# Who Takes the Leash? The Price Discovery of China's Index Futures with Policy Breaks

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## Abstract

China is catching up on its development in financial markets. In 2010, China introduced its first stock index futures contract, the CSI 300. After a few years, the CSI 300 became one of the most actively traded index futures in the world. It is essential for market participants, including hedgers, speculators and policy makers, to understand the behavior and the dynamic of prices and returns in index futures markets. This research tests and investigates the long-term equilibrium in price series, the short-term interaction of market returns and the dynamic of them with policy breaks. Results show the cointegration relationship is not stable over the whole data period. While the cash price is always dominating the price discovery, the long-term equilibrium between price series can be strengthened by contractionary policies. The expansionary policies on the other hand, could cut the leash between the two markets. While wiped out 95% of the CSI 300 contracts trading volume, the extreme restrictions on futures trading adopted in 2015 did bring back the market rationality. It is also proved in the research that it is almost impossible to manipulate the index cash market by shorting the index in futures market.

## Quick Start

- It is believed that the price of index futures is cointegrated with the underlying spot price and futures market dominates in price discovery
- The CSI 300 index futures was first traded in 2010 as China's first stock index futures and became one of the most actively traded index futures in the world just several years later
- Small/individual investors are the majority in China's stock market in number while most players in index futures market are institutional
- There is the T+1 trading policy (Hold to next trading day to sell) in stock market while T+0 in futures market
- China's stock index was sky high in early 2015. The market crashed to the bottom in 2 months after the peak. The crash was likely due to the heavy selloff in index futures market by institutions
- The most severe restrictions over futures market was adopted over the night of Sep 02, 2015, to stop the market from further melting. The trading volume of CSI 300 futures then dropped 95% the next trading day(600,000 to 38,000), and never came back
- Structural break test captures several policy changes and sub-period models are then estimated

Figure 1: Spot Price and Futures Price



Comparison of Spot Prices vs. Futures Prices

Figure 2: Daily Trading Volume



Daily Trading Volume
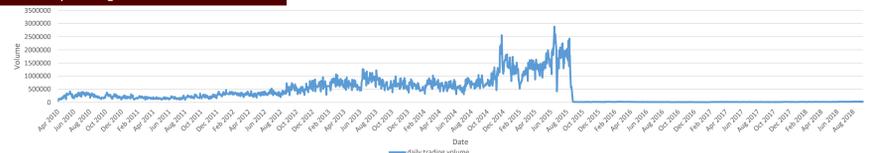
Figure 3: Daily Trading Volume After Sep 02, 2015



Daily Trading Volume(after Sep 2, 2015)

## Methods and Data

Daily data of front-month and second-month futures price and spot price are collected from DataStream Professional. The nearest-to-maturity futures settle price is constructed and used in the regressions. The daily close price for CSI 300 index is used as the spot price.

A bivariate VECM can be written as,

$$\Delta F_t = \mu_F + \alpha_F\left(\ln S_{t-1} - \beta \ln F_{T,t-1} - \eta\right) + \sum_{i=1}^{k-1} a_{F,i}\Delta S_{t-i} + \sum_{i=1}^{k-i} b_{F,i}\Delta F_{t-i} + \varepsilon_{F,t}$$

$$\Delta S_t = \mu_S + \alpha_S\left(\ln S_{t-1} - \beta \ln F_{T,t-1} - \eta\right) + \sum_{i=1}^{k-1} a_{S,i}\Delta S_{t-i} + \sum_{i=1}^{k-i} b_{S,i}\Delta F_{t-i} + \varepsilon_{S,t}$$

$$\Delta X_t = \mu + \Pi X_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} + \varepsilon_t$$

