Return Extrapolation and Day/Night Effects

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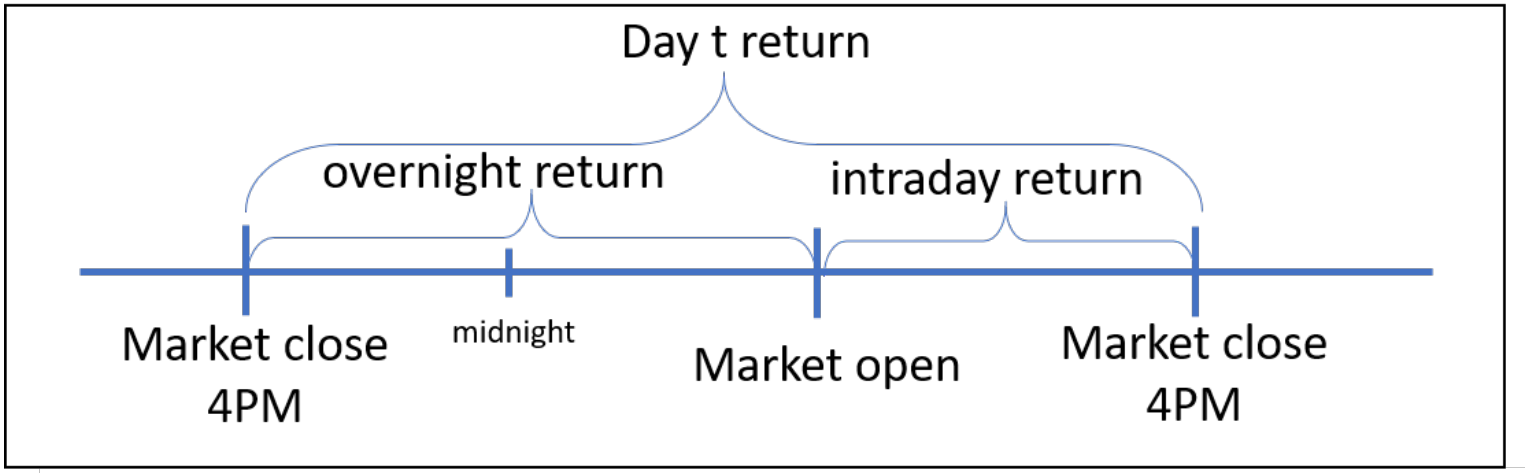
Tug of war – Lou, Polk, and Skouras (2019)



Panel A: Portfolios sorted by overnight returns

Decile	Overnight Excess	Intraday Excess
1	**−1.51%**	**1.62%**
	(−7.76)	(4.76)
10	**1.96%**	**−1.63%**
	(8.17)	(−4.74)
10–1	**3.47%**	**−3.24%**
	(16.57)	(−9.34)

