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REGULATOR'S DECISION AND RISK MANAGEMENT: THE CASE OF INDIA

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Abstract. Whenever Indian Economy had to tackle significant inflationary pressure, Securities Exchange Board of India (SEBI), which is the apex regulator of capital and commodity markets, has time and again resorted to stop the trade in futures of essential agricultural commodities while allowing trade in futures of essential energy commodities. SEBI has justified the step on the grounds that, doing so prevents volatility in agricultural spot market. Our study tries to analyze the nature of correction in the two segments with the help of vector error correction model in the backdrop of inflationary and non-inflationary periods. In energy segment, among select commodities, the speed of error correction was 1to 2 days more as compared to non-inflationary period. With regards to commercial agricultural segment, the rate of error correction among select commodities was 4 to 7 days more as compared to non-inflationary period. Given the underdeveloped nature of agricultural futures market, SEBI's action seems bit too stringent. Although prior studies have been undertaken about Indian spot and derivative markets, empirical studies which have focused on analyzing economic rationale of SEBI's decision of restricting trade in agricultural futures during inflation are scarce. Our study tries to bridge the gap regarding the same.

1. Introduction

Future market and spot market are highly interlinked and interrelated. If both markets are integrated in letter and spirit, then they have the potential of creating manifold positive externalities for the economy (Baldi, Lucia et al., 2011; V.P. Saranya, 2015). The importance of Future market lies in the fact that, it can, not only help in price discovery, but also help in minimizing the risk exposure of traders and has the potential to give better returns to sellers (Czudaj et al., 2012; Ramakrishna, R. & Jayasheela, 2009). Concept of future market is not new for India. In fact, trade in futures and derivatives of agricultural commodities was prevalent in India as early as 1920s. Furthermore, at the time of independence there were around 46 exchanges trading in futures and derivatives of agricultural commodities (G. Anuradha and Bohra Dimple,2012). However, at the time of independence there was conspicuous lack of standardization, and absence of proper regulatory mechanism in place. So, in interests of larger good, Government decided to impose a ban on futures and derivatives trading in agricultural commodities. It was only in 2001, that the Government repealed the legislation and allowed trade of futures and derivatives in agricultural commodities. In India as of now there are six National commodity exchanges, of which the lion's share of market is held by Multi Commodity Stock Exchange (MCX) and National commodity and derivative exchange

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(NCDEX). The other commodity exchanges which are actively operating in India are India commodity Exchange (ICEX), National Multi Commodity Exchange (NCME), ACE derivatives Exchange and Universal Commodity exchange (UCX). If conducive environment is created to integrate spot market with future market, especially with regards to agricultural commodities, then it can go a long way to secure the interests of farmers. However, since the inception, futures and derivatives market dealing with agricultural commodities didn't have the fortune of being in a conducive environment to grow and flourish and become a mature market. Time and again they are suspended in periods of high inflation, in order to 'protect the interests of greater good' despite the fact that Abhijit Sen Committee in its report stated that, there is ambiguity as to whether, inflation in agricultural commodities is caused by future markets or not. Furthermore, Professor Prakash Apte, who was part of Abhijit Sen Committee states that, after undertaking a thorough analysis of available Indian data, it was found that for some commodities post futures, inflation seems to have accelerated whereas for some commodities post futures, inflation seems to have decelerated (Abhijit Sen Committee Report, 2008). Decision of the Government to impose suspension on derivatives and futures trade of agricultural commodities, whenever there is high inflationary pressure seems to have done agricultural commodity market more harm than good. In this backdrop, our study wanted to analyze the economic rationality behind imposing ban on agricultural segment while allowing energy segment to be actively traded in futures market.

