

Discussion: How Much Does the Weighted Price
Contribution Measure Price Discovery?
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Motivation

- Microstructure increasingly vital to understanding markets.¹
 - \Rightarrow knowing where to look for price discovery is useful.
- Study price discovery metric: WPC^2
 - WPC for sequential markets; IS for parallel markets?
- Why we care: decompose where/when of price discovery.
 - Does price discovery happen in options markets?³
 - 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).

¹Like particle physicists wrt microelectronics, or Tim Johnson's quote.

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

³Muravyev, 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 (ι ?); hard to follow.
 - Some variables are non-standard. (e.g. A vs Φ or Ψ)
 - 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 σ_i, σ_{-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.