Activism, Strategic Trading, and Market Liquidity

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Activists play central role in modern corporate governance and are often successful in increasing the value of targeted companies (Icahn, Buffett, Ackman, Peltz, Loeb).

Feb 2015 issue of The Economist called them "Capitalism's unlikely heroes."

- Assets under management more than doubled since 2008 to close to $120 billion of capital in 2014, where it attracted a fifth of all flows into hedge funds.
- According to the Economist: “Last year Activists launched 344 campaigns against public companies, large and small. In the past five years one company in two in the S&P 500 index of Americas most valuable listed firms has had a big activist fund on its share register, and one in seven has been on the receiving end of an activist attack.”
Activism: Schedule 13D Disclosure Rules

- Activists typically accumulate shares by trading *anonymously* in secondary markets.
- When their stake hits 5%, SEC requires they disclose within 10 days:
  1. their holdings and intentions (Brav et al. 2008) (e.g., *Corporate governance action, Management shake-up, M&A transaction, Capital structure change, Cost reduction measures, Dividend payouts, Share buybacks, ...*)
  2. all their trades during prior 60 days (CD and Fos (2015)):
Schedule 13D activists:

- own **7.2% stake** on average on the filing date
- increase share-holder value significantly (**+6% excess returns** in 30 days pre-filing) and persistently
- target more **liquid** stocks (and trade when liquidity is high).
Activism and Shareholder Value

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- Big law firms such as Wachtell, Lipton, Rosen and Katz lobby the SEC to review the 13D disclosure rules to make it more difficult for activists to acquire shares "*in the interest of transparency and fairness for small shareholders.*"
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⇒ Raises questions about economic efficiency (and market liquidity).
Link between market liquidity (price efficiency), corporate governance (activism), and firm value (economic efficiency):

- Suppose activist can create (or destroy) value at some cost (e.g., governance).
- Profitability depends on ability to buy (or sell) shares before market reflects full value (Maug (1998)).
- Conversely, if market reflects value of activism, market liquidity may allow activist to sell out of her stake and hurt share-holders (Coffee (1991), Bhide (1993)).
Background

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- Kyle (1985) proposes seminal model of strategic trading by informed investor:
  - Risk-neutral trader knows *exogenous* firm value $V$
  - Market marker sets price equal to expected value given she observes only total order flow (equal to informed trading plus noise).

  $\Rightarrow$ (a) Optimal trading strategy, (b) Equilibrium price dynamics, (c) Market liquidity.
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- We endogenize the liquidation value $V(X_T)$ by modeling the effort choice of the activist as a function of the accumulated stake.
**Types of Activism**

- Activist asks to increase payouts (larger effort leads to a larger change in firm value)

- Activist risk arbitrageur influences an M&A deal (larger effort leads to a higher probability of success)

- Activist requires to fire a CEO (binary outcome and non-binary effort)

- Activist nominates an alternative slate of board members (the outcome depends on activist’s effort)

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It is an open question whether and how the relation between market liquidity and economic efficiency depends on the activism technology.
The microstructure literature
Kyle, 1985; Glosten and Milgrom, 1985; Easley and O’Hare, 1987; Back, 1992

Take-over literature

Corporate governance literature

Dynamic model of governance

Market efficiency and disclosure rules:

Insider trading:
Given a price function $P(t, Y_t)$, the activist seeks to maximize

$$\max_{v, \theta} E \left[ v X_T - C(v) - \int_0^T P(t, Y_t)\theta_t \, dt \mid X_0 \right].$$

(1)

where

- $C(v)$ is arbitrary (convex) effort cost paid by activist to achieve $v$.
- $X_t = X_0 + \int_0^t \theta_s \, ds$ is aggregate stock position of activist.
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Market Maker has prior \( X_0 \sim N(\mu_X, \sigma_X^2) \) and observes total order flow \( Y_t \):

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dY_t = \theta_t \, dt + \sigma \, dZ_t
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An equilibrium is a pair $(P, \theta)$ s.t. trading strategy $\theta$ maximizes (1) given $P$ and
\[
P(t, Y_t) = E \left[ V(X_T) \mid \mathcal{F}_t^Y \right]
\]  
(2)
for each $t$, given $\theta$ and where $V(x) = \arg\max_v \{vx - C(v)\}$.
Some Examples of Cost Function

