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RELATIVE ANALYSIS OF MCX ENERGY AND MCX METAL INDEX

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ABSTRACT

The commodity market in India facilitates multi commodity exchange within and outside the country based on requirements. Multi Commodity Exchange of India Limited ***is the*** *India's No. 1 commodity exchange has been given the efficient platform for price discovery and risk management across a wide range of segments in India's commodity futures market MCX* ***which*** *has been offering products and services with specifications that perfectly meet the needs of its diverse customer base in a cost effective manner. The innovations in MCX's products and services facilitate* ***the*** *users to hedge price risks in international commodities within the country; thereby enabling they attain efficiency and competitiveness without* ***using the*** *foreign exchange platform. MCX COMDEX is* ***the*** *India's first and only composite commodity futures price index. Other commodity indices developed by the* ***co****mpany* ***are*** *MCX Agri, MCX Energy and MCX Metal. The year 2001 is taken as the base period for the purpose of average Index price. The Comdex is periodically evaluated and the weights of its components are revised so that the Comdex reflects the sentiments of the contemporary markets. An attempt is made to study the temporal relationship between* ***the*** *MCX Energy and MCX Metals ,****correlation*** *and regression analysis has been* ***done*** *to unveil the relationship* ***bet****ween the two .An attempt is made to analyse the relationship between return on price and volume of both the indices. The study also tries to find the auto correlation using Durbin Watson statistics.*

Key words: MCX Agri, MCX Energy, MCX COMDEX, Autocorrelation, Durbin Watson statistics.

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1. INTRODUCTION

MCX COMDEX is the India's maiden real-time Composite Commodity Index based on commodity futures prices of an exchange. Group Indices for MCX AGRI, MCX METAL **and** MCX ENERGY **which are** on commodity futures prices **and mainly they have been** developed to represent different commodity **s**egments as traded on the Exchange .The constituents of the Index are liquid commodities traded on the Exchange. The weights to the constituents within sub-indexes are assigned giving equal importance to their physical market size and their liquidity on the Exchange. The rebalancing is done annually or as when deemed necessary by the Index management team. The MCX COMDEX is the simple weighted average of the three group indices – MCX AGRI, MCX METAL & MCX ENERGY. The group indices are computed based on Geometric Mean

The present composition of commodities and their weights in the MCX-COMDEX are as follows:

MCX COMDEX Weights w.e.f. September 22, 2015

MCX COMDEX	Commodity	Weight (New)	Group Adjusted Wts.
MCX METAL INDEX	Gold	16.17%	40.0%
	Silver	4.62%	
	Copper	7.06%	
	Aluminum	2.92%	
	Nickel	4.91%	
	Zinc	2.32%	
	Lead	2.00%	
MCX ENERGY INDEX	Crude Oil	32.73%	40.0%
	Natural Gas	7.27%	
MCX AGRI INDEX	Cardamom	2.13%	20.0%
	Mentha Oil	3.38%	
	Crude Palm Oil	6.09%	
	Cotton	8.40%	

Table 1 Present composition of commodities and their weights in the MCXMETAL:

No.	. Commodity MCX METAL	Weight (New)
1	**GOLD**	12.54%
2	**SILVER**	9.26%
3	**COPPER**	9.85%

From the table it is clear that gold has more weightage in mcx metal Index in comparison with silver and copper.

