Price discovery across multiple spot and futures markets

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1 Introduction: Castorseed markets in India

India is the leading producer and exporter of castorseed in the world. Spot and futures markets for castorseed are found in Ahmedabad, the capital of the state of Gujarat, and in Bombay, which is a port and the commercial capital of the country. A large fraction of India's castorseed production is in Gujarat. Upto 1998, most of the export took place from the port of Bombay. As a consequence, the large trading houses are located in Bombay.[1]

2 Data description

We observe daily closing futures and spot prices. This data was obtained from the Forward Markets Commission (FMC), which is the regulatory agency dealing with commodity markets in India. Our data runs from May 1985 till December 1999. We have 100 observations of daily data per contract. Table **??** show simple summary statistics about the futures prices.

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[1]The port of Kandla, in Gujarat started operating from 1995, which would serve to disintermediate Bombay to some extent. However, volumes through this port grew larger than the port at Bombay only from 1999 onwards. We use data till December 1999 in this paper, a period of dominance through Bombay dominated.

	Bombay	Ahmedabad
No. of obs.	1203	1203
Min	4.44	-5.56
Max	4.40	6.33
Mean	0.04	0.04
Std. Dev.	0.91	1.06
Skewness	0.13	-0.11
Kurtosis	2.98	2.07

Table 1: Summary statistics about futures returns (%)

3 Estimation strategy

In the GS framework, the equations estimated are:

$$S_t - S_{t-1} = \alpha_s + \beta_s \left(F_{t-1} - S_{t-1}\right) + \epsilon_{s,t} \quad (1)$$

$$F_t - F_{t-1} = \alpha_f - \beta_f \left(F_{t-1} - S_{t-1}\right) + \epsilon_{f,t} \quad (2)$$

Here, the explanatory variable $F_t - S_t$ is the basis. In the context of the cost of carry model, the basis should reflect the cost of capital from trading date till expiration date, and should contain a negative time trend. An additional complication in the case of commodity futures markets is that the simple cost of carry model does not always hold. Hence, we test for the time series properties of the independant variable in our dataset.[2]

We test the basis for both a stochastic trend, using the Augmented Dicky–Fuller test, as well as for a deterministic time trend. If the basis does turn out to be an I(1) variable, then the above regressions will suffer from the problem of having a non–stationary explanatory variable in an equation with other stationary variables. We find that the basis is stationary, which suggests that the trend is deterministic. We regress the basis for each contract, pooled across all the years, on a time variable $(t-1)$, where t is the time to maturity and we find that the estimated coefficient on time trend, β_b, is negative.

$$F_{t-1} - S_{t-1} = \alpha_b + \beta_b(t-1) + \epsilon_{b,t}$$

[2]A trend is clearly observed in the graphs of the basis for each contract averaged across different years.

4 Empirical results

Coefficient	March	June	September	December	Pooled
β_s	0.0252	0.0636	0.0257	0.0298	0.0274
	(2.27)	(4.53)	(3.02)	(4.32)	(13.15)
R^2	0.001	0.008	0.002	0.003	0.005
D-W	1.70	1.67	1.82	1.60	1.71
β_f	0.0385	-0.0066	0.0084	0.0060	0.0134
	(3.69)	(-0.49)	(1.04)	(0.92)	(6.78)
R^2	0.001	0.001	0.001	0.001	0.001
D-W	2.01	2.05	1.93	1.86	1.95
θ	0.40	1.00	0.75	0.83	0.67

(t statistics in parenthesis)

Table 2: Price discovery within market : Bombay

The results in table **??** show that the futures prices lead the spot prices in the months of June, September and December. For March, it appears that the spot price leads the futures price.

5 Conclusion

The conclusion that we can draw from the above results is that markets that trade exactly the same asset, in the same time zone, do react differently to information. In the Bombay market, futures markets prices dominate spot market price in all contracts but one. In Ahmedabad, neither the futures nor the spot market dominates in price discovery.

Across the two markets, even though Bombay has much smaller volumes, there is a clear dominance of the Bombay futures prices over the Ahmedabad prices for all contracts, except for the contract maturing at the time of harvest. In this contract, the Ahmedabad futures market prices dominates over the Bombay futures market prices. A further result is that for the contract maturing at harvest, futures market prices are dominated by the spot market prices in Ahmedabad. In the harvest period, the spot market reacts to information faster than the futures market.

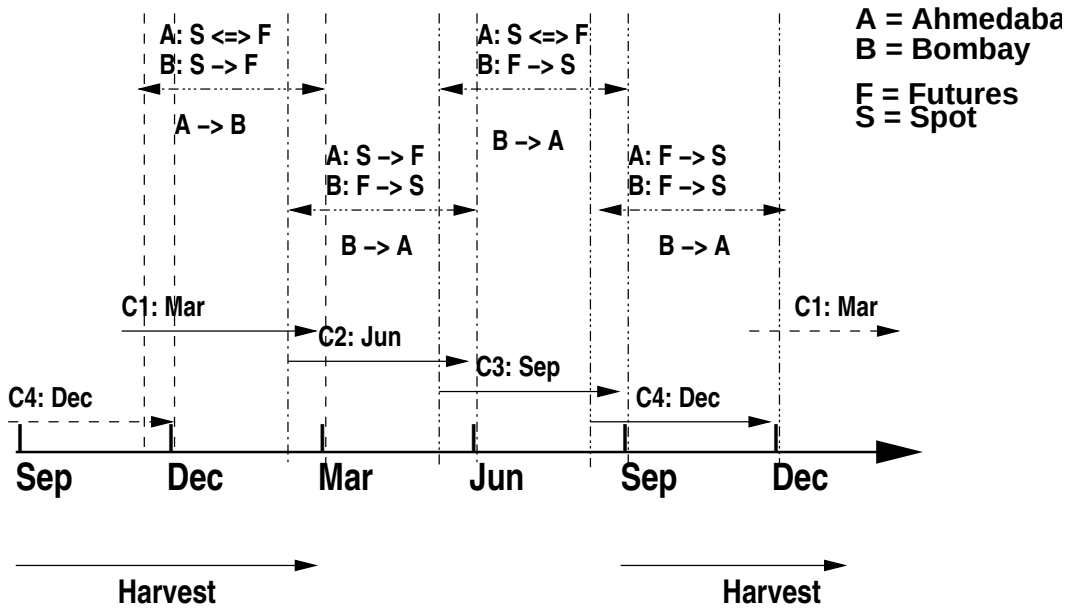

Figure 1: Price discovery in the Indian castorseed futures markets