



RISK MANAGEMENT IN THE PHOSPHATE FERTILIZERS CHAIN VALUE

Candidate: Btissam El Bahraoui

Advisor: M.Pierre Noel Giraud

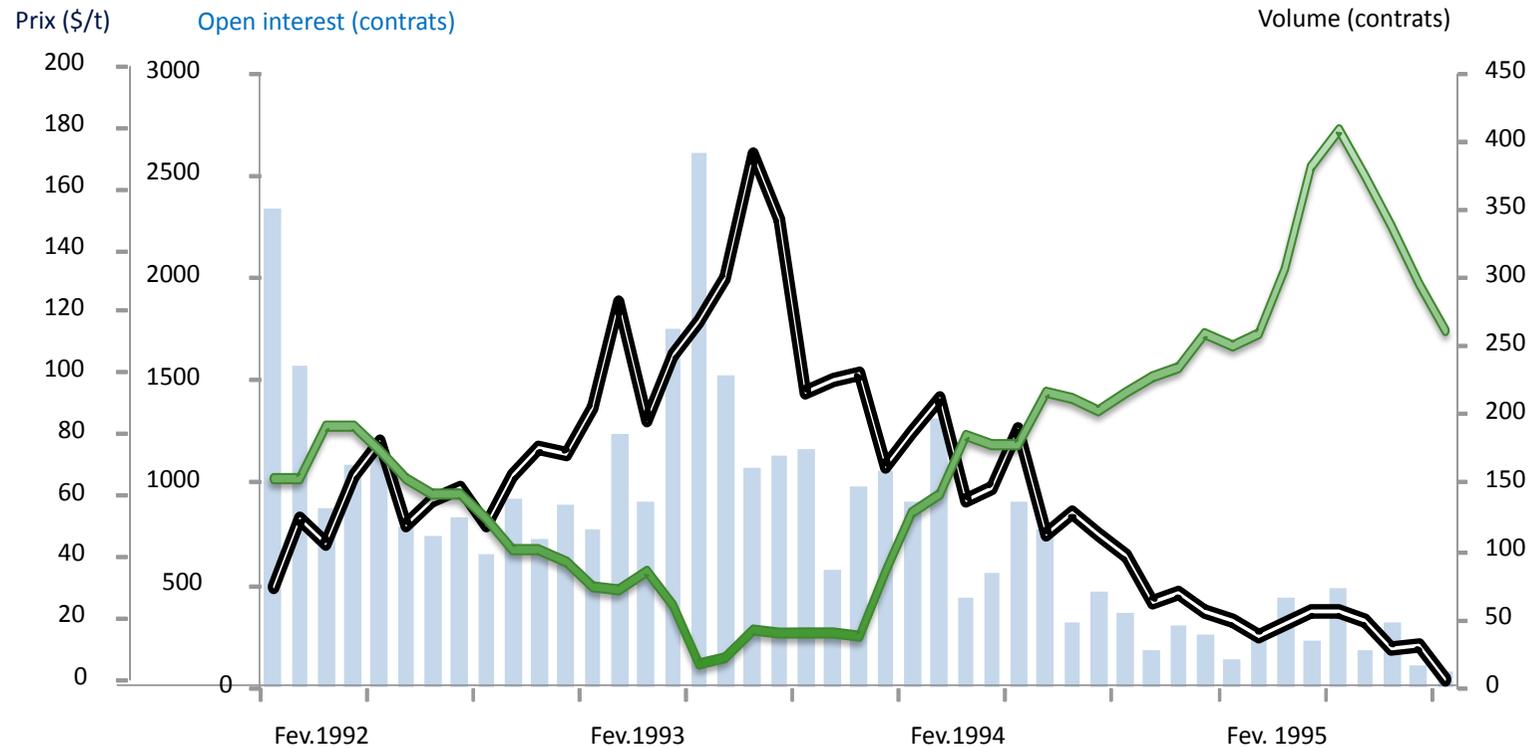
CHAIRE OCP/MINES PARISTECH

Ecole des Mines & Télécom ParisTech

