

Circuit Breakers and Market Runs

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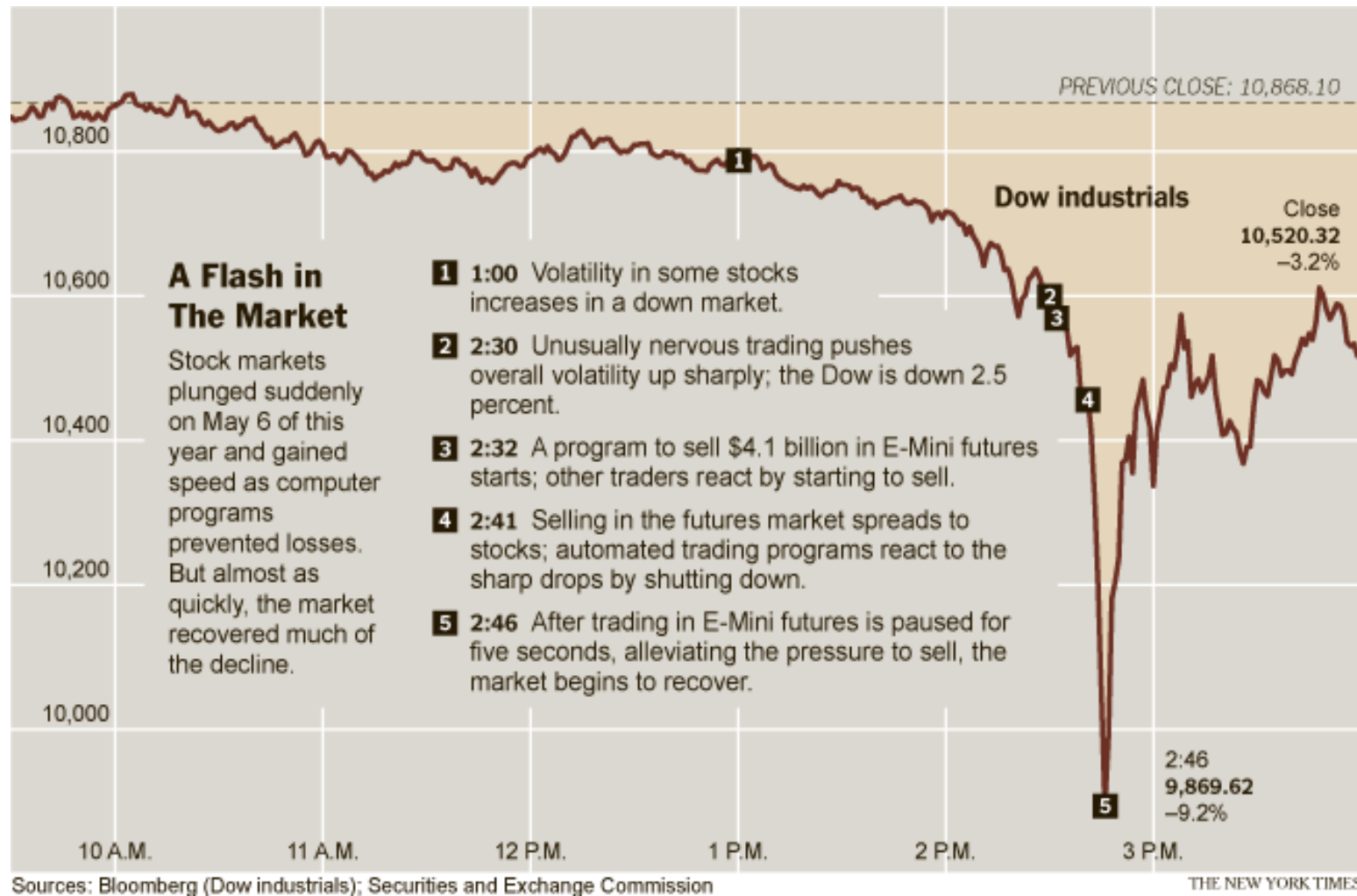
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Motivation

- May 6th 2010 2:32 pm: 9% drop in the DJ, supposed to be caused (and recovered) by algos
⇒ **“flash crash”**
- Alleged cause: large mutual fund firm initiated automated execution algorithm to aggressively sell a large index-futures position (valued at approximately \$4.1 billion) as a hedge to an existing equity position
- Immediate consequence: huge "hot-potato" volume effect between HFTs resulting into a vicious liquidity spiral
- Conclusion: initial local non-informational event triggered broad contagion effects (20' later, losses mostly recovered)
- See Easley et al. (2011) and Menkveld and Yueshen (2011)

Motivation



Motivation

Trading halts (circuit breakers):

- Introduced after Oct 1987 crash at a global level
- Aim: curbing and avoiding extreme price volatility and the resulting massive panic sell-offs (prevent trades from occurring at prices far off fundamental values)
- How:
 - mechanisms that monitor market continuously and trigger trading halt as soon as the price of an individual security or of an index goes (or is bound to go) beyond a predetermined level
 - temporary or, under extreme circumstances, close the market before the normal close of the trading session

