Dark Trading and Financial Markets Stability

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Motivation

Algo Crash: Shock $\Rightarrow$ correlated sales $\Rightarrow$ adverse selection

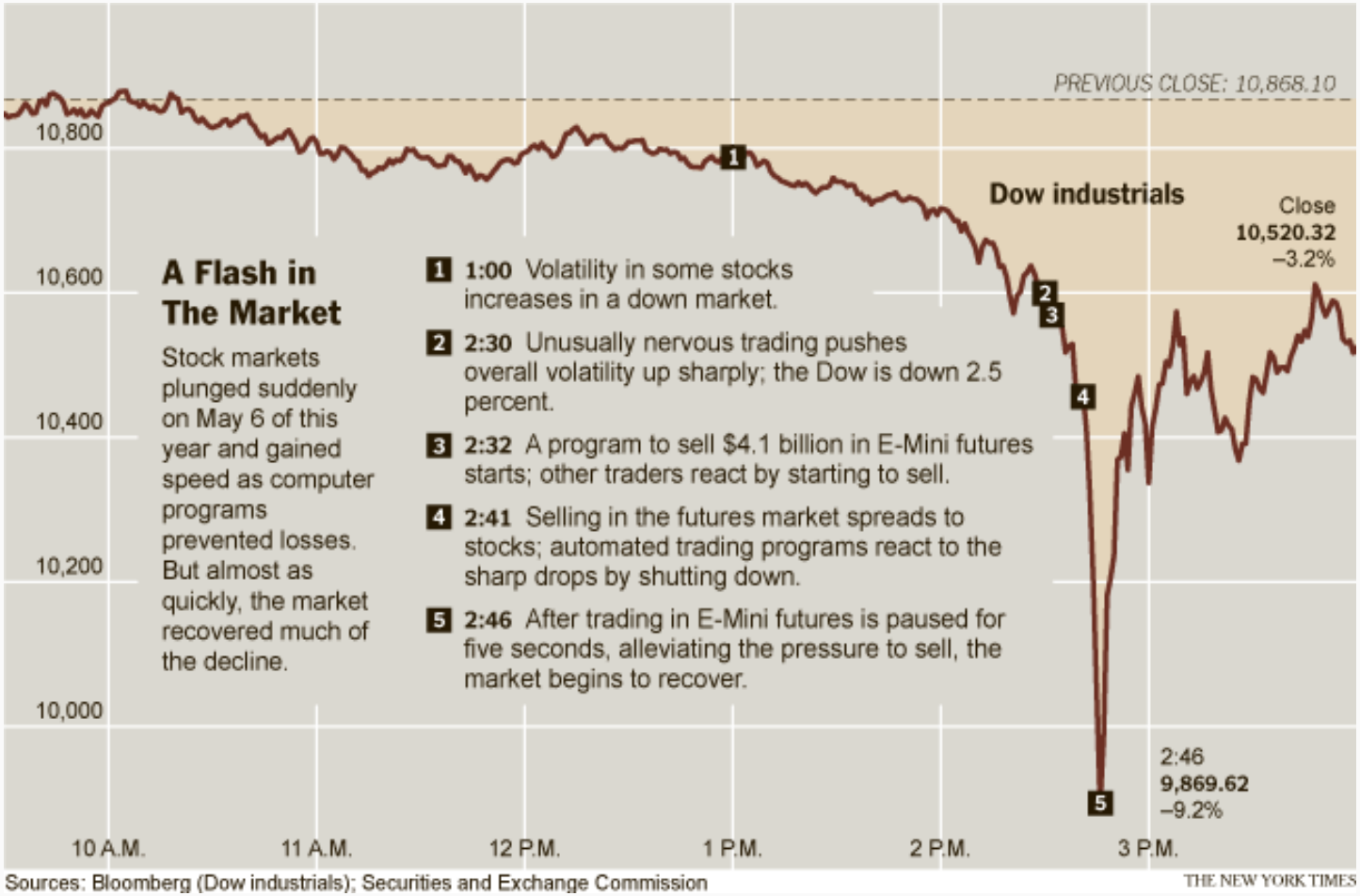

Figure 1: The Flash Crash on May 6, 2010

Mini-Flash Crash

- Intervals of 50 trades (durations of 0 – 169 seconds)
- Extreme return's Z-score ≥ 7
- 30-minutes price reversal is, on average, 88%

