Discussion of “Aggregate Risk: A Unified Approach on Market Efficiency and Liquidity” by Ming Guo

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Summary

This paper considers a two-period Kyle (1985)-type setting with risk-averse market makers

- Inventory concerns arise on top of information asymmetry concerns
- Price informativeness and return autocorrelations are uniquely determined by aggregate risk *but not liquidity (price impact)*

$\Rightarrow$ Easy to estimate price informativeness from market data

- Evaluate the role of the informed trader for return autocorrelations and liquidity provision
- *Update:* comparison with competitive informed traders setup

Literature

A large literature considers various extensions of the Kyle-85 model, but few papers consider risk-averse market makers

	one period	multi-periods
risk-neutral MM	Kyle (1985)	
risk-averse MM	Subrahmanyam (1991)	this paper

Multi-period Grossman-Stiglitz framework: He and Wang (1995)

This discussion

Review of the adverse selection and inventory channels with a couple of comments and suggestions along the way

1. Main message and economic interpretation of the results
2. Return autocorrelation results

Adverse selection framework

Continuous-time model of informed trading (Kyle (1985))

- Informed trader and noise traders send order flow to competitive *risk-neutral* market maker
- Informed trader's information: σ_D
- Noise trading volatility: σ_{noise}

$\Rightarrow$ Price impact $= \frac{\sigma_D}{\sigma_{\text{noise}}}$

$\Rightarrow$ Volatility $= \sigma_D$

$\Rightarrow$ Volume ($=$ volatility of total order flow) $= \sigma_{\text{noise}}$

$\Rightarrow$ Price is a martingale: no serial correlation in price changes

Inventory risk framework

Supply shocks are risky to absorb for risk-averse market makers (Grossman and Miller (1988))

- Competitive liquidity providers with *risk aversion* γ absorb liquidity shocks with volatility σ_{noise}
- Each period, the asset pays dividends $\mathcal{N} \sim (0, \sigma_D)$

$\Rightarrow$ Price impact $\propto \gamma\sigma^2_{\text{ret}}$

$\Rightarrow$ Volatility$^2 \approx \text{PI}^2\sigma^2_{\text{noise}} + \sigma^2_D$ since noise trading moves prices

$\Rightarrow$ Volume $\propto \sigma^2_{\text{noise}}$

$\Rightarrow$ Price changes are *negatively* correlated to compensate the risk-averse market makers for absorbing liquidity shocks

Model

Informed demand:

$$x_1 = \beta_{11} D$$
$$x_2 = \beta_{21} D + \beta_{22}\omega_1$$

Learning:

$$E[D|\mathcal{F}_1] = \tau_{11}\omega_1$$
$$E[D|\mathcal{F}_2] = \tau_{21}\omega_1 + \tau_{22}\omega_1$$

Equilibrium:

$$y_1 + \omega_1 = 0$$
$$y_2 + \omega_2 = 0$$

Prices:

$$p_1 = \lambda_{11}\omega_1$$
$$p_2 = \lambda_{21}\omega_1 + \lambda_{22}\omega_2$$

Model (2)

Aggregate risk: $\rho \equiv \gamma \sigma_D \sigma_{\text{noise}}$

- Price impact $= f(\rho) \frac{\sigma_D}{\sigma_{\text{noise}}}$
- Price volatility $= g(\rho) \sigma_D$
- Volume $= h(\rho) \sigma_D \sigma_{\text{noise}}$
- Price changes are *negatively* autocorrelated (except in the first period?)

Be explicit about what is new

- The negative relation between price informativeness and price impact is already in Subrahmanyam (1991) (Prop.6)
- Contribution here is about the dynamics $\Rightarrow$ emphasize it (in particular the impact of σ_{noise} on λ_{11}, instead of fn 8)
  - Can σ_{noise} increase price impact?

Economic interpretation

Return autocorrelation is a measure of price informativeness but not necessarily of liquidity

- Different from both the Kyle-85 setup and the Grossman-Miller setup
  - In the limit?
- Alternative to discuss: gradual incorporation of information (due to inefficiency) increases return autocorrelation

Return autocorrelation

Let p_0 be the "pre-trade" price

$$Corr[p_1 - p_0, p_2 - p_1] = 0$$
$$Corr[p_2 - p_1, D - p_2] < 0$$

With informed trading:
$Corr[p_1 - p_0, p_2 - p_1]^I > Corr[p_1 - p_0, p_2 - p_1]$ (as expected)
and $Corr[p_1 - p_0, p_2 - p_1]^I < 0$
$\Rightarrow$ informed trading endogenously generate return reversal (!)

But p_0 is exogenous, what we are really interested in is

$$Corr[p_{t+1} - p_t, p_t - p_{t-1}],$$

for any intermediate period t s.t. $1 < t < T$

Return autocorrelation (2)

Puzzling that with risk-averse market makers and without informed trading, the autocorrelation isn't negative

- Permanent vs transitory impact
- Is it an artifact of the exogenous pre-trade price?
- If not, this should be put forward more clearly
- But it seems to me that

$$Corr[p_{t+1} - p_t, p_t - p_{t-1}] < 0$$

⇒ Important to clarify since autocorrelations are considered prominently in the paper

Conclusion

Nice model, well exposed and clear

- Sharpen the focus of the paper and emphasize the key predictions
  - e.g., comparison of competitive and strategic settings (Lee and Kyle (2018))
  - Focus on the dynamics
- Verify that the zero serial correlation result is robust
  - This would be an interesting result, but I think it is driven by the pre-trade price
  - Non-stationarity issues could be somehow assuaged by considering more periods