Academic year 2016

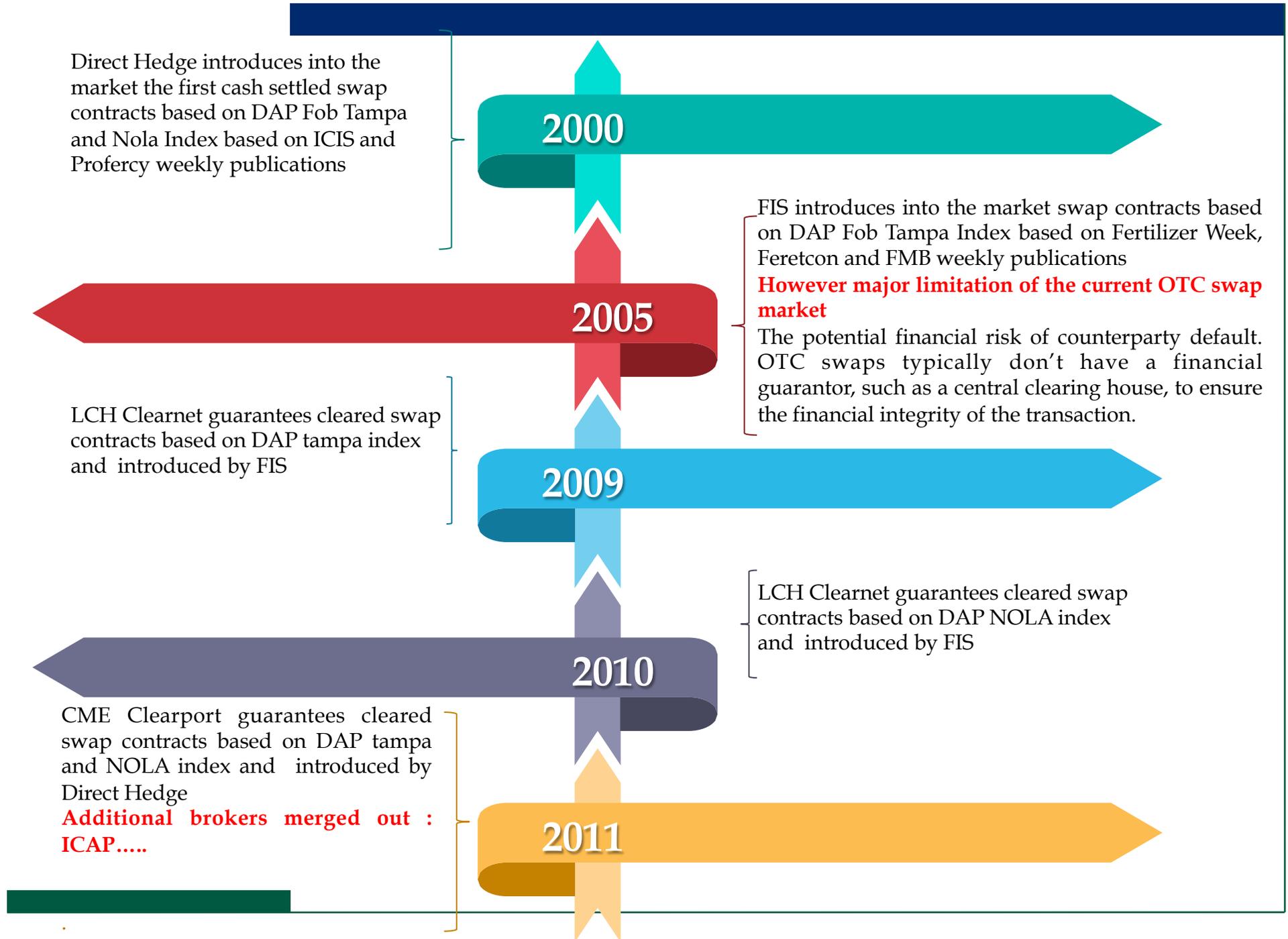


I. DAP Financialization State Of Art



Issue: Two DAP futures Contracts Failures: On the Chicago Board of Trade (1991/1997)/CME (2004/2008)
What were the reasons behind this failure?