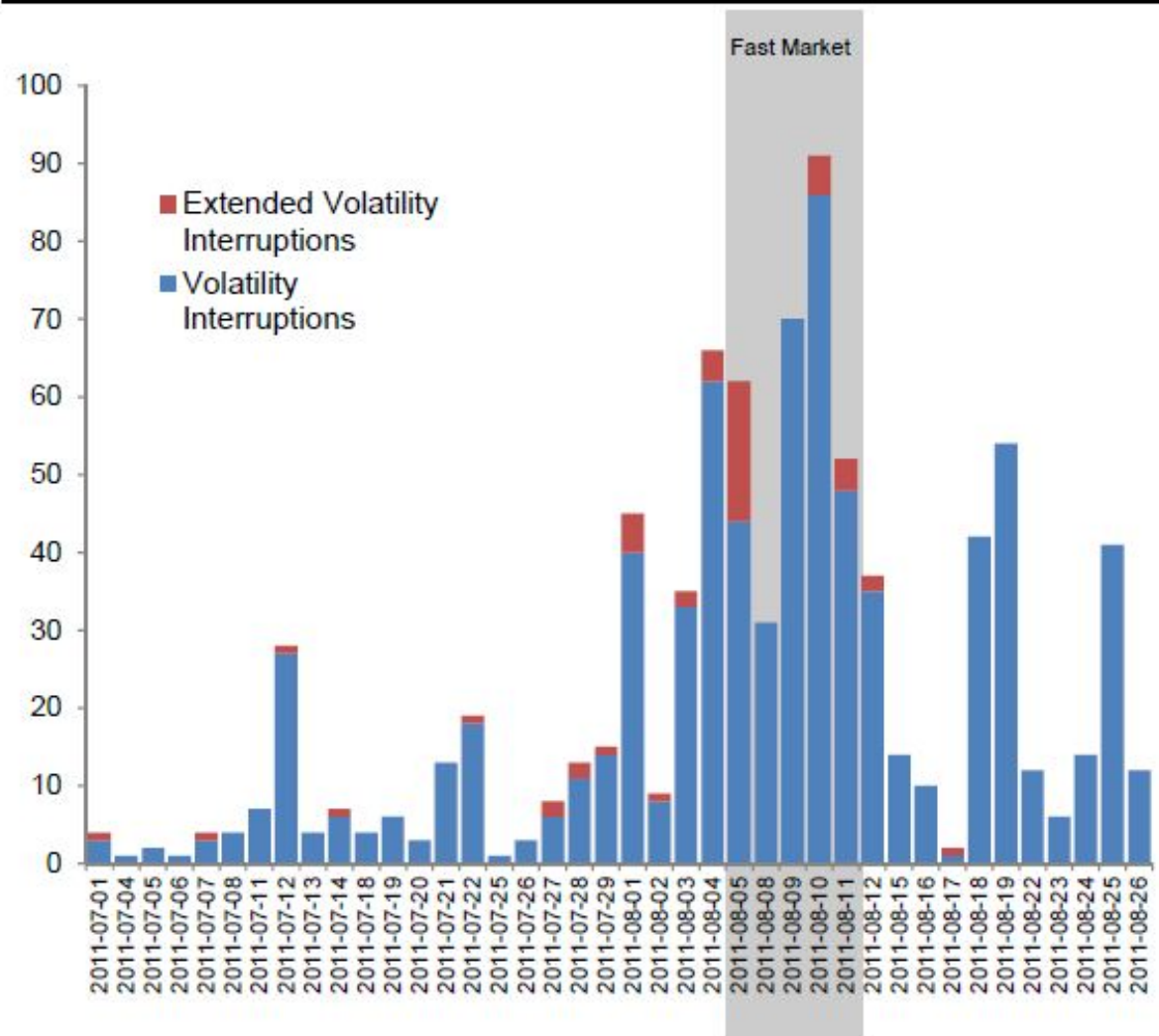
Motivation

Trading halts (circuit breakers):

- Post flash crash debate (regulators and markets):
Are “old” trading halts designed adequately in HFT times?
- US: regulators and markets set up a large-scale pilot experiment in which the existing rudimentary market-wide circuit breaker regime is adjusted and complemented by tailor-made narrowly set per-stock mechanisms + additional “Limit-Up/Limit-Down Mechanism”
- EUR (MiFID II, ESMA): regulators and markets are redesigning current fragmented circuit breaker regime to a unified framework in which circuit breaker rules could function across markets when needed
- Underlying aim: better manage HFT/Algo trading...

Motivation

Number of (extended) volatility interruptions in the DAX in July and August 2011*



* Period: 01/07/2011 till 26/08/2011

Motivation

- Aim of this paper:
 - assess usefulness of circuit breakers
 - insights on optimal circuit breaker configuration
- How:
 - translate Diamond and Dybvig (1983) bank run model to financial market context (in line with Bernardo and Welch (2004))
 - Agents know they might face urgent liquidity needs in the future
 - market run setting in which agents fail to coordinate their actions and trade massively before the liquidity shock truly occurs, although they should refrain from it (in line with crash evidence by Shiller (1987))
 - introducing a circuit breaker limits transactable volume within one trading period
 - assess usefulness of circuit breakers in solving this coordination failure

Related Theoretical Literature

- Trading halts
 - Greenwald and Stein (1991) + Kodres and O'Brien (1994): circuit breaker induces more liquidity provision as more value-motivated traders enter the market
 - Subrahmanyam (1994): circuit breaker induces traders to trade large volumes early
 - Subrahmanyam (1995): suggests randomizing circuit breaker limits
 - Morris (1990): analyzes two markets, and proposes cross-market circuit breakers

Contribution: in-depth analysis of welfare effects of circuit breakers, and their usefulness in preventing market runs

Related Theoretical Literature

- Liquidity shocks and liquidity crises:
 - Initial liquidity shocks could create endogenous negative liquidity spirals
 - Schleifer and Vishny (1992), Gromb and Vayanos (2002), Anshuman and Viswanathan (2005), Garleanu and Pedersen (2007), Brunnermeier and Pedersen (2009)

Contribution: analysis whether circuit breakers form useful tools to prevent market run to occur even before liquidity shock realizes

Related Theoretical Literature

- HFT and market stability

Trade-off:

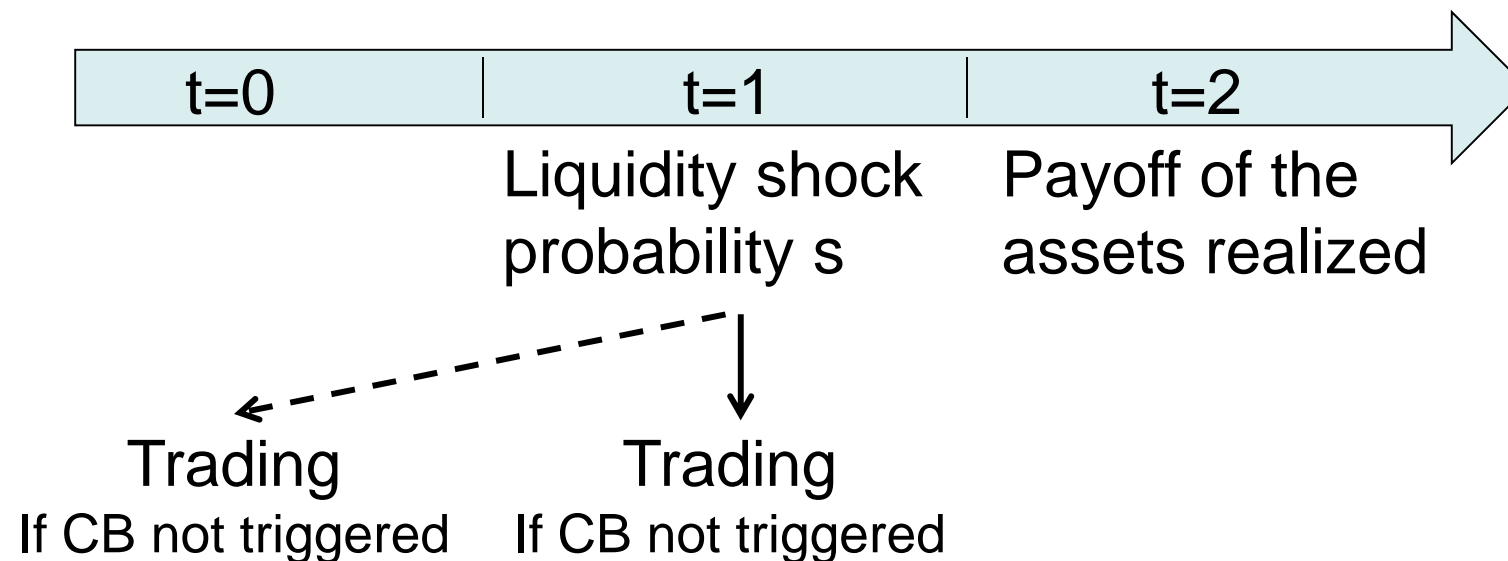
- pre-programmed algorithms may provide less stability when market conditions exceed the circumstances they are programmed to function in
- rational algo traders exhibit less overreaction to new and uncertain market conditions