- Symmetric quadratic (continuous) cost: \( C(v) = \frac{(v - v_0)^2}{2\psi} \):
  - Linear \( V(x) = v_0 + \psi x \)
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- Asymmetric Quadratic cost: \( C(v) = \begin{cases} 
  (v - v_0)^2/(2\psi) & \text{if } v \geq v_0, \\
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  - Piece-wise linear and convex \( V(x) = v_0 + \psi x^+ \)
**Some Examples of Cost Function**

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- **Exponential case**: \( C(v) = \frac{1}{\psi} v \ln \left( \frac{v}{v_0} \right) - \frac{1}{\psi} v \)
  
  \[ \text{Strictly convex } V(x) = v_0 e^{\psi x} \]
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  \]
  
  \[
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  \]

- **Binary (all or nothing):** It costs \( c > 0 \) to increase stock value from \( v_0 \) to \( v_0 + \Delta \).
  
  \[
  \text{Digital } V(x) = v_0 + \Delta 1_{[c/\Delta, \infty)}(x)
  \]
**Theorem**

The pricing rule \( P(t, Y_t) = \mathbb{E} \left[ h(Y_T) \mid \mathcal{F}_t \right] \) with \( h(y) = V(\mu_x + \Lambda y) \)
and the trading strategy:

\[
\theta_t = \frac{1}{T - t} \left( \frac{X_t - \mu_x - \Lambda Y_t}{\Lambda - 2} \right),
\]

where \( \Lambda = 1 + \sqrt{1 + \frac{\sigma_x^2}{\bar{\sigma}^2 T}} \) only depends on the signal to noise ratio,
constitute an equilibrium such that:

- \( dP(t, Y_t) = \lambda(t, Y_t) dY_t \) with \( \lambda(t, y) = \frac{\partial P(t, y)}{\partial y} \).

- Price impact \( \lambda(t, Y_t) \) is a martingale.

- \( P(T, Y_T) = V(X_T) \) almost surely.

- \( \mathbb{E}[\theta_t \mid \mathcal{F}_t^Y] = 0. \)

- \( X_T \sim \text{Normal} \left[ \mu_x, (\sigma\sqrt{T} + \sqrt{\sigma^2 T + \sigma_x^2})^2 \right] \).
**Equilibrium Trading Strategy**

- \( dY_t = \theta_t dt + \sigma dZ_t \) is a Brownian Motion with volatility \( \sigma \) on its own (i.e., market maker’s) filtration
  - This implies that the optimal trading strategy is *inconspicuous.*
EQUILIBRIUM TRADING STRATEGY

- $dY_t = \theta_t dt + \sigma dZ_t$ is a Brownian Motion with volatility $\sigma$ on its own (i.e., market maker’s) filtration
  - This implies that the optimal trading strategy is inconspicuous.

- Remarkably, the optimal trading strategy, $\theta_t = \frac{1}{T-t} \frac{(X_t - \mu_x - \Lambda Y_t)}{\Lambda - 2}$, is independent of the effort cost ($C(v), V(x)$) when expressed as a function of $Y_t, X_t$.
  - Instead, the cost function $C(v)$ determines $V(x)$ and thus affects the price function $P(t, Y)$ and the amount of effort expended.
**Equilibrium trading strategy**

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  - Instead, the cost function \( C(v) \) determines \( V(x) \) and thus affects the price function \( P(t, Y) \) and the amount of effort expended.

- Different from Kyle, the optimal trading strategy depends positively on the number of accumulated shares \((X_t)\)
  - **Amplification effect**: The informed (activist) more than offsets the cumulative noise trading demand because the value of activism increases with activist’s ownership.
  - Evidence on activists’ trading strategies
  - The endogenous value of the firm depends on the amount of realized liquidity trading.
**Examples: The Symmetric Quadratic Model**

**Example**

In the symmetric quadratic model, \( V(x) = v_0 + \psi x \), so

\[
h(y) = v_0 + \psi \mu_x + \psi \Lambda y.
\]

The price function at any time \( t \leq T \) is given by:

\[
P(y, t) = v_0 + \psi \mu_x + \psi \Lambda y
\tag{4}
\]