## Results

| | Sub-Period One April 16, 2010 to May 28,2014 | | Sub-Period Two May 29, 2014 to Aug 26, | | Sub-Period Three Aug 27, 2015 to Dec 13, | | Sub-Period Four Dec 13, 2016 to Sep 21, | |
|---|---|---|---|---|---|---|---|---|
| | Coef. | p value | Coef. | P value | Coef. | P value | Coef. | P value |
| $c_S$ | 0.047 | 0.581 | . | . | -0.003 | 0.958 | -0.193 | 0.207 |
| $a_{S,1}$ | 0.001 | 0.993 | 0.266 | 0.112 | -0.403 *** | 0 | 0.12 | 0.532 |
| $a_{S,2}$ | 0.148 | 0.227 | 0.097 | 0.585 | . | . | 0.247 | 0.151 |
| $a_{S,3}$ | . | . | 0.343 * | 0.057 | . | . | . | . |
| $a_{S,4}$ | . | . | 0.288 | 0.108 | . | . | . | . |
| $a_{S,5}$ | . | . | 0.071 | 0.682 | . | . | . | . |
| $b_{S,1}$ | -0.007 | 0.957 | -0.119 | 0.423 | 0.38 *** | 0 | -0.086 | 0.63 |
| $b_{S,2}$ | -0.182 | 0.133 | -0.199 | 0.201 | . | . | -0.219 | 0.173 |
| $b_{S,3}$ | . | . | -0.333 * | 0.037 | . | . | . | . |
| $b_{S,4}$ | . | . | -0.016 | 0.922 | . | . | . | . |
| $b_{S,5}$ | . | . | -0.054 | 0.724 | . | . | . | . |
| | | | | | | | | |
| $c_F$ | 0.206 ** | 0.014 | . | . | 0.192 *** | 0.003 | 0.089 | 0.594 |
| $a_{F,1}$ | 0.27 ** | 0.033 | 0.66 *** | 0 | -0.296 *** | 0.008 | 0.455 ** | 0.029 |
| $a_{F,2}$ | 0.279 ** | 0.019 | 0.42 ** | 0.033 | . | . | 0.408 ** | 0.03 |
| $a_{F,3}$ | . | . | 0.658 *** | 0.001 | . | . | . | . |
| $a_{F,4}$ | . | . | 0.463 ** | 0.02 | . | . | . | . |
| $a_{F,5}$ | . | . | 0.268 | 0.167 | . | . | . | . |
| $b_{F,1}$ | -0.253 ** | 0.047 | -0.454 *** | 0.006 | 0.275 ** | 0.013 | -0.398 ** | 0.042 |
| $b_{F,2}$ | -0.288 ** | 0.015 | -0.518 *** | 0.003 | . | . | -0.351 ** | 0.046 |
| $b_{F,3}$ | . | . | -0.6 *** | 0.001 | . | . | . | . |
| $b_{F,4}$ | . | . | -0.144 | 0.416 | . | . | . | . |
| $b_{F,5}$ | . | . | -0.208 | 0.219 | . | . | . | . |
| Cointegration | T | | F | | T | | T | |
| Unbiasedness | F | | . | | T | | F | |
| $\beta$ | -0.981 *** | 0 | . | | -1.023 *** | 0 | -0.984 *** | 0 |

The existence of cointegration relationship between price series are denoted with TRUE (T) and the absence of that is denoted with FALSE(F). Similarly TRUE(T) means the futures price is the unbiased estimator of the spot price for the unbiasedness test while FALUSE(F) means the futures price is not the unbiased estimator of the spot price.

## Walking the Dog with a Leash

- Let the master be the futures price and the dog be the spot price
- Error correction term is like the leash, correcting any deviation between the master and the dog. As long as the cointegration exists, the leash will exist
- Who takes the leash depends on which market, spot or futures, dominates the price discovery. Commonly master shall lead the dog. This means that in an efficient market, the futures shall lead the spot. If any deviation occurs, error correction term (the leash) shall corrects spot market (the dog) more. So if the error term corrects the futures price more, then the dog is actually taking the leash and walking his master



## Conclusions

- This study shows the CSI 300 stock market index cash market is actually taking the leash of price discovery. Our sample of 8 years daily price data from both index cash market and index futures market proves that China has not stepped out of its infancy in the development of stock index futures yet.
- The cash market return is almost exogenous in our models and is barely affected by lag returns of both markets. The index futures return on the other hand is very predictable from the model and has strong correlations with lag returns.
- The price discovery and dynamic interactions between market returns are sensitive to policy changes. Particularly, the price discovery and prediction power of futures prices will be strengthened by contractionary policies. The expansionary policies actually weaken the cointegration between price series.
- It is almost impossible to manipulate the index cash market by shorting the index futures market. Thus there is no reason for investors or policy makers to be convinced by rumors when the market crashes. Although eliminated the intraday trading advantage on index futures and almost killed CSI 300 index futures contract, the most restricted trading policies adopted in late August/early September of 2015 did strengthen the rationality of cash market participants and the interaction of both markets.

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