

When do stock futures dominate price discovery?

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The question

- Accepted wisdom: when information arrives in the market place, speculators prefer to trade using leveraged instruments.
- Hypothesis: Derivatives prices ought to lead spot prices.
- Econometric methodology: Hasbrouck information share (1995) / Granger-Gonzalo component share (1995).
- Literature:
 - Hypothesis accepted for index futures. (From Pizzi et al (1998), Hasbrouck (2003), Kurov and Lasser (2004) to many others.)
 - No consensus in the case of options, or single stock futures. (Chakravarty et al (2004), Shastri et al (2008).) Indian studies. (Kumar and Chaturvedla (2007), Kumar and Tse (2009))
- Why revisit this question?
Advances in market microstructure / liquidity. Advances in econometric methodology.

Microstructure issues

- 1 Most papers present summary measures of Information Share (IS) for the whole sample and conclude that spot markets lead single stock futures (SSF).
However, it is not clear how this may differ across individual securities.
- 2 Some of the evidence suggests that liquidity might be one reason why spot markets dominate price discovery.
- 3 From the perspective of the choice of venue of informed trading, this has traction because lack of liquidity could be a counterbalancing cost to the positive benefits of leverage.

- Original approach: Hasbrouck (IS) and Granger-Gonzalo (CS) both developed methodologies that are based on VECM using changes in the prices from two markets.
- However, the results from the two approaches were frequently contradictory, making it difficult to establish consensus. (Journal of Financial Markets special issue, 2002)
- Lehmann (2002): these contradictions arise because both approaches used the reduced form VECM rather than stay on the structural model.
- Yan and Zivot (2010) interpret the two measures in terms of two underlying structural innovations: *information related innovations* (permanent shocks) and *non-information related innovations* (transitory shocks) such as those due to trading frictions.

Our approach

- Estimate both IS and CS measures for *Market 1* and *Market 2*.
- Use IS to determine where price discovery takes place, where
- We supplement inference about the IS estimate by examining whether:
 - the IS vs. CS measures supports the position that one market has a stronger response to permanent shocks, and / or
 - the other market response could be due to transitory shocks.

Implementating the supplementary approaches

1. Ratio of IS vs. CS (calculated from equations in Yan and Zivot, 2011):

$$\frac{|IS_1 \times CS_2|}{|IS_2 \times CS_1|}$$

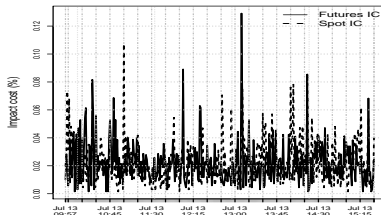
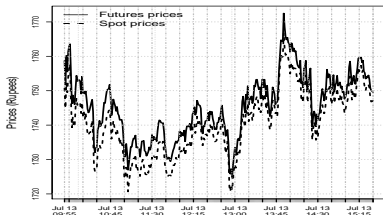
- The ratio is the response of *Market 1* to a permanent shock compared to the response to the same shock by *Market 2*. Ratio greater than 1 means that the response of *Market 1* is more.
- 2. IS estimates support the dominance of *Market 1* more if *Market 2* is more vulnerable to transitory shocks.
- Transitory shocks are estimated by the variance in the observed bid-ask spread, or impact costs (IC) where IC is defined as:

$$IC_t = (P_{Q,t} - P_{\text{midquote},t}) / P_{\text{midquote},t}$$

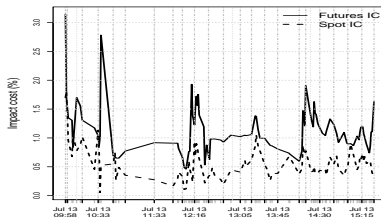
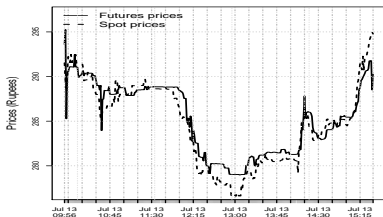
- *Market 1*: Single Stock Futures (SSF); *Market 2*: Equity spot.
- *Source*: The National Stock Exchange of India, Ltd., (NSE) ranks third by way of trades on SSFs in the world – unique liquidity in SSF.
- *Microstructure*: Electronic LOB markets, largely retail orderflow.
- *Sample*: Top 97 securities (by market cap). *Period*: March 2009 to August 2009, six months.
- *Frequency*: One second.

Some graphs

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- $H_0 : (\text{Price discovery}_F > \text{Price discovery}_S)$ if
(Liquidity_F > Liquidity_S)
- $H_0 : (\text{Price discovery}_F < \text{Price discovery}_S)$ if
(Liquidity_F < Liquidity_S)
- $H_0 : (\text{Price discovery}_{(F, \text{high}\sigma)}) > (\text{Price discovery}_{(F, \text{low}\sigma)})$

- Overall sample: IS is 49% for SSF, and 51% for spot.
- By liquidity quartiles:
 - For Q1 (most liquid firms) IS is 61% for SSF, and 39% for spot.
 - For Q4 (least liquid firms), IS is 24% for SSF, and 76% for spot.
- Supplementary evidence #1:
 - 1 Overall sample: IS vs. CS ratio – 1.00.
 - 2 For Q1: IS vs. CS ratio – 1.14.
 - 3 For Q4: IS vs. CS ratio – 0.61.

Evidence of IS in periods of high volatility: time of day

- Start of day (first half hour of trading)
 - ① Overall sample: IS is 56% SSF, 44% spot.
 - ② Q1: IS is 66% SSF, 34% spot.
 - ③ Q4: IS is 32% SSF, 68% spot.
- Middle of day (noon to 1pm)
 - ① Overall sample: IS is 49% SSF, 51% spot.
 - ② Q1: IS is 59% SSF, 41% spot.
 - ③ Q4: IS is 27% SSF, 73% spot.

Evidence of IS in periods of high volatility: earnings announcements

- IS in the 30 minutes post earnings announcement.
- Periods of announcement: April-May 2009, July-August 2009
 - ① Overall sample: IS is 54% SSF, 46% spot.
 - ② Q1: IS is 54% SSF, 46% spot.
 - ③ Q4: IS is 44% SSF, 56% spot.

Conclusions

- The dominance of SSF in price discovery appears to depend upon the liquidity of the SSF vs. the liquidity of the spot.
- During periods of high information, the IS of futures markets increases.