Dark Trading and Fiancial Markets Stability

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Motivation and Research Question

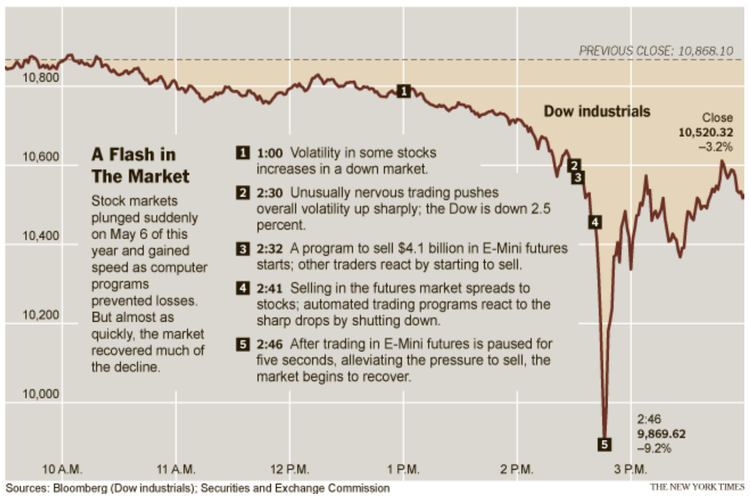

Figure 1: The Flash Crash, May 6, 2010

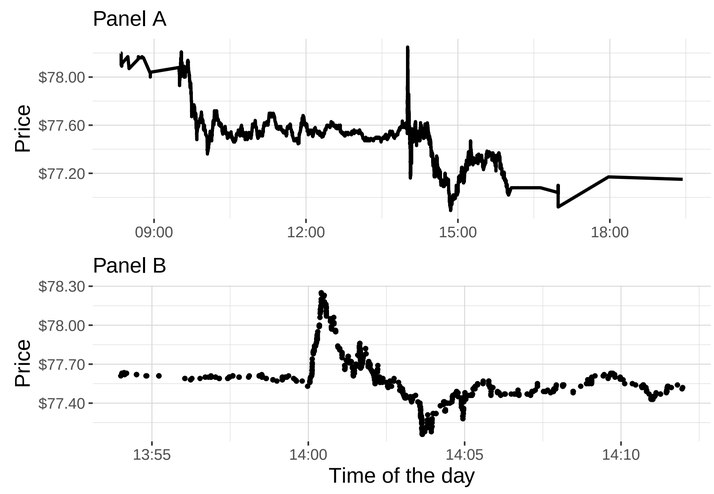

Figure 2: Mini-Flach Crash (P&G, March 21, 2018; Return: 0.98%, Duration: 26 s, Reversal: 140%)

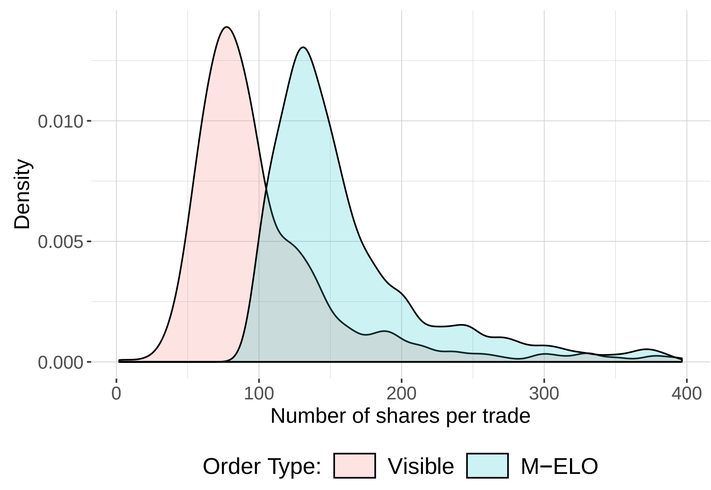

Figure 3: Densities of lit (visible) order sizes and M-ELO (dark) order sizes.

Research Question: How dark (M-ELO) activity impacts the number of mini-flash crashes and market liquidity?

Data

Data Sources:

1. NASDAQ historical ITCH
2. M-ELO Transparency Statistics
3. MIDAS Market Structure Metrics

Mini-Flash Crashes:

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

Crash Characteristics:

1. Return Z-score
2. Crash Duration, s
3. Price reversal, 30 min

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

Liquidity Measures:

1. Quoted, Realized Spreads
2. Price Impact
3. LOB Depth around the midquote
4. Depth Imbalance

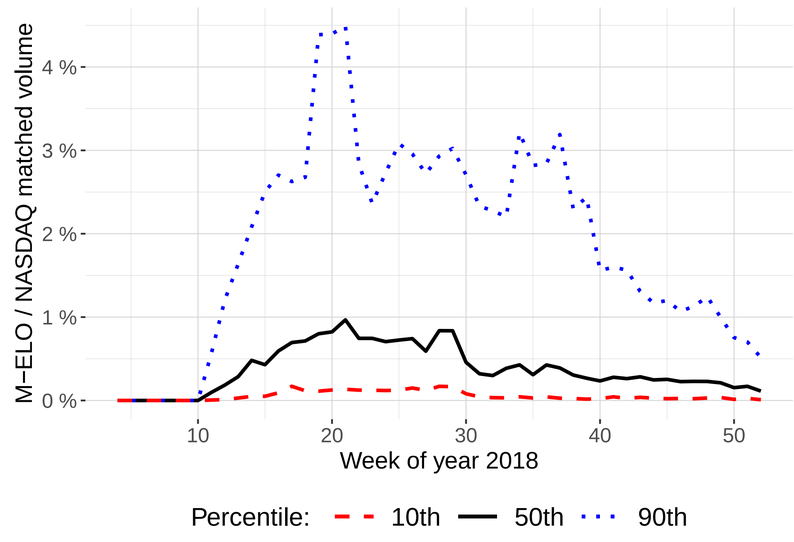

Figure 4: Share of M-ELO executions

Empirical Analysis

Methodology:

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

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

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

where $y_{i,t}$ is the main dependent variable (number of mini-flash crashes, crash characteristic, liquidity measure), $\text{M-ELO}_{i,t}$ 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: $\mathrm{E}\left[u_{i,t} | X_{i,t}, C_i\right] = 0,\ \forall i, t$

	Linear Panel Model (2SLS)		
Dependent Variable	M-ELO Coeff.	p-Value	F-statistic
Numb. crashes	-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^{***}
Relative Depth	0.6^{***}	$9.75 \cdot 10^{-9}$	$1{,}099.33^{***}$
Depth Imbalance	-56.33^{**}	0.0318	29.956^{***}

Robustness Tests

- Alternative specifications of M-ELO activity
- Alternative mini-flash crash identification
- Estimation of the model on separate sub-periods
- Separate estimation for small and big stocks
- Independent first-stage regression for each stock
- Different instruments for M-ELO
- Different control variables
- Outliers removal

Conclusions

- 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

References

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- Degryse, H., De Jong, F., Kervel, V. v., 2015. The impact of dark trading and visible fragmentation on market quality. *Review of Finance* 19 (4), 1587–1622.