Several studies (Czudaj et al., 2012; Ramakrishna, R. & Jayasheela, 2009; Mukherjee, 2011) have ascertained the efficacy of futures market in aiding price discovery of commodities in the segments of agriculture, minerals and energy. Recent studies conducted by Tirtha et al (2019) and Rajib et al (2021) have reaffirmed that actively linking commodity market with futures market is beneficial for farmers. However, empirical studies which have dwelled upon the rationality of SEBI suspending trade of agricultural commodity in futures market and its repercussion on growth and development of agricultural spot and futures market are rather scarce. The novelty of our study lies in the fact that, in our research, we have tried to empirically verify as to whether SEBI'S decision of suspending the trade in futures of agricultural commodities during high rate of inflation but allowing futures trade in segments pertaining to energy and minerals is economical or not. Through granger causality, cointegration, and vector error correction model, we have estimated the causal relationship, speed of correction and long run relationship of commodities belonging to agriculture and those belonging to essential energy segment in the backdrop of inflationary and non-inflationary period and tried to validate as to whether the stand taken by SEBI is plausible or not. As food crops and cash crops were empirically verified to be strongly interdependent by the study undertaken by Amrouk et al (2017), by using DCC GRACH model, in our study, as data pertaining to food crops were not available, cash crops were seen as a viable proxy for food crops. Thus, as the trade of food crops in agricultural segment was suspended in times of inflation, cash crops of agricultural segment has been taken as a proxy for food crops and comparative analysis has been made with regards to agricultural cash crops and commodities in energy segment to validate the stand taken by SEBI.

2. Research Design

The objective of our study was to analyze as to whether SEBI's decision of suspending trade of essential agricultural commodities while allowing the same in essential energy commodities was economically viable or not. To objectively understand the same, we had to analyze the relationship between the spot and future prices of the concerned commodities in the periods of high inflation vis-à-vis periods of low inflation. Imposition of SEBI's suspension on essential agricultural commodities is not something new, SEBI has been imposing such measures to combat inflation on a regular basis. It can be seen in past as well. In this context acquiring data related to essential energy commodities was not a difficult affair, as they were traded, data related to their trade was readily available. However, the problem in constructing this model was analyzing impact on SEBI's policy on essential agricultural commodities. Since essential agricultural commodities were not allowed to be traded, data relating to them is not available.

To overcome this problem, we have taken commercial crops grown by farmers for the purpose of analysis. Although commercial crops are not perfect substitutes for essential food crops, as they are part of agricultural crops, they are expected to display similar behavior when influenced by identical external agent, which in our case happens to be forward market. Hence, we have chosen commercial crops as a proxy for essential crops in our analysis.

Furthermore, it is interesting to note that on December 2020, SEBI had suspended 7 commodities from being traded on National Commodities and Derivatives Exchange (NCDEX) for a period of one year. The list of the commodities on which the future trade was suspended were chana, wheat, paddy (non-basmati), mustard seed and its derivatives, crude palm oil, moong along with soyabean and its derivatives. However, Crude palm oil was allowed to be traded in Multi Commodity Stock Exchange for which data is available. Thus, in the commercial crops that we have taken for analysis, we have included crude palm oil as well which enhances the reliability of our model.

Data regarding the future and spot prices for agricultural crops and energy commodities were accessed from Multi Commodity Stock Exchange, which is held under the ownership of Ministry of Finance, Government of India. Period from 2012 to 2013 was chosen as inflationary years to analyze the impact of future market on spot prices, as in these years the inflation rate was 9.31 and 11.01 percent respectively. Furthermore, period from 2018 to 2019 was chosen as non-inflationary years to understand the same, as in these years the inflation rate was 3.95 and 3.72 percent respectively.

3. Key Variables

3.1. **Dependent and Independent Variables.** Most of the studies which had been undertaken to understand the relation between future and spot market, have ascertained that future prices influence spot price. However, some studies have ascertained the opposite as well. In our analysis we have used granger causality to understand granger cause and effect relationship between variables. The results of granger causality have been summarized in table 1.

Table 1. Granger causality between the variables

Variable	Granger Causality (at 5% Significance)	
	High Inflation (9 -11%)	Low Inflation (3-4%)
Cotton	Future granger causes Spot	Future granger causes Spot
Crude Palm Oil	Bidirectional relationship	Future granger causes Spot
Natural Gas	Future granger causes Spot	Bidirectional relationship
Crude Oil	Future granger causes Spot	Bidirectional relationship

From table 1, we can observe that, in most of the cases future prices granger causes spot prices. Even in some cases, where it otherwise, they have cause and effect relationship. In this backdrop, we have treated spot price to be dependent variable and future price to be independent variable.