2. REVIEW OF LITERATURE

1. **Aulton, Ennew, and Rayner (1997)-**This study re-investigat**es** the efficiency of UK agricultural commodity futures markets using the cointegration methodology. Researchers found that the market is efficient for wheat (but not efficient for some other commodities like potatoes). Zapata *et al* (2005) conclude about the relationship between **the s**ugar futures prices traded in New York and the world cash prices for exporting sugar .The finding of cointegration between futures and cash prices suggests that the sugar futures contract is a useful tool for reducing overall market price risk faced by cash market participants selling in the world price. The literature on emerging commodity futures markets in the developing countries is sparse due to lack of meaningful data.
2. **Borensztein and Reinhart (1994)-** have identified **the** key determinants of commodity price from a structural model using Reinhart and Wickham(1994) technique. They have found that the cyclical movement of world commodity price is significantly influenced by the real U.S. **dollar's** effective exchange rate and the state of the business cycle in industrial countries
3. **Coakley, Jerry,Dollery, JianKellard, Neil (2001)-**This study employs daily data for 14 commodities and three financial assets 1990-2009 to explore the impact of the time series properties of the futures-spot basis and the cost of carry on forward market unbiasedness. The main result is that the basis of 16 assets exhibits both long memory and structural breaks. These new findings suggest that the forecast error has long memory and are inconsistent with unbiasedness.
4. **Chakrabarty, RanajitSarkar (2006)-**This study intends to analyse whether the commodity futures market provides information and subsequently whether it helps to reduce the volatility of the Indian spot market. Since, rice is a very important agricultural commodity for India, this paper studies the commodity futures market for different qualities of rice, potato, wheat and masoor grain. It has been found that the commodity spot market indices and the futures market indices are cointegrated with each other. The price of the different qualities of the rice depends on the recent news but not on the old news. The Bayesian estimation of the GARCH model concludes that the overall Indian **Commodity Spot** and future market and the Indian **Stock Market** are stationary and current values **are** also influenced by old news of the market
5. Coletti (1992) examines a small set of non-energy commodities that mainly include industrial materials (e.g. metals, minerals and forest products) over the 1900-91 period. He finds no obvious secular decline in relative prices of those commodities.

3. OBJECTIVE OF THE STUDY

1. To Analyse the return on price of MCX Energy and MCX Metal
2. To Analyse the return on volume of MCX Energy and MCX Metal
3. Assess the temporal relationship between MCX Energy and MCX Metals
4. The study tries to find the auto correlation using Durbin Watson statistics.

4. RESEARCH METHODOLOGY

The present study conducted is based on secondary data, which is collected from commodity market and their publications, books on the related topics, magazines, reputed journals, research paper, newspaper, and internet sources like www.mcxindia.com, www. Sebi .gov.in, commodity market bulletins, and other publications. The study tries to analyze the return on price and volume of crude oil and gold and also the Index. An attempt is made to study the Causal relationship between the two. The co movement of the markets is analysed with the help of Moving Average and the intensity in their relation is analysed with Cross Correlation Function that takes into consideration the time lag.

5. TOOLS USED FOR ANALYSIS

The following tools have been employed for analysis of the data.

Moving Average, Augmented Dickey-Fuller test Statistic, Multiple Regression, Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests, ARMA Model, Heteroskedasticity -Autocorrelation popularly known as HAC Test correlogram**.**

MCX METAL

Table 2 ADF unit root test for Returns on MCX METAL Index for the year 2016

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-15.72668	0.0000
Test critical values:	1% level	-3.456730	
	5% level	-2.873045	
	10% level	-2.572976	

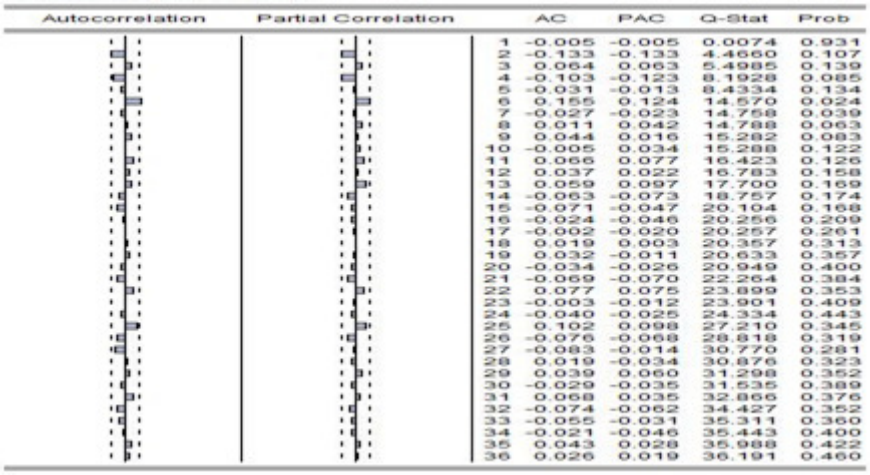
The calculated t-statistic is -15.722668 which is greater than the critical values at all the significance level. This means that the null **hypothesis is rejected** which says that Return on Index has a unit root. It means that Returns on Index do not have a unit root.

