearity. The analysis reveals that there is positive impact of IIP on menthaoil and cotton. Thus, the increase of 1% IIP, results the mentha oil future price to increase by 35.3% and 75 % increase in cotton future price. The inflation rate found to have negative impact on cardamom and CPO, which indicates the investment in these commodities is risky against inflation. The exchange rate has found to have negative impact on cardamom future price and positive impact on cotton future price. Thus, the increase in exchange rate by 1% results in 48% decrease in price of cardamom future price and 80% increase in price of cotton future price.

CONCLUSION

The study found that each and every macroeconomic variable plays a significant role in pricing a commodity. The volatility of agricultural commodities is correlated with macroeconomic variables (Saminathan *et al*., 2020b). The study examines the impact of macroeconomic factors by stepwise regression and individually analysing each commodity. The information discussed in accordance with the Indian commodity market, reveals that the macroeconomic variables have high economic influence on the volatility of commodity futures in India (Kavitha & Gopinath, 2020a; Gopinath *et al*., 2019). Moreover, the risk of macroeconomic variable is a vital factor for the volatility of commodity futures, especially for cotton considering IIP as a major factor. 1% increase of IIP will have the impact of 75% increase in price of cotton future market (Kavitha & Gopinath, 2020b; Jaya & Gopinath, 2020).

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