4. Empirical Model

In keeping with the objective of our study, we wanted to analyze the economic rationality behind SEBI's policy initiatives to curtail inflation. The dualism adopted by SEBI with regards to the two types of essential commodities during inflationary period is intriguing at best and requires justification on economic grounds. SEBI, on one hand has imposed suspension on essential agricultural commodities from being traded in future markets, whereas on the other hand SEBI had made allowance for essential energy commodities like natural gas and crude oil to be traded in future market. On surface level, as both food crops and fuels like crude oil and natural gas belongs to essential category, it seems justifiable to treat both the segments on level ground in the backdrop of inflation. However, SEBI has adopted a dualistic approach. Our study wanted to find out the economical rationality behind the approach which SEBI has adopted.

To understand the economic rationality, we have leveraged Cointegration and Vector Error Correction Model (VECM). The rationale behind using VECM is as follows. In past several studies which have dealt with spot and future prices have shown that these variables are cointegrated. Thus, we had a fair degree of confidence, that the variables we have taken to consideration would also be cointegrated. Provided, they were cointegrated, we could use VECM to find out the speed of adjustment in deviation of their prices.

In our model, we have analyzed the spot and future prices of agricultural and essential energy commodities during inflationary (2012 & 2013) and non-inflationary (2018 & 2019) period. If the rate of error correction of the prices of agricultural commodities would be slower in inflationary period as opposed to non-inflationary period, then the action undertaken by SEBI in case of agricultural crops would be economically justifiable. On the other hand, if the rate error correction of essential energy commodities' prices wouldn't be significantly during both

inflationary and non-inflationary period, then SEBI's decision of allowing the essential energy commodities to be traded in forwarded market would be justifiable. If where it otherwise, SEBI's decision might lack economic justification, provided both the markets are equally developed.

The generalized equation for long term and short-term relationship respectively are depicted as follows:

$$Spot_t = \beta_0 + \beta_1 * Future_t + e_t \tag{1}$$

Equation (1) helps us to understand the long run relationship between spot and future prices prevailing in agricultural and energy markets. In equation (1), $Spot_t$ refers to spot prices of Agricultural or essential commodities in the long run. $Future_t$ refers to Future prices of Agricultural or essential energy commodities in the long run. β_i refers to the terms which are to be estimated. e_t refers to the error term.

$$\Delta Sport_t = \beta_0 + \beta_1 * \Delta Future_t + \beta_2 * e_{t-1} + \nu_t \tag{2}$$

Equation (2) helps us to understand the short run relationship between spot and future prices. In equation (2), $\Delta Sport_t$ refers to change in spot prices of Agricultural or Energy commodities; $\Delta Future_t$ refers to change in the Future Prices of Agricultural or Essential energy commodities. β_i refers to the terms which are to be estimated and the error correction term, $e_{t-1} = Spot_{t-1} - \beta_0 - \beta_1 * \Delta Future_{t-1}$.

5. Empirical Results

The long run and short run relationship of agricultural and essential energy commodities in inflationary period are summarized in table 2 and table 3 respectively:

Table 2: Influence of Future Market on Spot Prices on Agricultural Commodities (Inflationary Period, January 2012 to December 2013)

Variable	Model				
	Long Run	P-Value	Short Run	P-Value	Speed of Correction
Cotton					
β_0	-2.54	0.0000	0.0001	0.5806	
$Future_t$	1.25	0.0000	0.4337	0.0000	
e_{t-1}	Not Applicable	Not Applicable	-0.0624	0.0000	16.02 days
Crude Palm Oil					
β_0	-0.28	0.0000	-5.28E-06	0.9831	
$Future_t$	1.04	0.0000	0.6583	0.0000	
e_{t-1}	Not Applicable	Not Applicable	-0.1145	0.0000	08.73 days

Table 2 helps us in understanding the influence of prices prevalent in future market on spot market prices in context of Agricultural commodities during January 2012 to December 2013,

which was a period of inflation in Indian economy. From the table, we can observe that the long run relationship between spot and future prices for cotton is:

$$Sport_t = -2.54 + 1.25 * Future_t + e_t \tag{3}$$

Where $Sport_t$ refers to price of cotton in spot market; $Future_t$ refers to price of cotton in future market and e_t refers to the error term.