See Biais, Hombert and Weil (2010), Biais, Foucault and Moinas (2011).

Contribution: to what extent are circuit breakers useful in reaching their intended goal of market stability?

Model

- A risky and a riskless asset & two trading rounds
- Traders: might be hit by an aggregate liquidity shock, need to sell the risky asset in the second trading round
- Market maker: absorbs (buys) the order flow
- A circuit breaker might interrupt trading



Model

- **Market maker**

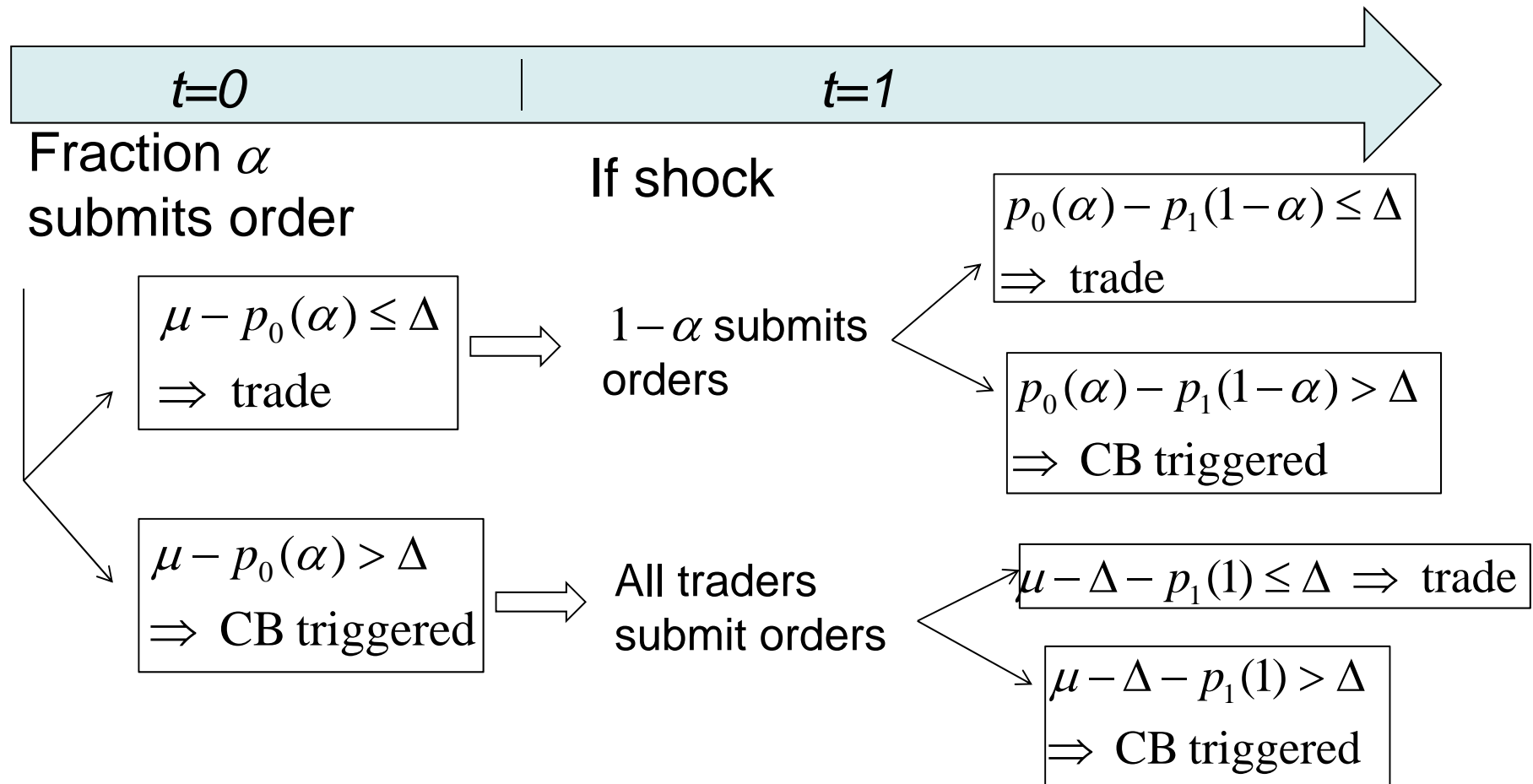
- Absorbs the entire order flow
- Risk averse: the larger the order flow to absorb, the lower the price
- At each date: the price is such that the market maker is indifferent between buying and not participating

- If α traders sell in $t=0$: $p_0(\alpha) = \mu - \frac{\gamma}{2} \sigma^2 \alpha$

- If $1-\alpha$ sell in $t=1$: $p_1(1-\alpha) = \mu - \frac{\gamma}{2} \sigma^2 (1+\alpha)$