The price impact function is given by:

\[
\lambda(y, t) = \psi \Lambda
\tag{5}
\]

This case resembles the original Kyle model:

- Price impact is constant
- However, \( \lim_{\sigma \to 0} \lambda = \psi > 0 \) (‘endogenous uncertainty’!).
**Example**

In the asymmetric quadratic model, \( V(x) = v_0 + \psi x^+ \), so

\[
h(y) = v_0 + \psi (\mu_x + \Lambda y)^+
\]

\[
= \begin{cases} 
  v_0 & \text{if } y < -\frac{\mu_x}{\Lambda}, \\
  v_0 + \psi \mu_x + \psi \Lambda y & \text{otherwise}.
\end{cases}
\]

The price function at any time \( t \leq T \) is given by:

\[
P(y, t) = v_0 + \psi (\mu_x + \Lambda y)N \left[ \frac{\mu_x + \Lambda y}{\Lambda \sigma \sqrt{T - t}} \right] + \psi \Lambda \sigma \sqrt{T - t} n \left[ \frac{\mu_x + \Lambda y}{\Lambda \sigma \sqrt{T - t}} \right]
\]

The price impact function is given by:

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\lambda(y, t) = \psi \Lambda N \left[ \frac{\mu_x + \Lambda y}{\Lambda \sigma \sqrt{T - t}} \right]
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Symmetric vs. Asymmetric Quadratic Cost Function

Motivation
Model of Activism, Liquidity and Efficiency
Conclusion

Background
Model Setup
Equilibrium
Economic efficiency and market liquidity

Activism, Strategic Trading, and Market Liquidity
SYMMETRIC VS. ASYMMETRIC QUADRATIC COST FUNCTION

Symmetric vs. asymmetric quadratic cost function

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**EXAMPLE**

In the exponential model, $V(x) = v_0 e^{\psi x}$, so

$$h(y) = v_0 e^{\psi (\mu x + \Lambda y)}$$

The price function at any time $t \leq T$ is given by:

$$P(y, t) = v_0 e^{\psi \left( \mu x + \Lambda y + \frac{1}{2} \Lambda^2 \sigma^2 (T-t) \right)}$$  \hspace{1cm} (8)

The price impact function is given by:

$$\lambda(y, t) = \Lambda P(y, t)$$  \hspace{1cm} (9)

A Black-Scholes price process with a price-volume relationship.
**Example:**

In the binary effort model,

\[ V(x) = v_0 + \Delta 1_{[c/\Delta, \infty)}(x), \]

so

\[ h(y) = v_0 + \Delta 1_{[c/\Delta, \infty)}(\mu x + \Lambda y) \]

\[ = \begin{cases} 
  v_0 & \text{if } y < \frac{(c/\Delta - \mu x)}{\Lambda}, \\
  v_0 + \Delta & \text{otherwise}.
\end{cases} \]

It follows that the price function at any time \( t \leq T \) is given by:

\[ P(y, t) = v_0 + \Delta N \left[ \frac{\mu x + \Lambda y - c/\Delta}{\Lambda \sigma \sqrt{T - t}} \right] \]

\[ \text{(10)} \]

The price impact is given by:

\[ \lambda(y, t) = \frac{\partial P(y, t)}{\partial y} = \Delta \frac{\frac{\mu x + \Lambda y - c/\Delta}{\Lambda \sigma \sqrt{T - t}}}{\sigma \sqrt{T - t}} \]
We measure economic efficiency by price (at time 0), which is the expected effort of the activist.
ECONOMIC EFFICIENCY AND MARKET LIQUIDITY

- We measure economic efficiency by price (at time 0), which is the expected effort of the activist.