Table 3 KPSS unit root test for Returns on MCX METAL Index for the year 2016

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.102142
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

The calculated t-statistic is 0.102142 which is less than the critical values at all the significance level. This means that the null hypothesis i**s not rejected**. Which says that Return on Index is stationary. It means that Returns on Index is stationary. Both the unit root test i.e. ADF and KPSS give the same result that Returns on Index are stationary.

Table 4 Correlogram of Return on MCX METAL Index for the year 2016



The most significant AR in this correlogram are AR (1) and AR (6). The most significant MA in this correlogram are MA (1), MA (4) and MA(6).

Table 5 ARMA test for Return on Prices.

Dependent Variable: RETURN_ON_PRICE				
Method: Least Squares				
Date: 04/23/16 Time: 01:21				
Sample (adjusted): 1/23/2016 12/31/2016				
Included observations: 234 after adjustments				
Convergence achieved after 8 iterations				
MA Backcast: OFF (Roots of MA process too large)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.029682	0.026061	-1.138956	0.2559
RETURN_ON_VOLUME	-0.000590	0.000258	-2.286359	0.0232
RETURN_ON_INDEX	0.726852	0.048848	14.87976	0.0000
AR(6)	0.321548	0.155757	2.064419	0.0401
AR(14)	-0.149314	0.060710	-2.459474	0.0147
MA(6)	-0.295282	0.163718	-1.803599	0.0726
MA(28)	-0.219121	0.066410	-3.299538	0.0011
R-squared	0.551342	Mean dependent var		-0.083318
Adjusted R-squared	0.539483	S.D. dependent var		0.925228
S.E. of regression	0.627873	Akaike info criterion		1.936499
Sum squared resid	89.48884	Schwarz criterion		2.039863
Log likelihood	-219.5704	Hannan-Quinn criter.		1.978175
F-statistic	46.49218	Durbin-Watson stat		2.120408
Prob(F-statistic)	0.000000			
Inverted AR Roots	.87-.15i	.87+.15i	.64-.55i	.64+.55i
	.42+.82i	.42-.82i	.00-.83i	.00+.83i
	-.42+.82i	-.42-.82i	-.64-.55i	-.64+.55i
	-.87+.15i	-.87-.15i		
Inverted MA Roots	.96	.93-.20i	.93+.20i	.85+.40i
	.85-.40i	.73+.59i	.73-.59i	.59+.75i
	.59-.75i	.42-.86i	.42+.86i	.22+.92i
	.22-.92i	-.00-.93i	-.00+.93i	-.22+.92i
	-.22-.92i	-.42+.86i	-.42-.86i	-.59-.75i
	-.59+.75i	-.73+.59i	-.73-.59i	-.85-.40i
	-.85+.40i	-.93-.20i	-.93+.20i	-.96

After the ARMA test, **it is** clear that the returns on prices have a negative relation with the returns on volume and returns on index, ie, an decrease of 1% in the returns on volume would cause a negative -0.000590% decrease in the returns on price and an increase of 1% in the return on index would cause a positive increase of 0.726852% in the returns on price .