What's used now: SWAPS overview



1

HYP1: A very low DAP Price Volatility at the trial periods

2

HYP2: A satisfaction with pre-existing hedging contracting methods

- ✓ Most producers limited their price risk through cash forward contracting.
- ✓ Cash purchase strategies attempt to diversify price risk by distributing purchases across the year and/or timing purchases to take advantage of seasonal price trends.
- ✓ When successful price-risk hedging tools already exist, significant demand for another tool is unlikely (Black 1986).
- ✓ Fertilizer, diesel fuel, and propane are examples of commodities that are frequently cross-hedged using other contracts.

3

HYP3: A lack of industry participation

- ✓ The success and the efficiency of a future market depends on the diversity of its economic agents (Gray).
- ✓ The presence of both agents- speculators and hedgers promote a balanced futures market where there is demand for both long and short side.
- ✓ In the case of DAP future markets, speculators provided approximately 50% of Market liquidity in 1993 (Thompson, Garcia and Bollman).
- ✓ Issue: Speculators Exit → Market size and Liquidity reduced → Exit of other agents

4

HYP4: Contract Characteristics

▪ **Hedging effectiveness**

Measures the extent to which changes in the fair value or cash flows of the future offset the changes in the fair value or cash flows of DAP cash price.

- ✓ The hedging effectiveness ratio is measured using the coefficient of determination of the bivariate regression model represented below

Where ΔFt is the change in futures price at time t , ΔCt is the change in the cash price at location y at time t , and, et is the error term.

The results indicate the hedging effectiveness of the DAP Futures contract was poor relative to most standards and highlights the usefulness to manage price risk.