The short run relationship between spot and future prices of cotton is depicted in equation (4)

$$\Delta Sport_t = 0.0001 + 0.4337 * \Delta Future_t - 0.0624 \tag{4}$$

Similarly, the long run relationship between spot and future prices of crude palm oil has been depicted in equation (5)

$$Spot_t = -0.28 + 1.04 * Future_t + e_t \tag{5}$$

The short run relationship between spot and future prices of crude palm oil has been depicted in equation (6)

$$\Delta Spot_t = -5.28E - 06 + 0.6583 * \Delta Future_t - 0.1145 \tag{6}$$

In equations (5) and (6), $Spot_t$ and $Future_t$ represents spot and future prices of crude palm oil during inflationary period.

Table 3: Influence of Future Market on Spot Prices on Essential Energy Commodities (Inflationary Period, January 2012 to December 2013)

Varoable	Model				
	Long Run	P-Value	Short Run	P-Value	Speed of Correction
Natural Gas					
β_0	-0.0206	0.0000	0.0005	0.4469	
$Future_t$	1.0016	0.0000	0.3599	0.0000	
e_{t-1}	Not Applicable	Not Applicable	-0.6317	0.0000	1.58 days
Crude Oil					
β_0	0.0772	0.0000	0.0004	0.5685	
$Future_t$	0.9905	0.0000	-0.0127	0.7756	
e_{t-1}	Not Applicable	Not Applicable	-0.4551	0.0000	2.2 days

Table 3 helps us in understanding the influence of prices prevalent in future market on spot market prices in context of Energy commodities during January 2012 to December 2013, which was a period of inflation in Indian economy. From the table, we can observe that the long run relationship between spot and future prices for Natural Gas is:

$$Spot_t = -0.0206 + 1.0016 * Future_t + e_t \tag{7}$$

Further, the short run relation between the spot and future prices of natural gas is:

$$\Delta Spot_t = 0.0005 + 0.3599 * \Delta Future_t - 0.6317 \tag{8}$$

In equations (7) and (8), $Spot_t$ and $Future_t$ represents spot and future prices of natural gas during inflationary period.

Similarly, the long run relationship between spot and future prices of crude oil has been depicted in equation (9)

$$Spot_t = 0.0772 + 0.9905 * Future_t + e_t \tag{9}$$

The short run relationship between spot and future prices of crude oil has been depicted in equation (10)

$$\Delta Spot_t = 0.0004 - 0.0127 * \Delta Future_t - 0.4551 \tag{10}$$

In equations (9) and (10), $Spot_t$ and $Future_t$ represents spot and future prices of crude oil during inflationary period.

The long run and short run relationship of agricultural and essential energy commodities in non-inflationary period are summarized in table 4 and table 5 respectively:

Table 4: Influence of Future Market on Spot Prices on Agricultural Commodities (Non-Inflationary Period, January 2018 to December 2019)

Variable	Model				
	Long Run	P-Value	Short Run	P-Value	Speed of Correlation
Cotton					
β_0	-0.7275	0.0000	-5.67E-05	0.8053	
$Future_t$	1.07	0.0000	0.3339	0.0000	
e_{t-1}	Not Applicable	Not Applicable	-0.0869	0.0000	11.50 days
Crude Palm Oil					
β_0	-0.15	0.0405	0.0004	0.6572	
$Future_t$	1.02	0.0000	0.3781	0.0064	
e_{t-1}	Not Applicable	Not Applicable	-0.8647	0.0000	01.15 days

Table 4 helps us in understanding the influence of prices prevalent in future market on spot market prices in context of Agricultural commodities during January 2018 to December 2019. This was a period in which inflation was under control in Indian economy. From the table, we can observe that the long run relationship between spot and future prices for cotton is:

$$Spot_t = -0.7275 + 1.07 * Future_t + e_t \tag{11}$$

Where $Spot_t$ refers to price of cotton in spot market; $Future_t$ refers to price of cotton in future market and e_t refers to the error term.

The short run relationship between spot and future prices of cotton is depicted in equation (12)

$$\Delta Spot_t = -5.67E - 05 + 0.3339 * \Delta Future_t - 0.0869 \tag{12}$$

Similarly, the long run relationship between spot and future prices of crude palm oil has been depicted in equation (13)

$$Spot_t = -0.15 + 1.02 * Future_t + e_t \tag{13}$$

The short run relationship between spot and future prices of crude palm oil has been depicted in equation (14)

$$\Delta Spot_t = 0.0004 + 0.3781 * \Delta Future_t - 0.8647 \tag{14}$$

In equations (13) and (14), $Spot_t$ and $Future_t$ represents spot and future prices of crude palm oil during inflationary period.