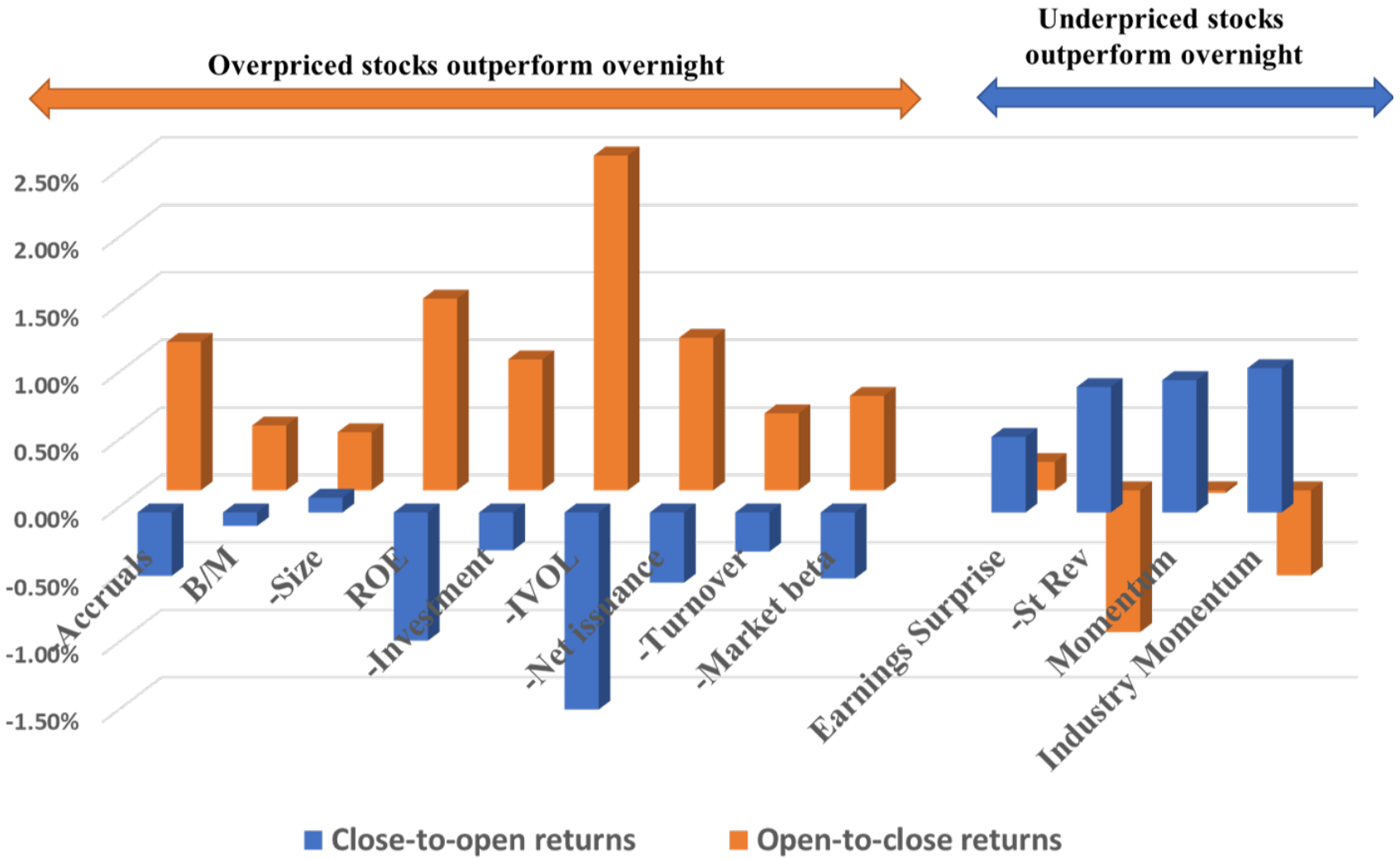
Panel B: Portfolios sorted by intraday returns

Decile	Overnight Excess	Intraday Excess
1	**1.59%**	**−1.51%**
	(5.51)	(−3.45)
10	**−0.22%**	**0.69%**
	(−1.20)	(2.51)
10–1	**−1.81%**	**2.19%**
	(−8.44)	(6.72)

- ▷ Stocks with relatively *high* past overnight (daytime) returns outperform *overnight* (during the day).

Tug of war – Lou, Polk, and Skouras (2019)

- Investors that have different clienteles trade on different times of the day.



Research questions

- What types of stocks do overnight traders prefer?
- What are the drivers of day/night return patterns?
- Relationship to other documented day/night return patterns
  - Stock prices appreciate only overnight (Kelly and Clark 2011)
  - CAPM only holds overnight (Hendershott, Livdan, Roesch 2020)

Three ingredients from behavioral finance and institutional trading

1) Return extrapolation
   - ▷ Expectations are positively correlated with past returns
   - ▷ Market returns (Greenwood and Shleifer 2014) and individual stock returns (Da, Huang, and Jin 2014)

2) Unsophisticated investors trade relatively more in the morning.
   - ▷ Different investor clientele (Lou, Polk, and Skouras 2019)
   - ▷ Higher attention at open (Berkman et. al. 2012)
   - ▷ Larger price dislocation and illquid at open (e.g., Brock and Kleidon 1992)

3) Short-selling constraint is binding $\rightarrow$ overpricing (Miller 1977)

Our main findings - Return extrapolation

- At the stock level, we find:
  - Morning order imbalance is positively (negatively for afternoon) related to past daytime returns
  - Overnight returns positively related (unrelated for daytime) to past daytime returns
- At the portfolio level, we find extrapolative trading leads to the observed day/night return patterns of characteristic-sorted portfolios
- At the aggregate level, we find evidence of extrapolative trading

Relationship to existing work

- The direction (daytime returns *positively* predict next night returns) is in contrast to
  - daily return reversals (e.g., Avramov Chordia, and Goyal 2006)
  - periodicity in order flows (Heston, Korajczyk, and Sadka 2010)
  - existence of investor clienteles (Lou, Polk, and Skouras 2019)
- We focus on the morning trades
  - Overnight risk premium (e.g., Barrot, Kaniel, and Sraer 2016, Hendershott et. al. 2020)
  - Margin requirement and lending fee overnight (e.g., Bogousslavsky 2021)

Data

- Trade and Quote (1993-2014) combined with Polygon (2015-2020)
  - Polygon is the data provider for Robinhood
  - NYSE, NASDAQ, and AMEX. Remove stock price less than \$5 and stocks with market capitalization that falls in the first NYSE quintile
- Returns are based on mid-quotes
- Intraday Order imbalance (OIB) measured using signed volume (Lee and Ready 1991)

