Do Short-selling Constraints Matter? by Cornelli & Yilmaz

Harjoat S. Bhamra

UBC

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Outline

- Aim
- Why do we care?
- Model Summary & Results
- Comments

Paper's aim:

- How do short selling constraints impact the relationship between prices and fundamentals
  - Focus on long - run prices

$$\lim_{t \to \infty} P_t \tag{1}$$

- Key features
  - Standard Diamond & Verrecchia (1987) framework
  - One important change: make proportion of informed traders unknown, but with a known distribution.

Short sales constraints and you

- Regulators restrict short selling to decrease potential downward price cascades. Counterargument: this only contributes to market inefficiency.
- Would like to understand impact of short selling constraints on
  - Financial variables
    - prices, returns, risk premia, volatility, correlation, etc
  - Real variables
    - real investment
    - production
    - household welfare $\leftarrow$ YOU
  - If anything happens, starts with financial variables and can feed into real economy, affecting welfare
- Diamond & Verrecchia (1987)
  - $\lim_{t\to\infty} P_t$ not impacted by short sales constraints
  - should be no long-run impact on welfare
- This paper
  - $\lim_{t\to\infty} P_t$ **is** impacted by large short sales constraints
  - should be a long-run impact on welfare

Model Summary I

- Two assets, ex-ante identical
- $t \in \mathbb{N}$
- **cash flow**, v (fundamental value) fixed over time, but which value does it take? Common knowledge: $\Pr(v = 1) = \lambda$, $\Pr(v = 0) = 1 - \lambda$.
- risk-neutral **market makers**: no inventory costs or constraints
- continuum of risk-neutral **traders**
  - μ are **Informed**
  - $1 - \mu$ are **Uninformed**: $1/2$ buy and $1/2$ sell in any period
  - fraction ρ own asset 1
  - fraction $1 - \rho$ own asset 2
  - μ unknown constant, common knowledge: pdf $f(\mu)$
  - ρ known constant
- What do Informed traders know?
  - iid signal s_i for asset i
  - $\Pr(s_i = 1 | v_i = 1) = \Pr(s_i = 0 | v_i = 0) = \phi \in (1/2, 1)$

Model Summary: Informed Traders, Learning

- Informed traders use information in signals
- Posterior belief via Bayes' Thm

$$\beta(v_i = 1|s_i = 1) = \frac{\Pr(s_i = 1|v_i = 1)\Pr(v_i = 1)}{\Pr(s_i = 1|v_i = 1)\Pr(v_i = 1) + \Pr(s_i = 1|v_i = 0)\Pr(v_i = 0)}$$
$$= \frac{\phi\lambda}{\phi\lambda + (1-\phi)(1-\lambda)} > \lambda$$

Model Summary: Markets Makers and Order Flow

Market makers and prices.

- Market makers set price to maximize expected profits $\Rightarrow$ in period 1

$$A_1 = E[v|\overbrace{h^1 = +1}^{\text{buy}}] \tag{2}$$

$$B_1 = E[v|\underbrace{h^1 = -1}_{\text{sell}}] \tag{3}$$

Prices impacted by order flow.

Long-run price with no short sale constraints

- What about price in the long-run as $t \to \infty$

$$\lim_{t\to\infty} P_t = E[v|\text{infinite seq of buys and sells}] \tag{4}$$

- In the long-run, what proportion of trades will be buys and sells?
- Conditional on $v = 1$, the fraction of buy orders for asset 1 is

$$\frac{\Pr(buy|v=1)}{\text{fraction of traders trading asset 1}} = \frac{\frac{1}{2}(1-\mu)\rho + \mu\phi}{1-(1-\mu)(1-\rho)} \tag{5}$$

- Conditional on $v = 0$, the fraction of buy orders for asset 1 is

$$\frac{\Pr(buy|v=0)}{\text{fraction of traders trading asset 1}} = \frac{\frac{1}{2}(1-\mu)\rho + \mu(1-\phi)}{1-(1-\mu)(1-\rho)} \tag{6}$$

- Fraction of buy orders cond. on $v = 1 > \frac{1}{2} >$ fraction of buy orders cond. on $v = 0$, $\forall \mu \in [0, 1]$
- After many observations, if fraction of buy orders $> \frac{1}{2}$, know $v = 1$ and if fraction of buy orders $< \frac{1}{2}$, know $v = 0$. **Through observing order flow eventually learn what v is.** Therefore,

$$\lim_{t\to\infty} P_t = v. \tag{7}$$

Long-run price with severe short sale constraints

- Ban short sales!
- Impacts the order flow: fraction of buys in long-run order flow sequence will be different.
- Can find values of μ such that market makers no longer learn v as $t \to \infty$

Summary

- uncertainty about μ (fraction of informed traders) + short sale ban $\Rightarrow$ cannot learn v from order flow as $t \to \infty$

Real life short sale constraints

- Usually, only a small proportion of the market is affected
- If we impose short sales constraints on a few stocks, there will be an eqm impact on other stocks, but will it really be of any consequence?
- Any welfare effects tiny?

Number of Assets

- Clarify why need 2 assets:
  - ownership effects? is that it?
  - I think one asset would be fine

Path Dependence

- Look at predictability, momentum?

Price Stationarity

- assumptions about v being fixed over time, not realistic when thinking about long-run prices.
- prices may look stationary over 1 day, but not over 10 years

$$V \in \{A + B \cdot t - 1, A + B \cdot t + 1\} \tag{8}$$

- Perhaps make B unknown instead of μ?

Framing the discussion of size of short selling costs

- cost of short selling is huge: equals fundamental value.
- Would 1% of fundamental value be ok? Or is that too small?

- page 9, Proof of Prop 3, 8th line from bottom, p, should be a ρ

Conclusion

- I enjoyed working through the proofs.
- Write another paper like this!
- Explore results on path dependence more fully.