

Liquidity Black Holes

Stephen Morris

Hyun Song Shin

Liquidity black holes: 1987 crash, 1998 crisis...

- Not merely rapid adjustment of prices
- Feedback process
- Endogenous shortening of horizons:
agency problems, bankruptcy/margin
constraints
- Severity depends on residual demand curve

Asset trades at date 1 and date 2

Liquidation value

$$v + z$$

v common knowledge at date 1

$$z \sim N(0, \sigma^2)$$

Two groups of traders:

- Risk-neutral traders, with loss limits $\{q_i\}$
- Risk averse, long-horizon traders (exponential utility)

\Rightarrow residual demand curve for asset:

$$p = v - cs$$

s is proportion of risk-neutral traders who sell

Loss limits

$$q_i = \theta + \eta_i$$

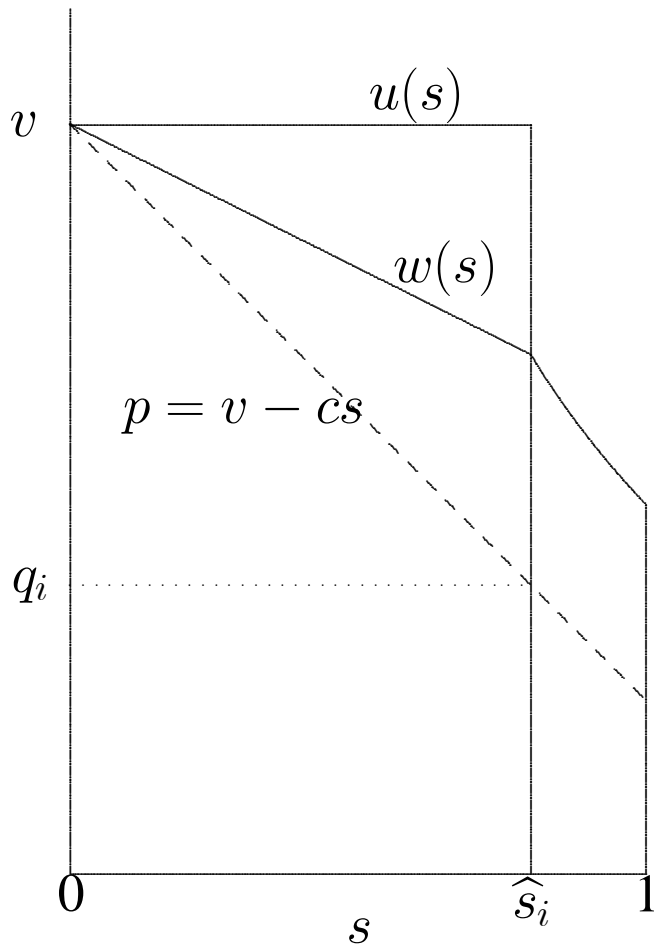
$$\begin{aligned}\theta &\sim U[\underline{\theta}, \bar{\theta}] \\ \eta_i &\sim U[-\varepsilon, \varepsilon]\end{aligned}$$

Strategy

$$(v, q_i) \longmapsto \{\text{hold, sell}\}$$

Three cases

- $v - c \geq q_i$ Hold is dominant
- $v < q_i$ Sell is dominant
- $q_i \leq v < q_i + c$ Intermediate region