Table 5 helps us in understanding the influence of prices prevalent in future market on spot market prices in context of Essential Energy commodities during January 2018 to December 2019. This was a period in which inflation was under control in Indian economy.

Table 5: Influence of Future Market on Spot Prices on Essential Energy Goods (Non-Inflationary Period, January 2018 to December 2019)					
Variable	Model				
	Long Run	P-Value	Short Run	P-Value	Speed of Correlation
Natural Gas					
β_0	-0.0559	0.0690	-0.0002	0.6385	
$Future_t$	1.0099	0.0000	0.2753	0.0000	Over Correction
e_{t-1}	Not Applicable	Not Applicable	-1.133	0.0000	Oscillating Convergence
Crude Oil					
β_0	-0.0379	0.4135	0.0001	0.7517	
$Future_t$	1.0043	0.0000	0.4153	0.0000	Over Correction
e_{t-1}	Not Applicable	Not Applicable	-1.199	0.0000	Oscillating Convergence

From Table 5, we can observe that the long run relationship between spot and future prices for Natural Gas is:

$$Spot_t = -0.0559 + 1.0099 * Future_t + e_t \tag{15}$$

Further, the short run relation between the spot and future prices of natural gas is:

$$\Delta Spot_t = -0.0002 + 0.2753 * \Delta Future_t - 1.133 \tag{16}$$

In equations (15) and (16), $Spot_t$ and $Future_t$ represents spot and future prices of natural gas during non-inflationary period.

Similarly, the long run relationship between spot and future prices of crude oil has been depicted in equation (17)

$$Spot_t = -0.0379 + 1.0043 * Future_t + e_t \tag{17}$$

The short run relationship between spot and future prices of crude oil has been depicted in equation (18)

$$\Delta Spot_t = 0.0001 + 0.4153 * \Delta Future_t - 1.199 \tag{18}$$

In equations (17) and (18), $Spot_t$ and $Future_t$ represents spot and future prices of crude oil during inflationary period.

To understand the implications of SEBI's dualistic policy on agricultural and energy sector, there is a need to get a bird's eye view of the above results, which has been presented in Table 6.

Table 6: Speed of Error Correction among different commodities in Inflationary and Noninflationary Periods		
Commodities	Speed of Correction	
	Inflationary Period (2012-13)	Non-Inflationary Period (2018-19)
Agricultural Commodities		
Cotton	16.02 days	11.50 days
Crude Palm Oil	8.73 days	1.15 days
Essential Energy Commodities		
Natural Gas	1.58 days	Over Correction
Crude Oil	2.22 days	Over Correction

6. Inferences

By observing table 6, we can infer that across all commodities independent of the segment they belong to, speed of price correction is slower during inflationary period as opposed to non-inflationary period. Furthermore, it is interesting to note that, although speed of price correction is slower in inflationary period across the commodities, speed of price correction in

energy commodities happens at a very quick pace. So much so that, allowing them to be traded in futures market wouldn't significantly affect speed of price correction in energy segment's spot market. In this backdrop, we have two inferences with regards to SEBI's policies:

1. SEBI's policy of suspending trade of essential agricultural commodities in times of high inflationary pressure may seem rational at superficial level according to our empirical analysis. This is so because, speed of price correction in inflationary period is relatively slow in case of commercial crops. If we were to consider perishable agricultural crops, the delay might be much more prominent. Given the lack of cold storage facilities and supply infrastructure, farmers growing perishable agricultural crops might not be able to afford the delay in price correction. However, at the same point of time, one should note that futures market for agricultural commodities is not that highly developed in India (Gulati et al., 2017). Farmers who are the largest stakeholders are significantly unaware about the dynamics between future and spot markets in India. In this regard, attributing delay in price correction solely to the nature of commodities while ignoring the nature and status of agricultural market doesn't seem to be rational or wholistic on part of SEBI. From previous studies (Kar M, 2021), it has been found that futures market in agricultural commodities have been playing an important role in price discovery and getting better remunerative prices for their farmers. Restricting the trade of futures in agricultural market in the name of reducing the price volatility in inflationary period without understanding the nature of market may in turn be doing more disservice than service to growth and development of agricultural spot and futures market.