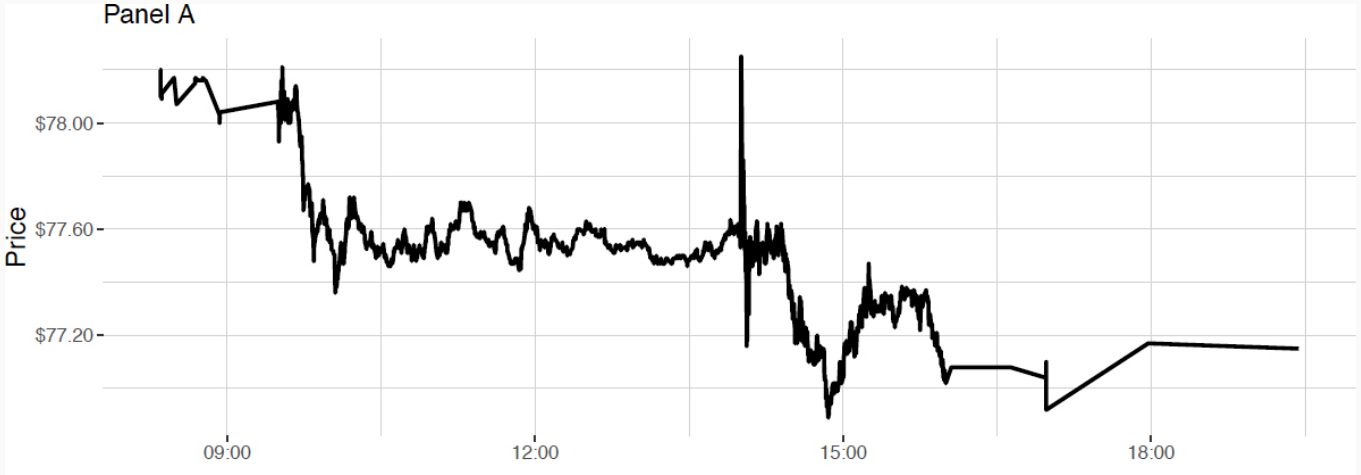

Figure 2: Mini-Flash Crash in P&G on March 21, 2018.
(Spike's return: 0.98%; Z-score ≈ 7; duration: ≈ 26 s; reversal: 140%)

Midpoint Extended Life Order (M-ELO)

- Hidden order
- Linked to Mid-price: $m_t = (a_t + b_t)/2$
- Interacts only with M-ELO type orders
- Non-Executable before an end of "Holding Period" (0.5 s)
- Available since March 12, 2018