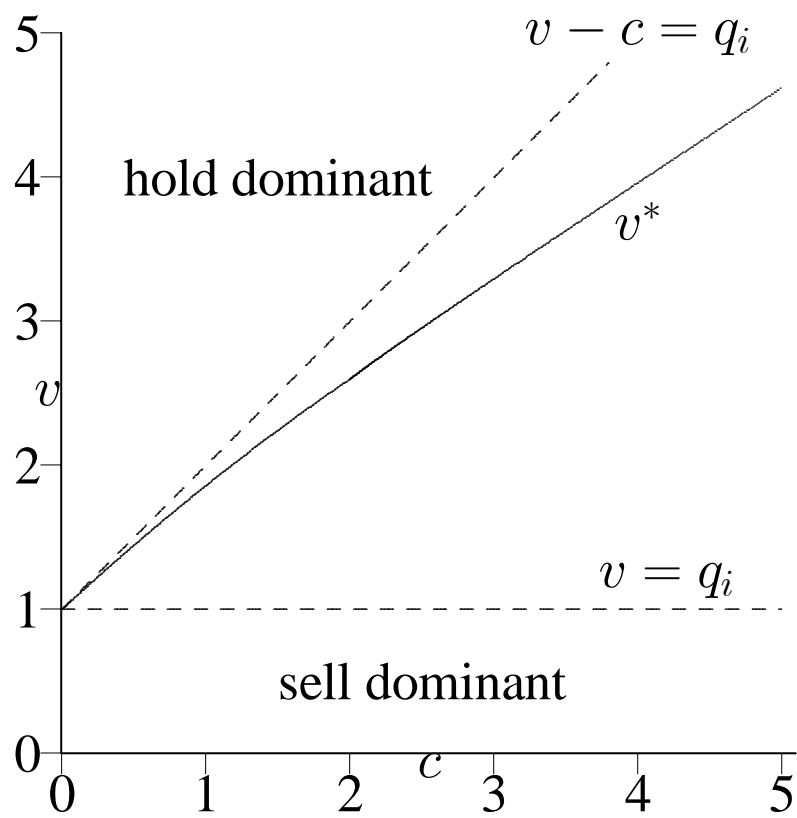


1. Payoffs

Theorem 1 *There is an equilibrium in threshold strategies where the threshold $v^*(q_i)$ for trader i is given by the unique value of v that solves*

$$v - q_i = c \exp \left\{ \frac{q_i - v}{2(v + q_i)} \right\}$$

There is no other threshold equilibrium.



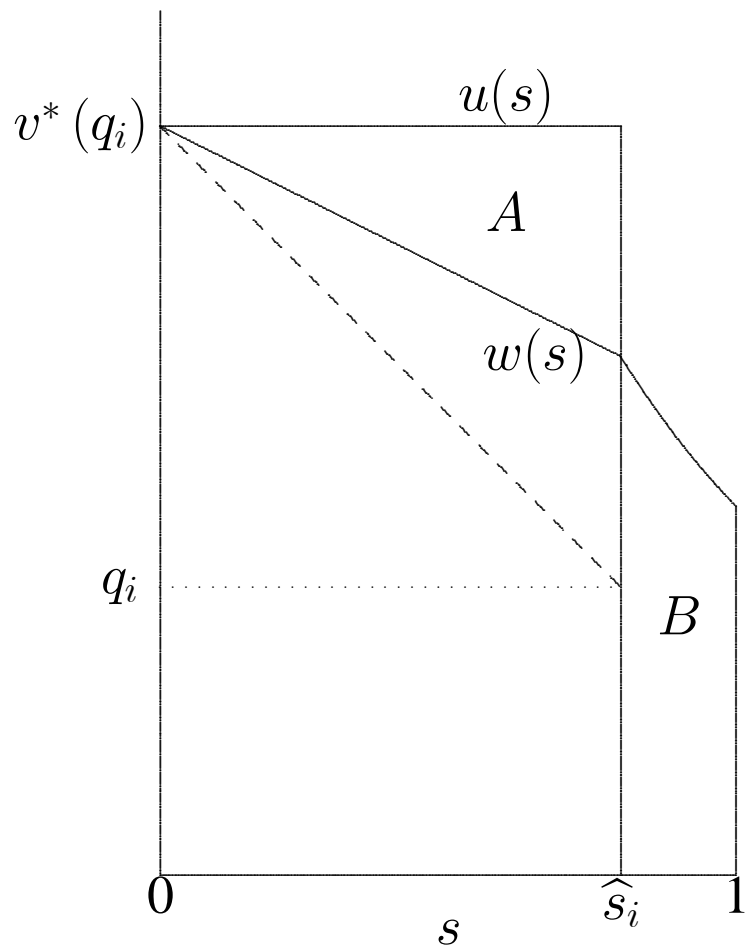
2. v^* as a function of c . $q_i = 1$

Strategic Uncertainty

At threshold $v^*(q_i)$, trader is indifferent between Hold and Sell.

$$\int_0^1 f(s|v^*(q_i), q_i) [u(s) - w(s)] ds = 0$$

Lemma 2 $f(s|v^*(q_i), q_i)$ is uniform.



3. Expected Payoffs in Equilibrium