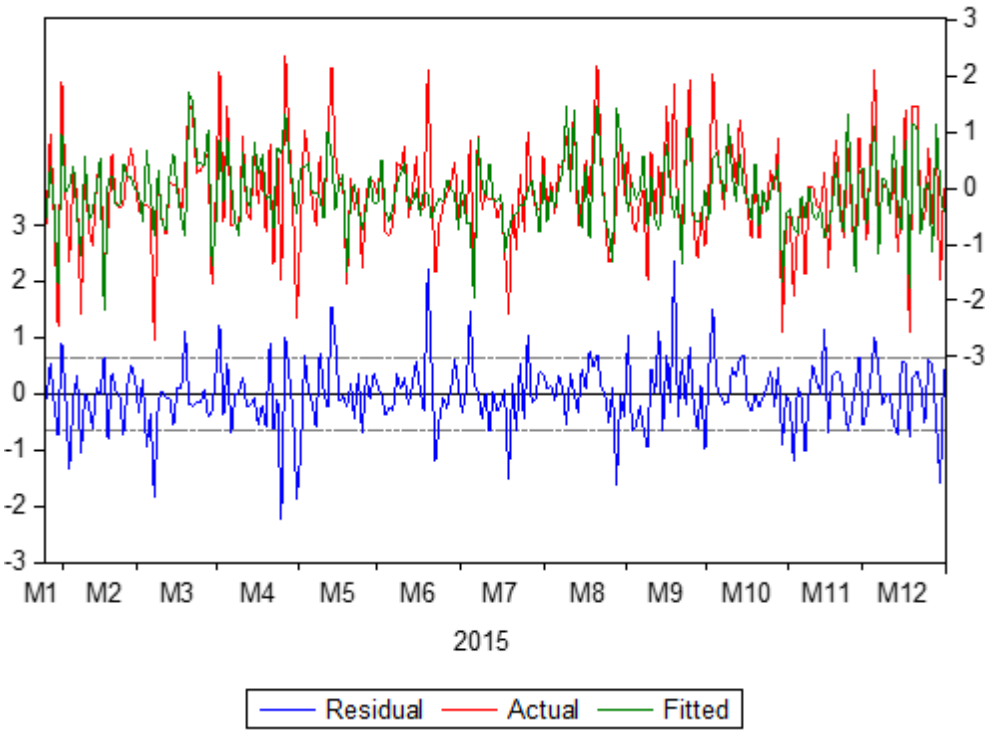
The ARMA equation would be as follows:

Returns_on_Price = -0.029682 - 0.000590Returns_on_Volume + 0.726852 Returns_on_Index + 0.321548 – 0.149314 – 0.295282 – 0.219121

i.e.

Returns_on_Price = -0.371851 + 0.000590Returns_on_Volume + 0.726852 Returns_on_Index.

Also R^2 value of 0.551342 shows that the model explains about 55.13% variation in the Returns on Price. The adjusted R^2 being 53.94% also shows that the model is a very good fit. The standard error is also minimised and its only around 62.78**%. The Durbin-Watson statistics of 2.12** also indicates that there is no autocorrelation in the residuals from the statistical regression analysis.



The actual and the fitted graph for the returns on Perpetual Contract are almost overlapping. This reflects the high level of goodness of fit for the model. The graphs are not overlapping at those points where the level of volatility is quite high. Also, the residual value is very less which reflects the high validity for the model

MCX ENERGY

Table 6 ADF unit root test for Returns on Index for the year 2016

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-14.16538	0.0000
Test critical values:	1% level	-3.456514	
	5% level	-2.872950	
	10% level	-2.572925	

The calculated t-statistic is -14.16538 which is greater **than** the critical values at all the significance level. This means that the null hypothesis is rejected. which says that Return on Index has a unit root. It means that Returns on Index do not have a unit root.

Table 7 KPSS unit root test for Returns on Index for the year 2016

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.095745
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

The calculated t-statistic is 0.095745 which is less than the critical values at all the significance level. This means that the null hypothesis **is not rejected** which says that Returns on Index is stationary. It means that Returns on **Index are** stationary. Both the unit root test i.e. ADF and KPSS give the same result that Returns on Index are stationary