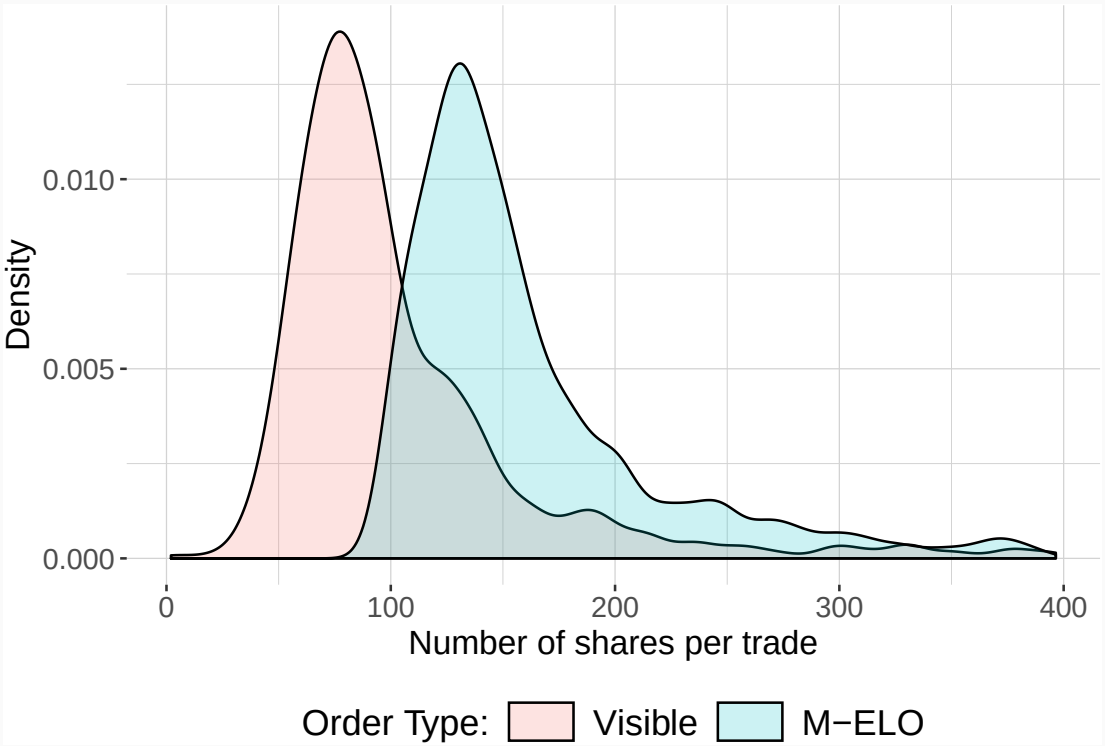

Figure 3: Densities of lit (visible) order sizes and M-ELO order sizes.

Data

- Order Book Message Data: NASDAQ historical ITCH (intraday)
- M-ELO trading: NASDAQ Transparency statistics (weekly)
- Time-span: January 22, 2018 – December 31, 2018
- 169 individual companies, 27 exchange traded funds

Table 1: Example of the historical ITCH data

Type	Timestamp	Reference	Side	Shares	Price	Bid	Ask
A	14400.01	13713	B	100	1.00	1.00	NA
D	14401.00	28705	B	2	1.00	1.00	NA
X	14432.36	287141	B	35	139.33	139.33	139.74
E	19922.60	515409	S	260	139.68	139.50	139.70
F	25200.25	2905093	B	100	0.01	139.50	139.63
P	26091.32	0	B	220	139.20	139.10	139.25
U	29423.20	4724289	S	100	138.95	138.91	138.95
C	34201.87	9851381	B	100	138.98	138.97	138.99

Methodology

- Linear panel model with fixed effects
- M-ELO trading is endogenous $\Rightarrow$ Instrumental approach (M-ELO trading in other stocks of the same turnover group)

$$\text{M-ELO}_{i,t} = b_1 X_{i,t} + b_2 W_{i,t} + C_i + \epsilon_{i,t}, \tag{1}$$

$$y_{i,t} = \beta_1 \widehat{\text{M-ELO}}_{i,t} + \beta_2 X_{i,t} + C_i + u_{i,t}, \tag{2}$$

where $y_{i,t}$ is a weekly number of mini-flash crashes, $\text{M-ELO}_{i,t}$ is a fraction of M-ELO shares among all shares matched by NASDAQ, $X_{i,t}$ is a vector of control variables, $W_{i,t}$ is a vector of excluded instruments, C_i is time invariant unobserved individual effect, $\epsilon_{i,t}$ and $u_{i,t}$ are error terms.

- Assume strict exogeneity: $\mathrm{E}\left[u_{i,t} | X_{i,t}, C_i\right] = 0, \forall i, t$

Results

	Linear Panel Model (2SLS)		
Dependent Variable	M-ELO Coefficient	*p*-Value	*F*-statistic
Numb. crashes (weekly)	-22.636^{***}	0.0019	$1{,}130.3^{***}$
Crash Characteristics:			
Z-score	-98.16^{***}	0.0017	102.128^{***}
Duration	$1{,}751.7^{***}$	0.0005	132.183^{***}
Reversal	4.582	0.5029	55.03^{***}
Liquidity Measures:			
Quoted Spread	-87.41^{***}	0.0001	314.938^{***}
$\frac{\text{Depth(30 bps)}}{\$ \text{ Volumes}}$	0.6^{***}	$9.75 \cdot 10^{-9}$	$1{,}099.33^{***}$
Depth Imbalance (30 bps)	-56.33^{**}	0.0318	29.956^{***}

Conclusion

- M-ELO is able to deemphasize HFT firms speed advantages, while leaving the possibility to manage the risk of open positions
- Dark trading can make markets more stable
- Liquidity provision improves in line with M-ELO trading activity

The effect of M-ELO trading stays if we:

- Use alternative specifications of M-ELO trading
- Estimate the model on separate sub-periods
- Do a separate estimation for small and big stocks
- Use different instruments for M-ELO
- Use different controls
- Perform other robustness checks

More information

- Thank you for your attention!
- For more information, check out the working paper at SSRN: https://ssrn.com/abstract=3384719