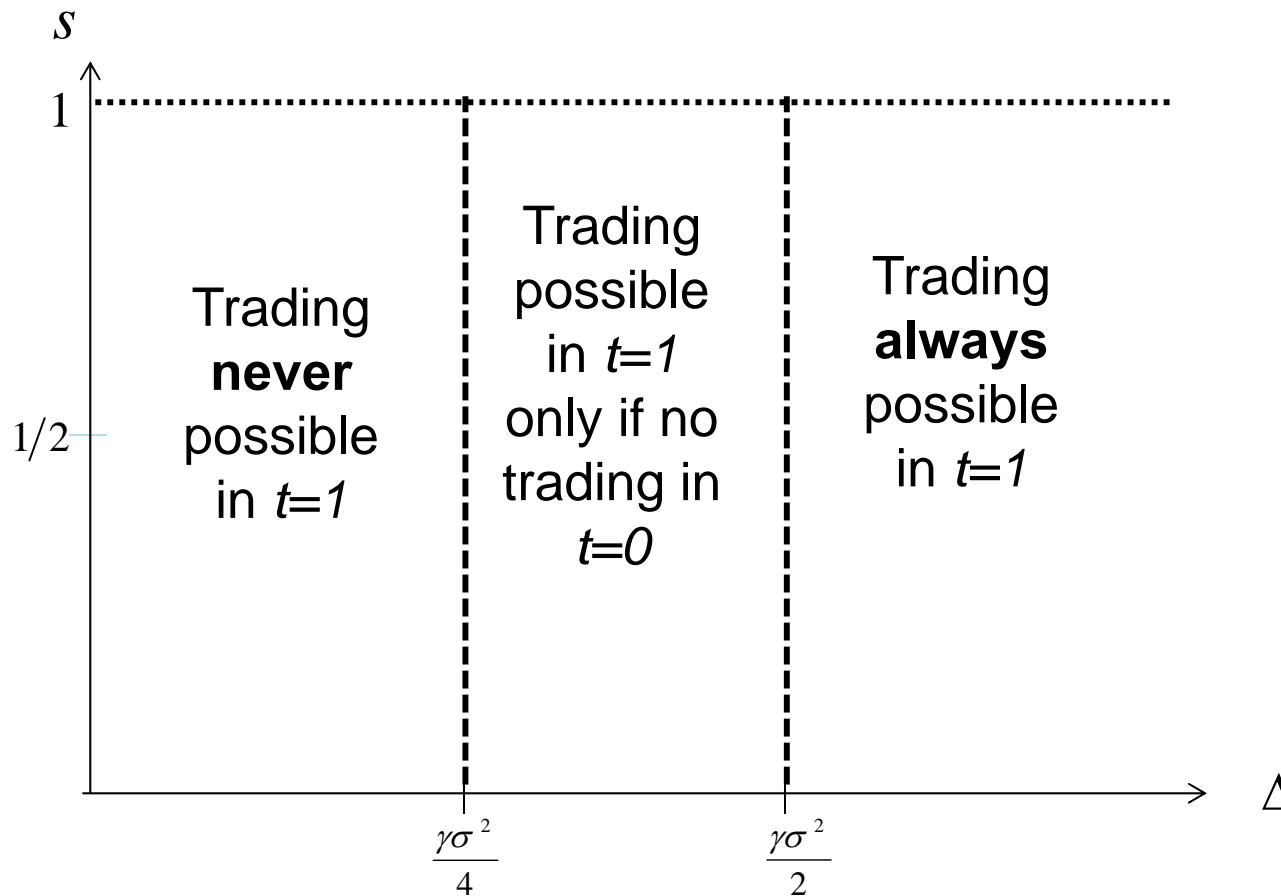
Model

- Circuit Breaker (Δ)**



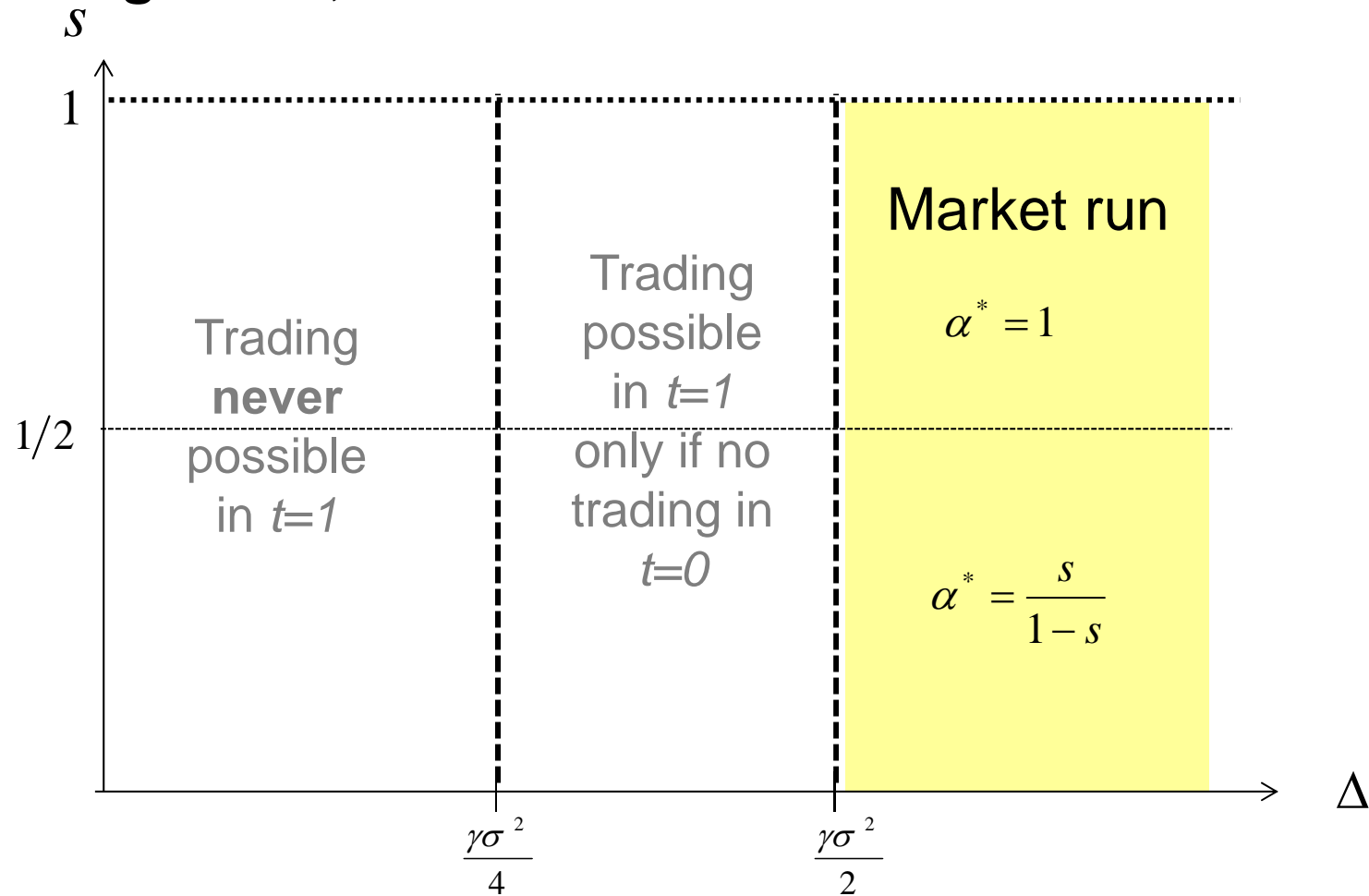
Analysis

- **Trading in $t=1$** (*all traders want to sell if shock occurs*)