2. SEBI's policy of allowing essential energy commodities to be traded even amidst high inflationary pressure seems to be backed by economic rationale. The speed of price correction of these commodities even in normal times is very high. So much so that the future prices overcorrect spot prices resulting in oscillatory convergence. This being the case, although speed of price correction is bound to slow down due to inflationary pressure, the extent of the pressure doesn't seem to have profound adverse effect on the economy. As has been seen through our model, the price correction seems to take place within span of 1 to 2 days, even amidst profound inflationary pressure of 9 and 11 percent. It is to be noted that the futures and spot segment of energy segment is highly developed and there is greater degree of awareness among the participants. Hence, despite the necessary nature of the goods involved, due to dynamic and formal structure of the market, the speed of correction seems to be more robust in case of energy segment.

7. Policy Implications

At superficial level it seems that the measures undertaken by SEBI is economically rationale and empirically justifiable. Furthermore, it is interesting and intriguing to note that two different markets dealing with essential commodities tend to behave so differently. Given the perennial demand for agricultural crops and fuels, it was expected that both would behave in the same manner. Technically, if we observe our results in detail, the two markets do behave in same manner. That is, the rate of adjustment of each market slows down during inflationary period and stays robust during non-inflationary period. The difference in between the two markets lies in the fact that the speed of adjustment is substantially slower in case of agricultural segment as compared to energy segment. The most prominent reason for the same can be the absence of participation from all the stakeholders in agricultural segment. Most importantly farmers who are the largest stakeholders in agricultural sector are unaware of futures market. If farmers were made aware of futures market, commodities were standardized, infrastructure of spot market were modernized and financial institutions actively participated in options and futures dealing with agricultural commodities, then we could hope for futures dealing with agricultural sector to be as resilient as any. Rational as it may be, suspensions imposed by SEBI on agricultural futures and derivatives to tackle inflationary pressure is addressing only the symptom of the problem and not the root cause of the problem. In this backdrop, it would do well for the Government to create a conducive environment for development of futures market

for agriculture. Furthermore, reforms in futures market cannot be undertaken in isolation, it has to be complemented with reforms in spot market.

Some of the important measures which can be undertaken to achieve the same are as follows:

Increase the depth of futures market dealing with agricultural commodity: Measures should be put in place to create awareness regarding risk management through futures market to farmers.

Allow Commercial players to actively take part in agricultural futures: Active participation of financial institutions can enhance credibility and confidence of public in the system. As a start, scheduled commercial banks may be allowed to deal in futures with the warehouses which are registered with Warehousing Development and Regulatory Authority of India (Sankarshan Basu, 2020).

Place a Mechanism to bring in standardization of Commodities: A major bottleneck in creating a transparent mechanism for establishing derivative market is lack of standardization. A mechanism should be put in place to standardize agricultural commodities.

Train farmers to access online platforms to trade: Futures and derivatives are traded online to ensure transparency. However, farmers are least aware as to how to access those platforms. Adult Education Initiative of New Education Policy 2020 can be leveraged to educate farmers on derivatives.

Simultaneous Reforms in both spot and future markets: Spot and future markets are highly interrelated and interconnected. To implement successful reforms in future market, spot market must be revamped in line with report submitted by Abhijit Sen Committee.

8. Conclusion

Future and Spot markets have profound interlinkages. Most of the studies, have shown that Future prices affect spot prices (Jin, Xin. 2017; Theissen, Erik., 2011). Future Market is not just a potential avenue for profiteers and speculators. Future market, if properly regulated can not only help in price discovery but can also be transformed as a hedging avenue to minimize the risk faced by importers, traders and farmers (Hariharan.R & Dr.B.A.Karunakara Reddy 2018). Given, the manifold problems faced by farmers, it is ironical that, most of farmers in India are unaware of Futures Market. If futures market are properly regulated and if a conducive environment is created to involve all the stake holders, then there is a very good possibility that Forward market dealing with agricultural commodities will be as resilient as any, which will in turn be beneficial for the entire economy.

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