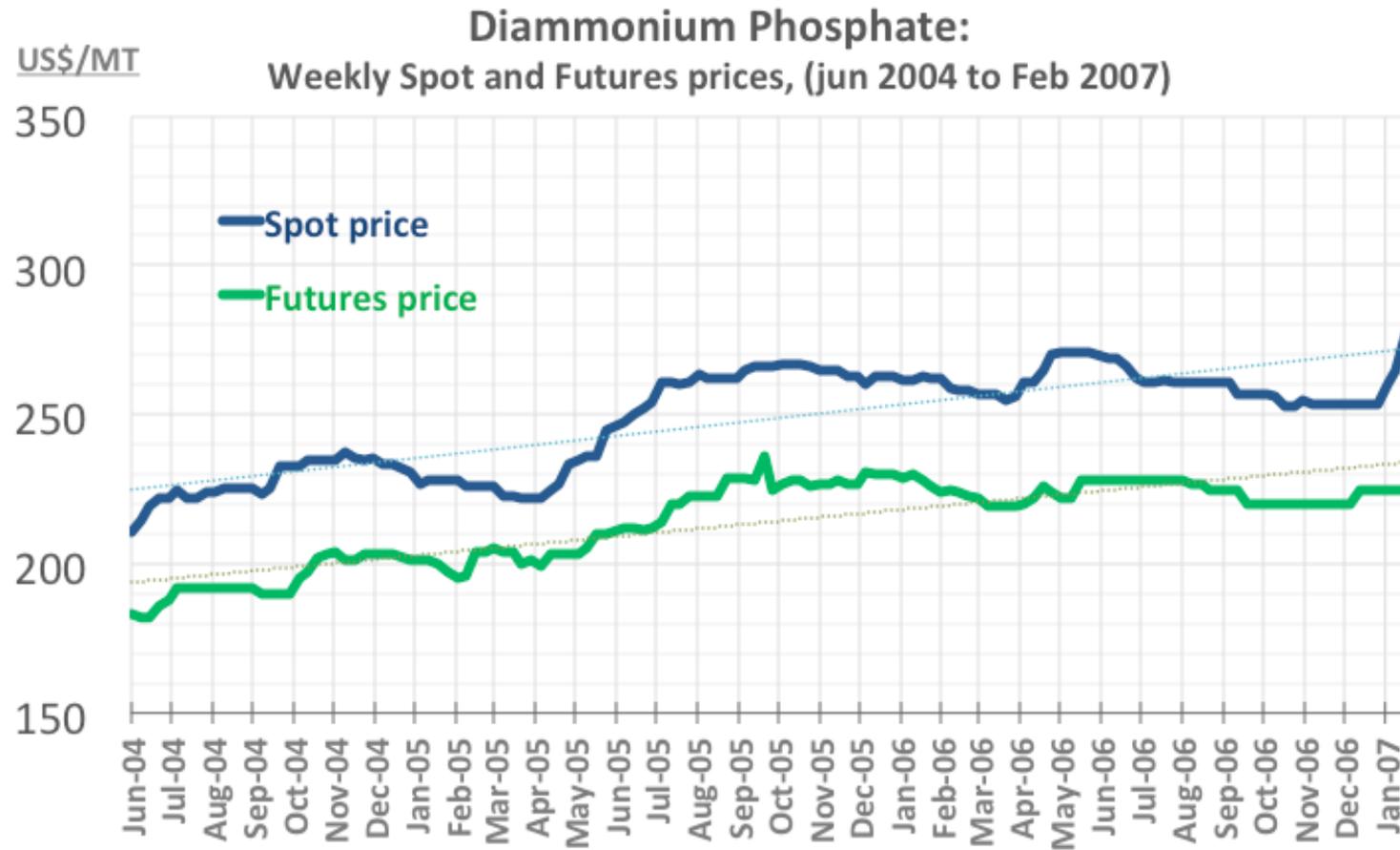


Analysis of the relationship between DAP Futures and Spot Prices

An Applied Time Series Approach (Stationarity, Cointegration, Granger-Causality)



I. Data Description



Sources: DAP Future prices: EconStats /DAP Spot Prices: CRU DATA

Time series Approach

Why do we need to test for Non-Stationarity?

- ✓ The non stationarity of a series can strongly influence its behavior and properties - e.g. persistence of shocks will be infinite for non stationary series
- ✓ Spurious regressions. If two variables are trending over time, a regression of one on the other could have a high R^2 even if the two are totally unrelated
- ✓ If the variables in the regression model are not stationary, the usual “t-ratios” will not follow a t-distribution, so we cannot validly undertake hypothesis tests about the regression parameters.