Table 8 Correlogram of Return on Index

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.100	0.100	2.5348	0.111
		2	-0.025	-0.035	2.6912	0.260
		3	-0.037	-0.032	3.0496	0.384
		4	0.033	0.040	3.3290	0.504
		5	0.011	0.002	3.3611	0.644
		6	-0.001	-0.001	3.3613	0.762
		7	0.023	0.026	3.4967	0.836
		8	-0.025	-0.031	3.6557	0.887
		9	-0.020	-0.013	3.7559	0.927
		10	-0.037	-0.034	4.1162	0.942
		11	-0.042	-0.040	4.5862	0.950
		12	0.071	0.079	5.9126	0.920
		13	0.007	-0.012	5.9264	0.949
		14	0.015	0.018	5.9838	0.967
		15	0.002	0.010	5.9854	0.980
		16	-0.002	-0.009	5.9869	0.988
		17	-0.059	-0.058	6.9272	0.984
		18	-0.078	-0.069	8.5977	0.968
		19	0.058	0.063	9.5046	0.964
		20	0.038	0.021	9.9006	0.970
		21	-0.004	-0.010	9.9055	0.980
		22	0.027	0.047	10.114	0.985
		23	-0.023	-0.027	10.266	0.990
		24	0.018	0.018	10.352	0.993
		25	-0.042	-0.044	10.848	0.994
		26	-0.004	-0.011	10.853	0.996
		27	-0.068	-0.072	12.143	0.994
		28	0.005	0.010	12.151	0.996
		29	-0.014	-0.012	12.206	0.997
		30	-0.086	-0.068	14.311	0.993
		31	-0.145	-0.136	20.340	0.928
		32	0.042	0.073	20.846	0.935
		33	0.096	0.077	23.506	0.889
		34	-0.004	-0.036	23.511	0.911
		35	0.020	0.036	23.634	0.928
		36	0.023	0.015	23.785	0.941

Table 9 ARMA test for Return on Prices.

Dependent Variable: RETURN_ON_PRICE
Method: Least Squares
Date: 04/17/16 Time: 20:59
Sample (adjusted): 1/05/2016 12/31/2016
Included observations: 249 after adjustments
Convergence achieved after 7 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.059615	0.063312	-0.941604	0.3473
RETURN_ON_VOLUME	0.001863	0.001376	1.354110	0.1769
RETURN_ON_INDEX	1.118247	0.038113	29.33998	0.0000
AR(1)	-0.462107	0.056749	-8.143036	0.0000

R-squared	0.761754	Mean dependent var	-0.144760
Adjusted R-squared	0.758837	S.D. dependent var	2.971017
S.E. of regression	1.459019	Akaike info criterion	3.609339
Sum squared resid	521.5401	Schwarz criterion	3.665844
Log likelihood	-445.3627	Hannan-Quinn criter.	3.632083
F-statistic	261.1162	Durbin-Watson stat	2.046838
Prob(F-statistic)	0.000000		

Inverted AR Roots -.46

After the ARMA test,its clear that the returns on prices have a negative relation with the returns on volume and returns on index ,ie, an increase of 1% in the returns on volume would cause a positive 0.001863% decrease in the returns on price and an increase of 1% in the return on index would cause a positive increase of 1.118247% in the returns on price .

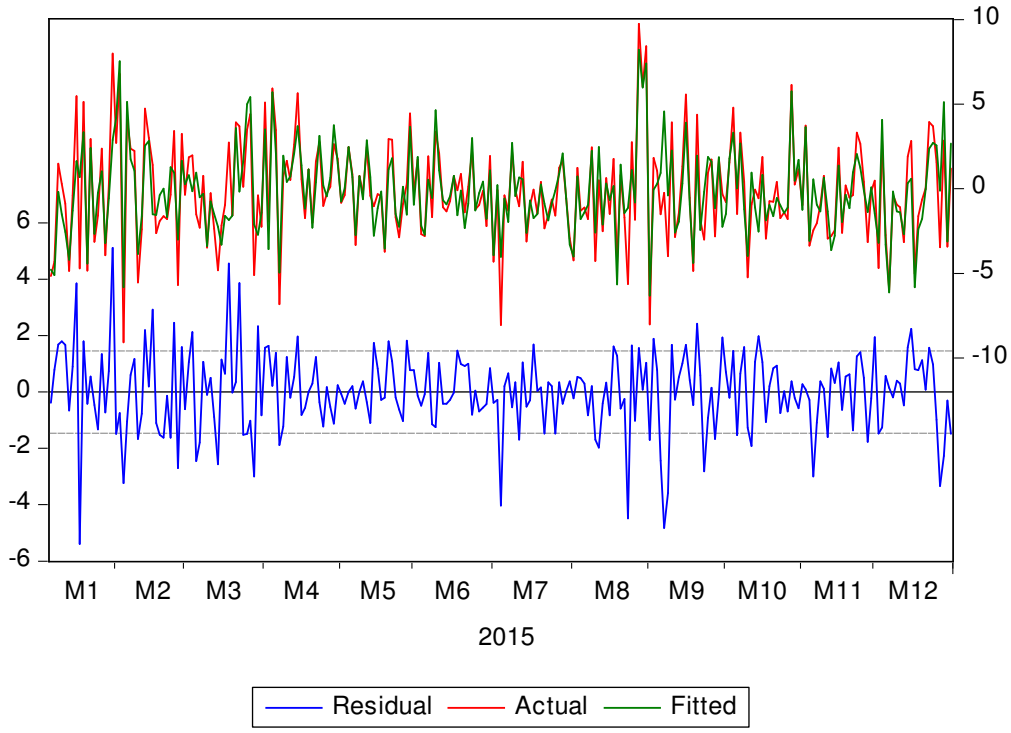
The ARMA equation would be as follows:

Returns_on_Price = -0.059615 -0.001863Returns_on_Volume + 1.118247 Returns_on_Index - 0.462107

i.e.

Returns_on_Price = -0.521722 - 0.001863Returns_on_Volume + 1.118247 Returns_on_Index.

Also R^2 value of 0.761754 shows that the model explains about 76.17% variation in the Returns on Price. The adjusted R^2 being 0.758837% also shows that the model is very good fit. The standard error is also minimised and it's only around 145.90%. **The Durbin-Watson statistics of** 2.04 also indicates that there is no autocorrelation in the residuals from the statistical regression analysis.



The actual and the fitted graph for the returns on Perpetual Contract are almost overlapping. This reflects the high level of goodness of fit for the model. The graphs are not overlapping only at those points where the level of volatility is quite high. Also, the residual value is very less which reflects the high validity for the model

6. FINDINGS

1. 1. Gold has more weightage in MCX Metal Index in comparison with silver and copper.
2. In case of ADF unit root test for return on Mcx Metal index The calculated t-statistic is is greater than the critical values at all the significance level. This means that the null **hypothesis is rejected** which says that Return on Index have a unit root.
3. KPSS unit root test for Returns on MCX METAL **Index the** calculated t-statistic is less than the critical values at all the significance level. This means that we do not reject the null hypothesis which says that Returns on Index is stationary.
4. Both the unit root test i.e. ADF and KPSS give the same result that Returns on Metal Index **are** stationary.
5. ARMA test proves that the returns on prices have a negative relation with the returns on volume and returns on Metal index
6. In case of ADF unit root test for return on Mcx Energy index the calculated t-statistic is greater than the critical values at all the significance level. This means that the null hypothesis **is rejected** which says that Return on Index **have** a unit root
7. Both the unit root test i.e. ADF and KPSS give the same result that Return on Energy Index **are** stationary
8. After the ARMA test, its clear that the returns on prices have a negative relation with the returns on volume and returns on Energy index.

7. SUGGESTIONS

- The Energy Index and Metal Index prices are more volatile , the investor has to be careful before investing their money in these commodities
- The investors should keep track of price movements of both ie the Metal index and Energy index, so that they can make profit from the positive movement.
- In the market scenario Gold prices seem to be very strong but after the sharp fall
- there is more of a chance for it to bounce back, so it would not be a bad idea to invest in gold
- The investors should invest their money taking into consideration of all the external factors.
- The brokers should give proper guidelines to the investors in order to avoid loss.

8. CONCLUSION

India is one of the top producers of large number of commodities and also has a long history of trading in commodities and related derivatives. The Commodities Derivatives market has witnessed ups and downs, but seems to have finally made enormous progress in terms of technology, transparency and trading activities. An attempt **is** made to study the temporal relationship between **the** MCX Energy and MCX Metals. The study proves that the returns on prices have a negative relation with the returns on volume and returns on index for both **the** Energy and Metal. The Durbin-Watson statistics also indicates that there is no autocorrelation in the residuals from the statistical regression analysis

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