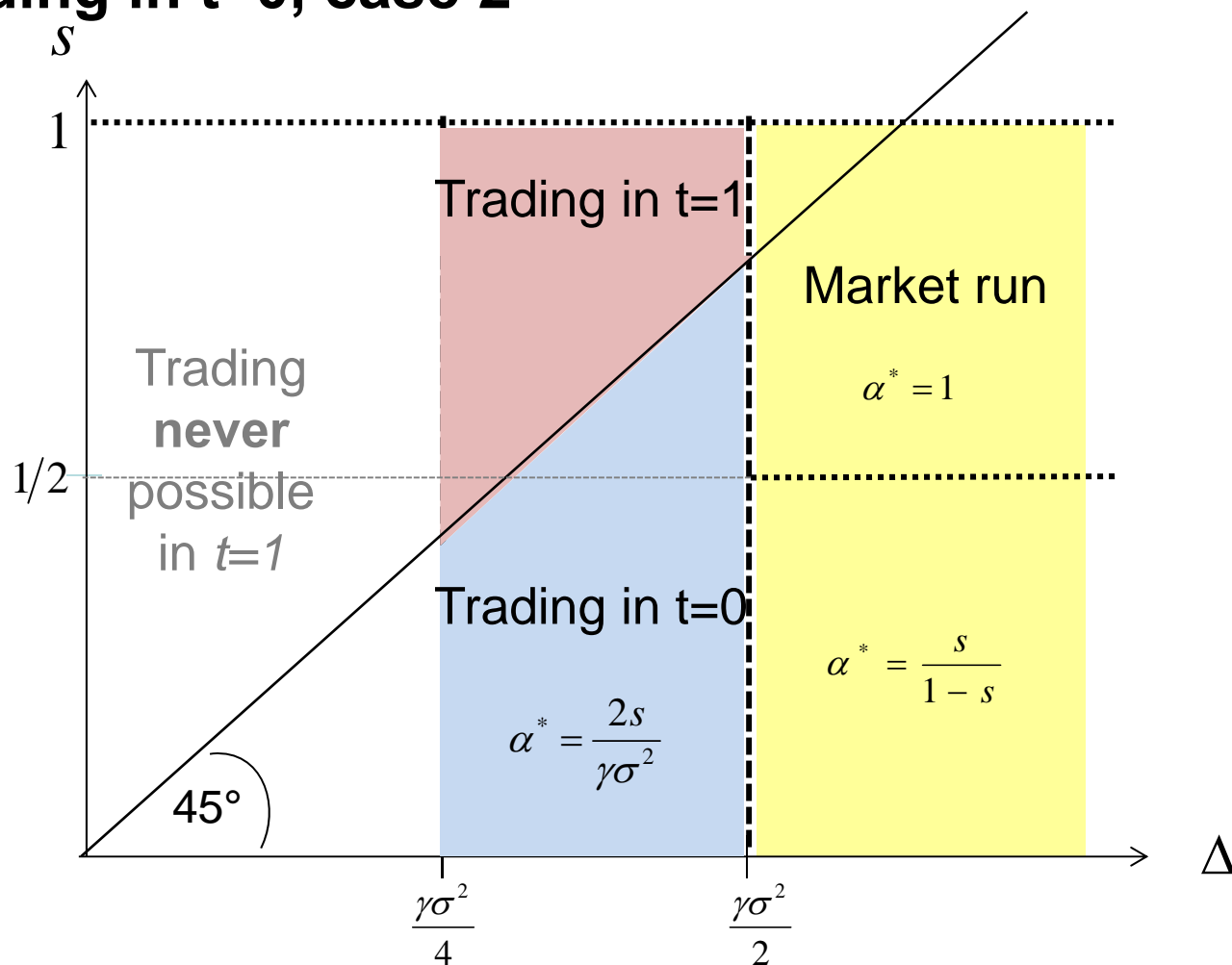
Analysis

- Trading in $t=0$, case 1



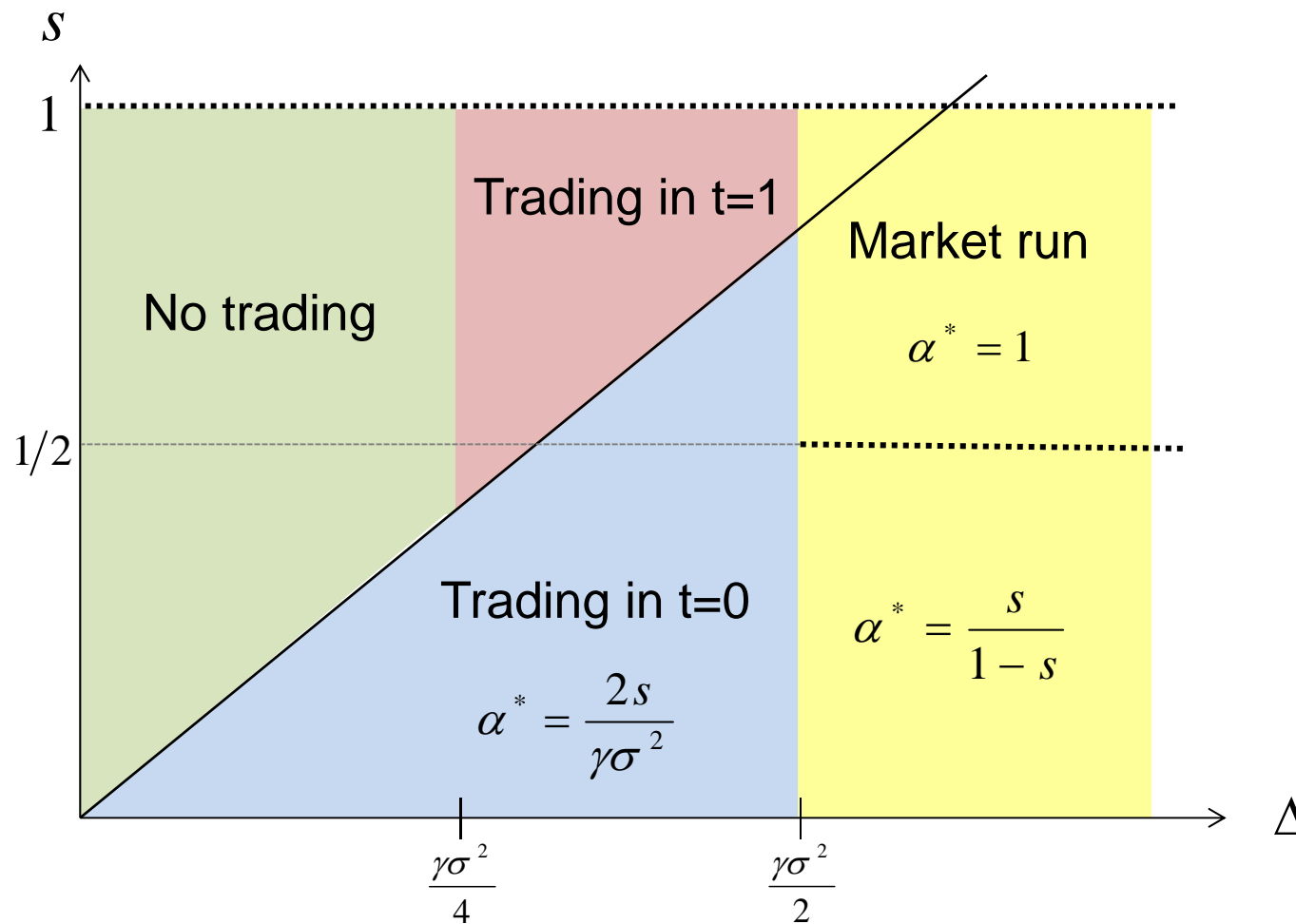
Analysis

- Trading in $t=0$, case 2



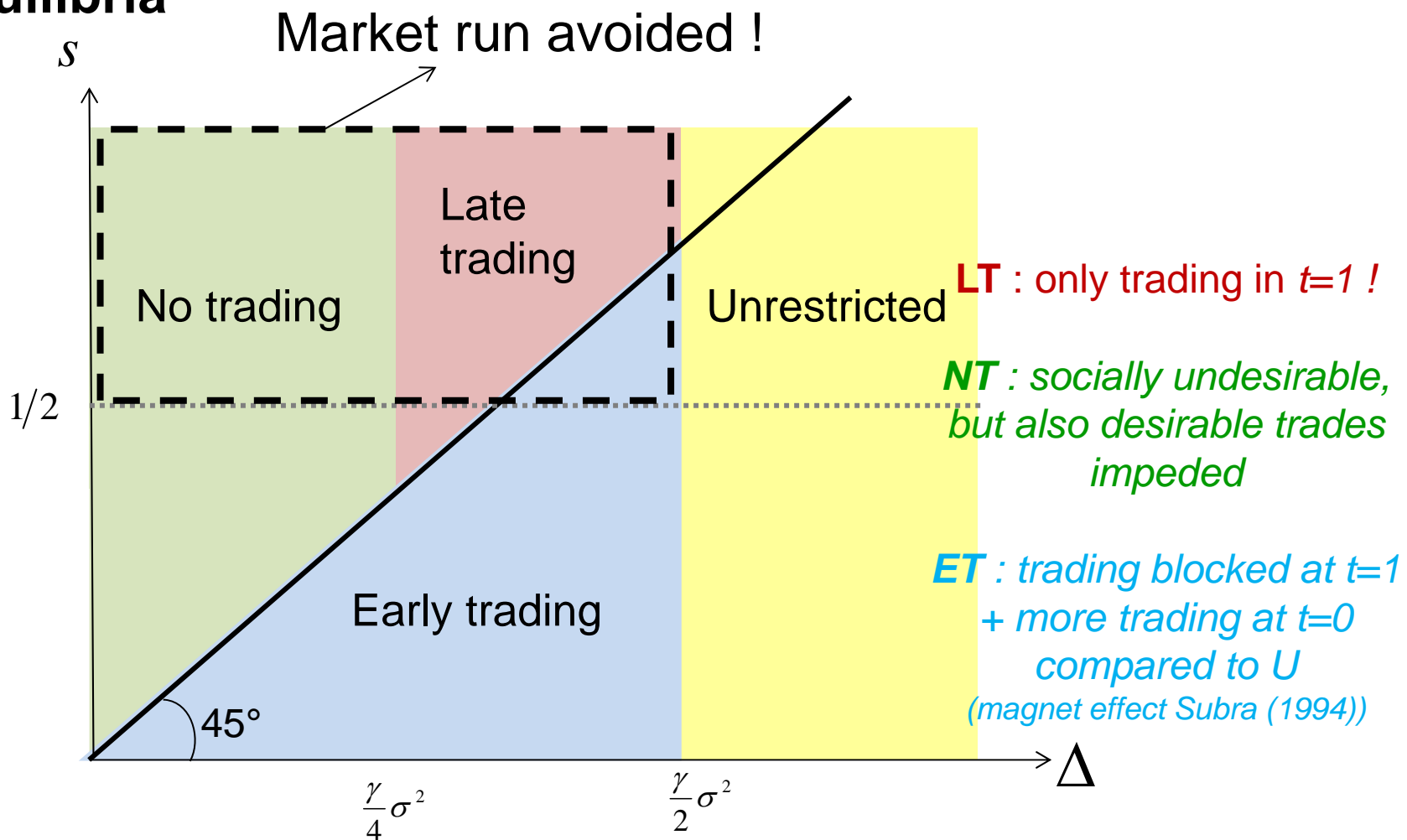
Analysis

- Trading in $t=0$, case 3



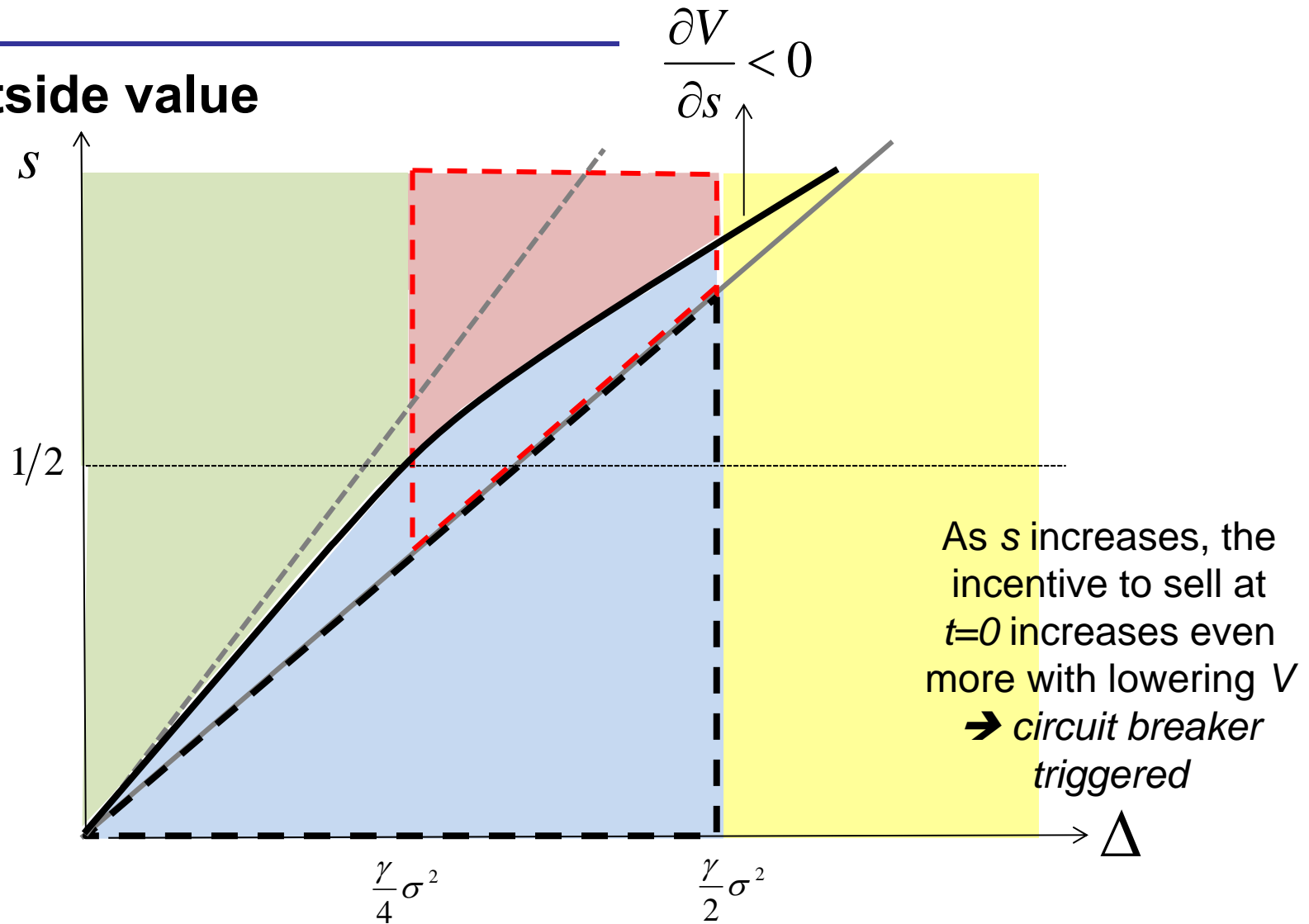
Analysis

- **Equilibria**



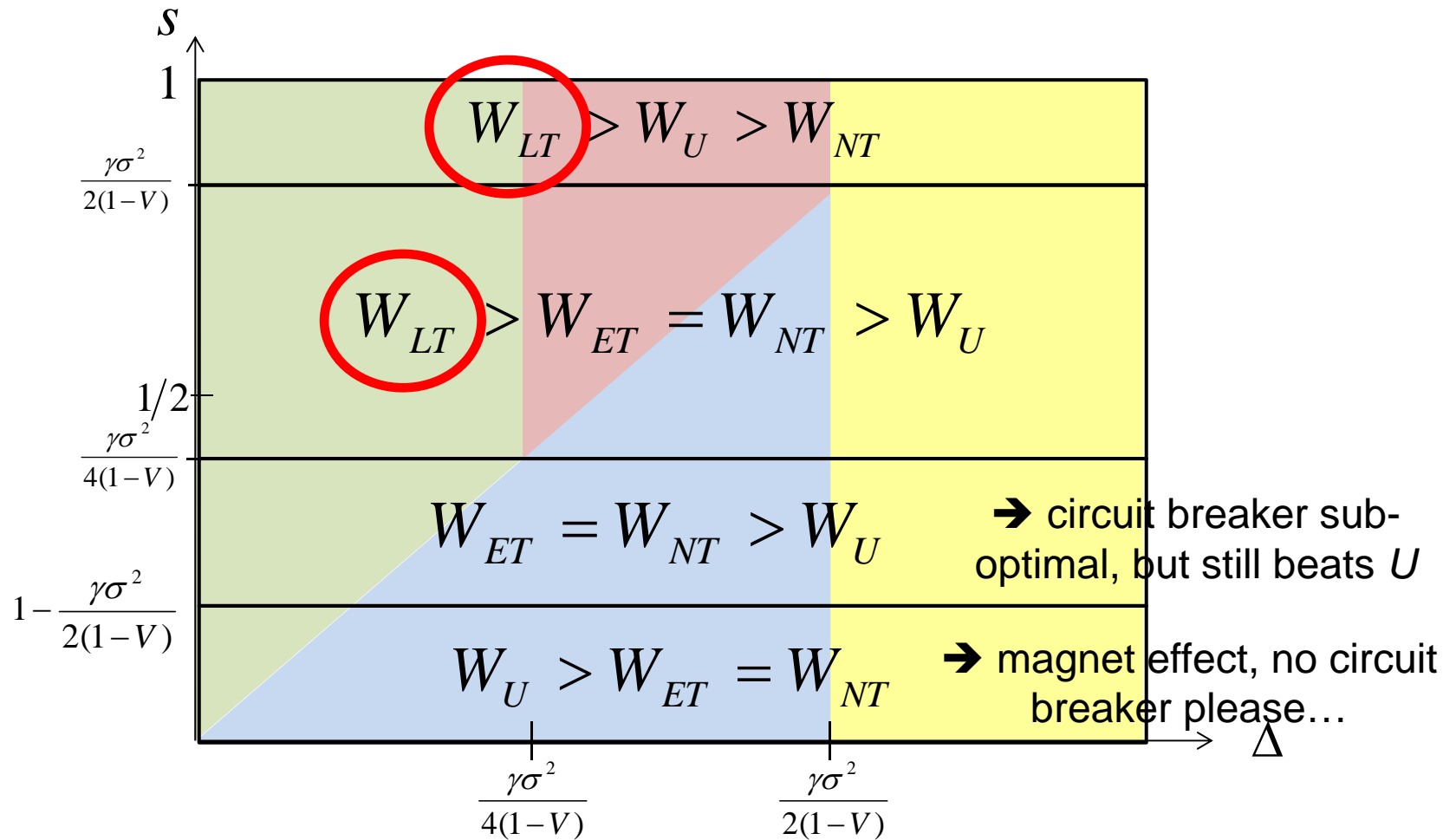
Analysis

- Outside value



Analysis

- Welfare

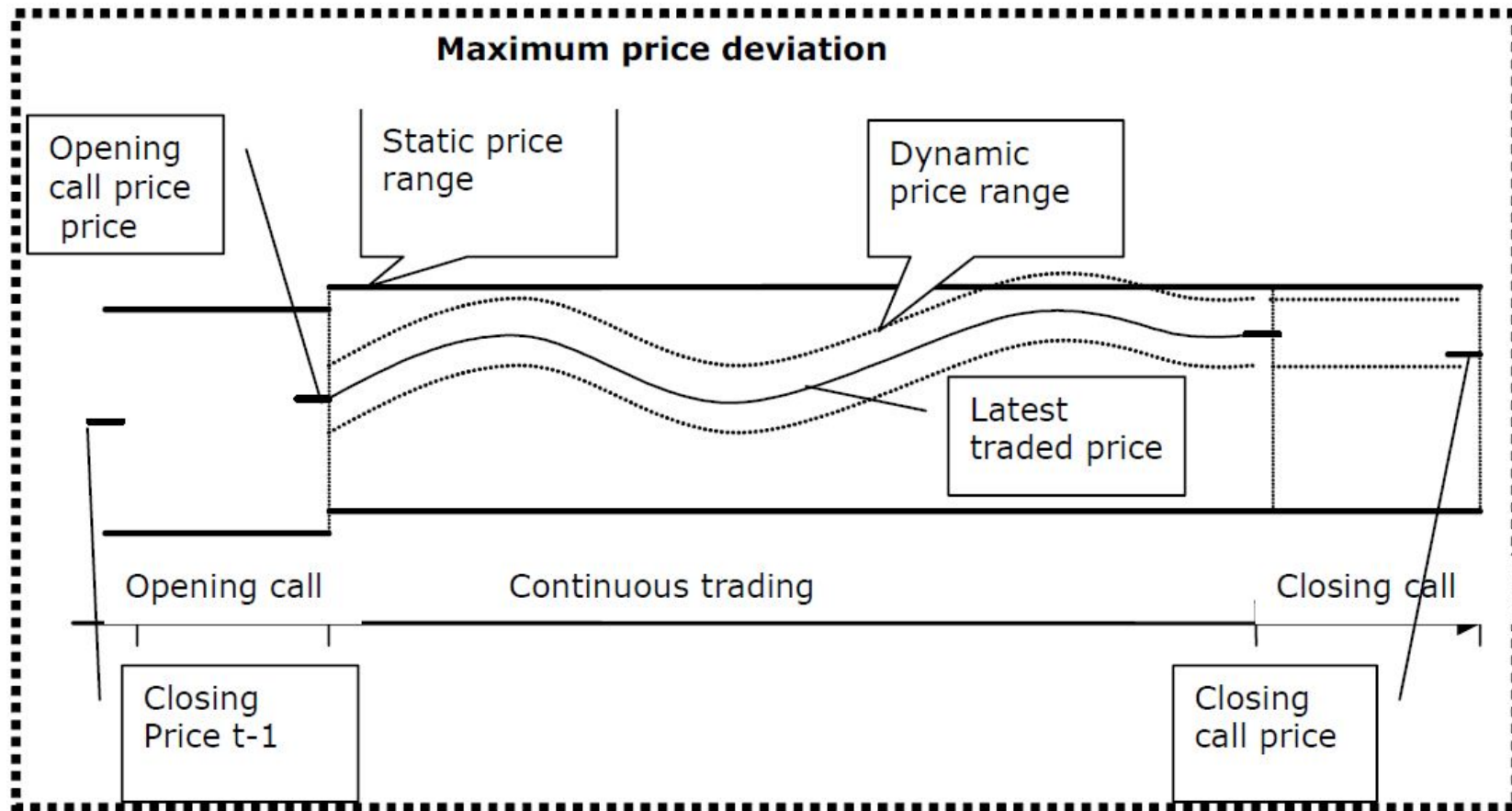


Conclusion

- Market run is avoided when circuit breaker is tight enough
- Existence of the circuit breaker may create welfare gains/losses