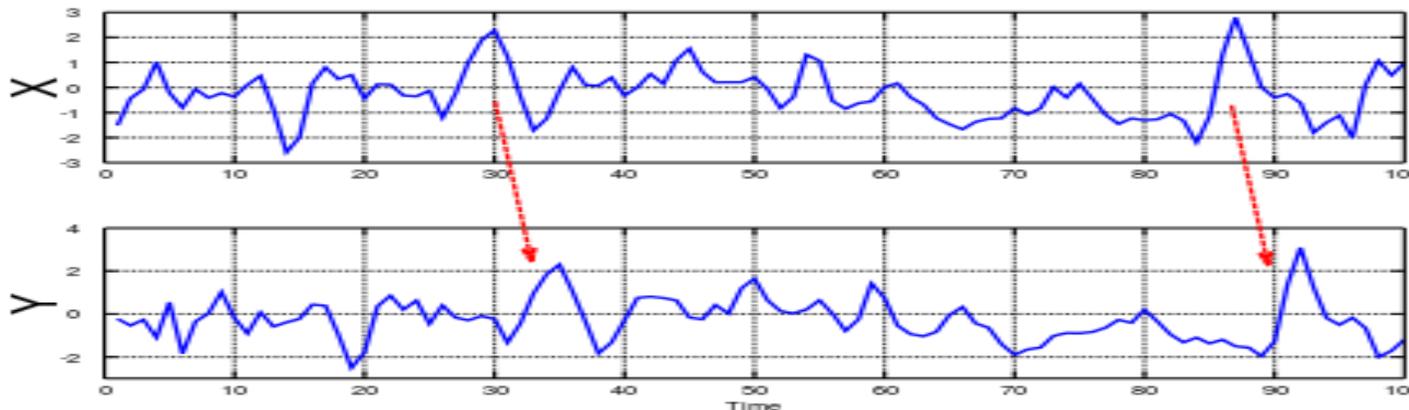


We Use Augmented Dickey Fuller test

Time series Approach

Why do we need to test for Granger Causality?

- ✓ The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another
- ✓ A time series X is said to Granger-cause Y if it can be shown, usually through a series of t-tests and F-tests on lagged values of X (and with lagged values of Y also included), that those X values provide statistically significant information about future values of Y .



Why do we need to test for cointegration?

- ✓ A cointegration test can be applied to determine the existence of a long-run relationship between economic variables. From a statistical point of view, a long-term relationship means that the variables move together over time

Time series Approach

- ✓ The results from Granger causality tests of this study suggest that in case of DAP market, the flow of information is from cash market to futures market.
- ✓ Futures market in the case of DAP did not play a role as price discovery vehicle for commodity price.
- ✓ As a result, the futures prices cannot be used as indicator for the movements in the DAP commodity market prices.
- ✓ The results could also suggest that financial investors used information in cash market to trade in futures market, and not vice versa. This may explain the fact that DAP cash market is more actively traded as compared to futures market which can be considered as new to investors.

Vector Error Correction Model and Price Discovery Measure

Where: If spot and futures prices are cointegrated, they have a VECM representation that allows for an investigation of lead-lag relationships.

$$\Delta P_{1,t} = \alpha_1 + \alpha_{p1}(P_{1,t-1} - \beta P_{2,t-1}) + \sum_{i=1} \alpha_{11}(i) \Delta P_{1,t-i} + \sum_{i=1} \alpha_{12}(i) \Delta P_{2,t-i} + \varepsilon_{p1,t}$$

$$\Delta P_{2,t} = \alpha_2 + \alpha_{p2}(P_{1,t-1} - \beta P_{2,t-1}) + \sum_{i=1} \alpha_{21}(i) \Delta P_{1,t-i} + \sum_{i=1} \alpha_{22}(i) \Delta P_{2,t-i} + \varepsilon_{p2,t}$$

Where: Δ indicates first differences; β is the parameter of the cointegration vector, ε is the error correction term. The α are all dynamic parameters where α_{p1} and α_{p2} indicating the speed of adjustment

Vector Error Correction Model and Price Discovery Measure

- ✓ According to the estimates of the price discovery measures:
 - ❑ The average contribution of DAP futures market to price discovery during the sample period is 22,03%
 - ❑ The contribution of spot market exceed 77%.
- ✓ Our findings from the VECM model identify the DAP spot market as the market where the majority of new information is processed.
- ✓ This suggests that market participants follow spot prices rather than futures prices.

OCP TOWARDS FAILURE / SUCCESS OF FUTURE CONTRACTS

RISKS

- ✓ Corner risks which are very frequent in paper markets
- ✓ Examples: Aluminum Market....

Opportunities

- ✓ Risk management: Anticipating price drop -> the possibility of price locking in the paper market
- ✓ More flexible commercial offers made by OCP to their clients

Prospective studies

- ✓ Analyzing the volatility spillover along the fertilizer value chain Size
- ✓ Analyzing the price transmission between international and local prices



Thank you for you attention!

