

Discussion: How Much Does the Weighted Price  
Contribution Measure Price Discovery?  
Jianxin Wang and Minxian Yang

Discussant: Dale W.R. Rosenthal  
University of Illinois at Chicago

Auckland Finance Meeting @ AUT

20 December 2012

# Motivation

- Microstructure increasingly vital to understanding markets.<sup>1</sup>
  - $\Rightarrow$  knowing where to look for price discovery is useful.
- Study price discovery metric:  $WPC$ <sup>2</sup>
  - $WPC$  for sequential markets;  $IS$  for parallel markets?
- Why we care: decompose where/when of price discovery.
  - Does price discovery happen in options markets?<sup>3</sup>
  - Does new regulation affect where/when of price discovery?
  - *Price Theory!*: price signals our economy; critical importance.
- Objective: explore  $WPC$ ; valid price discovery measure?
  - 1 Theoretical: Asymptotic proofs of  $WPC$  behavior.
  - 2 Empirical: Study known sequential market (night vs day).

---

<sup>1</sup>Like particle physicists wrt microelectronics, or Tim Johnson's quote.

<sup>2</sup> $WPC = \text{Weighted Price Contribution of Barclay and Warner (1993)}$ .

<sup>3</sup>Muravyev, Pearson, and Broussard (2013): no;  
Sinha and Dong (WP): sometimes yes.

# Findings

- Theoretical/asymptotics show WPC:
  - Mostly measures ratio of volatilities, not returns;
  - Efficient estimate of Information Share (*IS*) if not AR.
  - $WPC \neq IS$ : mainly due to day-night return correlation.
  - $WPC \neq IS$ : not strongly affected by skewness, kurtosis.
- WPC is valid if  $r \sim (0, \sigma^2 I)$  (or close)
  - Problem 1: returns over longer time periods are not close to 0.
  - Problem 2: correlations b/w sequential markets often high.
- Suggest using modified *IS* of Wang and Yang (2011).

# Motivation

- Really need to emphasize how important price discovery is.
  - Now key to regulation, monitoring, market design
- Motivate with sequential markets examples, possibilities:
  - FX price discovery outside normal hours = manipulation?
  - Changes in where macro-important prices set (e.g. oil).
  - Firm's credit becomes scarier in some regions (e.g. CDS).
- Especially promising: use with vast high-frequency data:
  - Can we get leading signals of changing economy?
  - Can we detect market trouble, changing fears in real-time?
- Paper gets technical; must remind people why they care.

# Context

- I think it would help to give a little more context.
  - Explain how price discovery measures usually work.
  - Can appeal to theory of ANOVA (which many measures are).
- Specifically: Your modified *IS* needs better explanation.
  - Comes from a VAR. Is model selection, matrix pruning done?
  - Some variables not clearly defined ( $\iota$ ?); hard to follow.
  - Some variables are non-standard. (e.g.  $A$  vs  $\Phi$  or  $\Psi$ )
  - Add table of variable definitions for easy reference.
  - Give variables economic meaning. (e.g. meaning of  $h$ ?)
  - How does your modified *IS* work for sequential markets?

# Price Discovery Metrics in General

- However, also fair to ask what these measures get at.
- In particular, many of these are versions of ANOVA.
- Good: ANOVA is one of older, more well-understood methods.
- Bad: Not always interested in main source of variation.
  - Often, *control* for main source of variation (e.g. noise).
  - In markets context: think of bid-ask bounce, Roll (1984).
  - Bounce is part of variance:  $\hat{\sigma}^2 = \sigma^2 + 2c^2$ .
  - Why HF volatility estimators may blow up as  $\Delta t \rightarrow 0$ .
  - *WPC, IS*: Bounce adds to price discovery. Really?
  - Similarly: In PCA, do we always care most about PC1?

# Technical

- Since you analyze behavior of  $WPC$ , analysis must be solid.
- Concern with equation 7: Not sure it is correct.
  - In particular, I suspect  $E(r_{it} \operatorname{sgn} r_t) \geq 0$ .
  - Think of the problem like a Brownian Bridge.
  - $r_t$  has realized drift over  $t \in (0, 1)$  ( $\tilde{r}_t$ ).
  - Subsamples of  $r_t$  have expected drift  $\Delta t \tilde{r}_t$ .
  - So  $WPC$  may be even more flawed than you find.
- Also worried about  $\sigma_i, \sigma_{-i}$  usage.
  - Depending on conditioning, these may well be correlated.
- Good person to consult at UTS: Alan Huang.

# Empirical Analysis

- The empirical analysis needs to be much better motivated.
- I wasn't sure what I should expect to see going in.
- Commentary on findings was a bit terse; let it breathe.
- Also of interest besides  $WPC - IS$ :  $\text{Var}(WPC - IS)$ .
  - Probably some factors which make one noisier than other.
  - But those factors might not necessarily bias difference.
- Small point regarding index "opening value":
  - For quoting, use previous close until stock opens.
  - For derivative settle (SQ), use open price of each stock.

# Conclusion

- Nice paper with a lot of potential.
  - Measures help assess relative market importance, quality.
  - Who cares? Regulators, policy makers, academics, industry.
- Many price discovery methods are ad hoc, poorly understood.
- Shines a light on common yet un-understood measure.
  - I believe findings are sound: *WPC* appears flawed.
  - However, cannot try a murderer on burglary charges.
  - Need to work hard on conditioning; bulletproofing proofs.
- Also highly policy relevant due to concerns about:
  - Ability to measure value added by decentralized trading;
  - Effects of high-frequency trading;
  - Effects of taxing trades, quotes; and,
  - Need for real-time monitoring of price discovery, breakdowns.