- Usefulness of circuit breaker hinges on how the set price limit is defined relative to:
 - Price impact of selling (security / market specific)
 - Expected loss in case of a liquidity shock (economic condition)

Motivation

Trading halts (circuit breakers):



Source: Consultation paper OMX (2006)

Motivation

Trading halts (circuit breakers): EUROPE

Exchange	Thresholds Static Price		Thresholds Dynamic Price		Duration Halt/auction
	Price Range	Reference Price	Price Range	Reference Price	
DB	Not published	Last auction price	Not published	Last traded price	2 min
Euronext	+/- 10%	Last auction price	+/- 2% +/- 5%	Last traded price	4 min
LSE	-	-	+/- 2% +/- 25%	Last traded price	5 min
Turquoise BATS Chi-X	No active circuit breakers, but “order entry controls” or “execution price collars”				

Source: Consultation paper OMX (2006), Markets Trading Guide CA (2012)

Motivation

Trading halts (circuit breakers): US

- Upon request of the SEC, market-wide domestic trading is halted in accordance with a threshold point decline.
- The NYSE sets them each quarter as 10%, 20% and 30% of the Dow Jones industrial average closing values for the prior month.
- For second quarter of 2012, triggering single-day decreases are:

	Before 1:00pm	1:00 PM – 1:59pm	2:00 PM – 2:30pm	After 2:30pm
1,200 point decline	1 hour halt	1 hour halt	½ hour halt	No effect
2,400 point decline	2 hour halt	1 hour halt	Close for day	Close for day
3,650 point decline	Close for day	Close for day	Close for day	Close for day*

➔ Not triggered during the flash crash... (-9.2% at 2.32pm)

- Exchanges have the ability to halt trading in stocks when there is a large imbalance between buy and sell orders, not binding on other markets