Evolving Market Performance in Brazilian Futures Contracts Using Relative Efficiency

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Introduction

Market efficiency is traditionally examined using tests of randomness, which provide an absolute measure in terms of whether or not a market is efficient. However, Campbell, Lo and McKinlay (1997) contend that the notion of relative efficiency–the efficiency of one market relative to another market–provides a more useful measure. They argue that market efficiency is an idealization that should be used as a benchmark to measure relative efficiency.

Objective

The objective of this paper is to investigate how efficiency has evolved in Brazilian commodity futures markets. Hurst exponents and agricultural futures contracts traded in the BM&FBOVESPA, Securities, Commodities and Futures Exchange (BVM&F) are used in the analysis. Three agricultural contracts are investigated: live cattle, coffee, and sugar. Examination of these contracts can provide informative insights into:

- the dynamics of newly developed contracts and also declining contracts;
- how efficiency evolves or fails to evolve in newly developed contracts; and
- how it is affected by extreme situations which can lead to the demise of a futures contract.

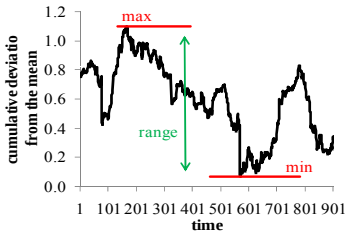
Research Method

Cajueiro and Tabak (2004a, 2004b, 2005) and others suggest a market efficiency rating based on the idea that efficient markets have a dense amount of non-redundant information and therefore are statistically similar to a random series. Hurst exponents (H) are used as a measure of efficiency.

- H=0.5: no long-range statistical dependence (random walk) and market efficiency.
- 0<H<0.5: anti-persistent behavior, positive (negative) trends in one period tend to become negative (positive).
- 0.5<H<1: persistent behavior, positive (negative) trends in one period tend to continue positive (negative).

Hurst coefficients have traditionally been estimated using rescaled range (R/S) analysis. R/S statistic is the range of partial sums of deviations of a returns (*r*) series from its mean (μ), rescaled by its standard deviation (σ).

$$(R/S)_n = \frac{1}{\sigma}\left[Max\sum_{i=1}^{n}(r_i-\mu) - Min\sum_{i=1}^{n}(r_i-\mu)\right]$$



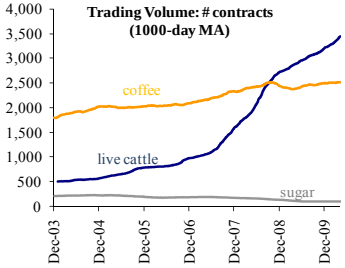
R/S statistic changes for different values of *n* according to:

$$(R/S)_n = \left(\frac{n}{2}\right)^H$$

In this study returns series are fit to an AR(1)-GARCH(1,1) process in order to account for short-range dependence. Then R/S analysis is applied to the residuals of this regression. Finally, Hurst exponents are estimated using 1,000-day rolling windows.

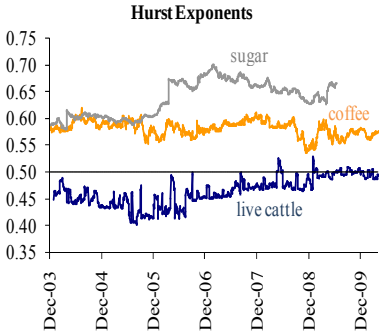
BVM&F: Agricultural Futures

- Live cattle and coffee are the most liquid contracts and have been trading for several years.
- Trading volume for both contracts has been increasing, but much faster for live cattle than for coffee.
- Sugar has also been listed for many years, but its trading volume is small and in some periods trading is almost nonexistent.



Results

- Live cattle exhibited Hurst exponents slightly below 0.5 during most of the period, but approximated 0.5 as trading volume increased at the end of the period.
- Coffee and sugar exhibited Hurst exponents above 0.5 during the whole period, denoting persistent behavior
- Coffee's Hurst exponents were just below 0.6 at the beginning of the period. They declined slowly towards 0.5 suggesting decreasing long-range dependence.
  - this corresponded to trading volume which increased smoothly.
- Sugar's Hurst exponents were also just below 0.6 at the beginning of the period. They increased and moved away from 0.5, indicating stronger long-range dependence and a drop in efficiency.
  - during the period trading volume decreased, and eventually ceased at the beginning of 2009.



	Live cattle	Coffee	Sugar
Obs.	1,301	1,317	1,118
Hurst exponent			
Mean	0.464	0.581	0.637
St. dev.	0.026	0.014	0.033
Max	0.528	0.618	0.701
Min	0.401	0.536	0.579

Conclusions

- Results suggest that efficiency and trading activity are linked.
  - higher trading activity leads to efficiency as measured by less long-range dependence.
- Live cattle and coffee saw rising trading volume and their Hurst indicated increasing market efficiency.
- Live cattle had stronger increase in trading volume than coffee, and its Hurst exponents are closer to 0.5 than coffee's Hurst exponents.
- Sugar exhibited declining trading volume over time and its trading eventually stopped. During this process its Hurst exponents indicated decreasing efficiency.
- Results suggest that market efficiency is not a static concept, and its magnitude can vary over time.

Further Research

- Hurst exponent is one measure of market efficiency. It remains to be seen how its results compare to other measures adopted in the literature.
- There are also other procedures to estimate Hurst exponents, and it remains to be seen how they differ from R/S analysis.
- There have been changes in contract specifications during this period, which can also have contributed to varying degrees of market efficiency over time.
- Both live cattle and coffee exhibited increasing efficiency, but their Hurst exponents indicate distinct types of behavior (persistent for coffee and anti-persistent for live cattle). Future research can also address this dimension.

References

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For further information

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