- We measure market liquidity by the expected average price impact \( (E\left[\frac{1}{T} \int_0^T \lambda_s ds\right] = \lambda_0) \).
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- Importantly, market liquidity (\( \lambda \)) can be affected by different channels:
  - Noise trading volatility (\( \sigma \)) \( \sim \) Trading tax or length of disclosure window.
  - Prior uncertainty about insider’s position (\( \sigma_X \)) \( \sim \) Disclosure rules.
  - Initial block size (\( \mu_x \)).
  - Productivity of the activist (\( \Delta, \psi \)) \( \sim \) Legal environment.
Economic efficiency and market liquidity

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- These channels also have different implications for economic efficiency.
  \(\Rightarrow\) We consider separately the ex-ante impact at date 0 when \(Y_0 = 0\) of a change in \(\sigma, \mu_X, \sigma_X, \psi\) on price (economic efficiency) and price impact (market liquidity).
Productivity of the Activist

Example

In all (symmetric, asymmetric quadratic, exponential, binary) models:

\[ \frac{\partial P}{\partial \psi} > 0 \quad \text{and} \quad \frac{\partial \lambda}{\partial \psi} > 0 \]

- Variation in activism productivity generates negative cross-sectional relation between economic efficiency and market liquidity, because uncertainty about the activist’s position creates more adverse selection when she is more productive.

- The causality (activism → liquidity) is reverse of what the literature has focused on.
Motivation
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Prior Uncertainty about Activist’s Position

Example

In the symmetric quadratic model: \( \frac{\partial P}{\partial \sigma_x} = 0 \) and \( \frac{\partial \lambda}{\partial \sigma_x} > 0 \)

Example

In the asymmetric quadratic model: \( \frac{\partial P}{\partial \sigma_x} > 0 \) and \( \frac{\partial \lambda}{\partial \sigma_x} > 0 \)

A general result obtains (since \( \sigma_x \) is mean-preserving spread for \( X_T \)):

Theorem

If \( V(x) \) is convex then \( \frac{\partial P}{\partial \sigma_x} \geq 0 \) (and conversely if \( V(x) \) is concave)

If \( V(x) \) satisfies mild regularity conditions \( \frac{\partial \lambda}{\partial \sigma_x} > 0 \)

- If \( V(x) \) is convex then cross-sectional variation in \( \mu_x, \sigma_x \) creates a negative relation between economic efficiency and market liquidity, because activism \( \rightarrow \) liquidity.
Cross-sectional variation in $\mu_x, \sigma_x$ creates a negative relation between economic efficiency and market liquidity if only if the expected initial take is too low to justify activism on its own.

More uncertainty about the insider’s position:
- creates more adverse selection risk and makes markets less liquid.
- increases the likelihood that actual stake $X_0$ is large enough to become active if $\mu_x \leq c/\Delta$. 

Example

In the binary effort model, $\frac{\partial P}{\partial \sigma_x} \geq 0 \iff \mu_x \leq c/\Delta$ and $\frac{\partial \lambda}{\partial \sigma_x} > 0$
**Noise trading volatility**

**Example**

In the symmetric quadratic model: \( \frac{\partial P}{\partial \sigma} = 0 \) and \( \frac{\partial \lambda}{\partial \sigma} < 0 \)

**Example**

In the asymmetric quadratic model: \( \frac{\partial P}{\partial \sigma} > 0 \) and \( \frac{\partial \lambda}{\partial \sigma} < 0 \)

A general result obtains (since an increase in \( \sigma \) is mean-preserving spread for \( X_T \)):

**Theorem**

If \( V(x) \) is convex then \( \frac{\partial P}{\partial \sigma} \geq 0 \) (and conversely if \( V(x) \) is concave then \( \frac{\partial P}{\partial \sigma} \leq 0 \))

However, comparative statics for market liquidity \( \lambda \) are less straightforward.
Example

In the binary effort model,

\[
\{ \frac{\partial P}{\partial \sigma} \geq 0 \iff \mu_x \leq c/\Delta \} \quad \text{and} \quad \{ \frac{\partial \lambda}{\partial \sigma} < 0 \iff |\mu_x - c/\Delta|^2 < T\sigma^2\Lambda^2(\Lambda - 1) \}.
\]
We endogenize terminal value in Kyle-Back model to study link between shareholder activism and liquidity.
CONCLUSION

- We endogenize terminal value in Kyle-Back model to study link between shareholder activism and liquidity.

- Three key results:
  - The underlying nature of activism plays a crucial role in the relation between liquidity and activism.
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  - The underlying nature of activism plays a crucial role in the relation between liquidity and activism.
  - Increase in noise trading does not necessarily improve market liquidity.
  - The relation between activism and liquidity depends on the source of variation in either.

- The paper informs about consequences of policy change such as trading tax, changing disclosure rules, disclosure window, legal environment.
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