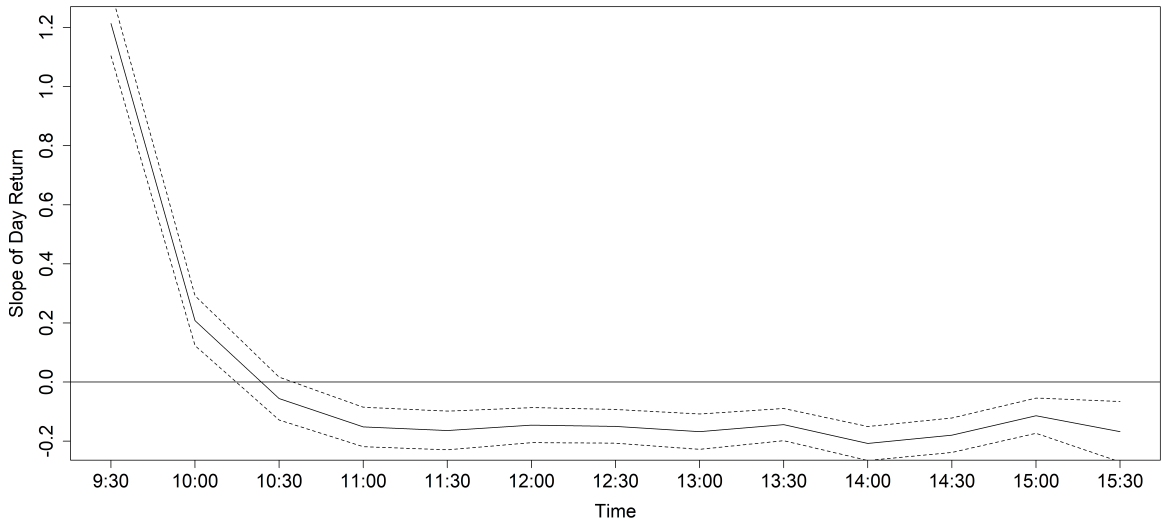
$$\text{OIB} = \frac{\text{Buy} - \text{Sell}}{\text{Shares Outstanding}}.$$

- 13 anomaly characteristics from Lou, Polk, and Skouras (2019)
- Retail order imbalance (Boehmer, Jones and Zhang 2021), intermarket sweep order to proxy institutional trade

Extrapolation at the stock level - Fama-Macbeth regression

$$\text{OIB}_{int,t,i} = \alpha + \beta R_{9:45-3:59,t-1,i} + \delta' \text{OIB}_{\mathbf{t-1,i}} + \epsilon_{\mathbf{int,t,i}}$$

	9:30-9:45	9:45-10:30	10:30-4:00
$R_{9:45-3:59,t-1,i}$	1.8620 (26.88)	0.3332 (9.51)	-0.1537 (-9.68)
R^2 (%)	0.68	1.41	3.27



What happens with binding short sale constraint?

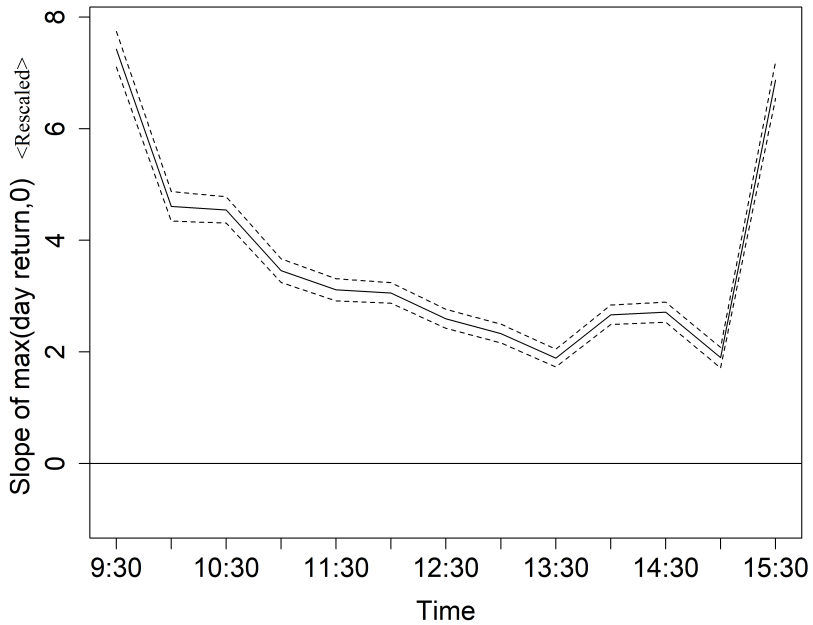
- Unconditional effect
  - Since returns are on average close to zero, return extrapolation does not imply any unconditional effect on morning OIB.

- However, short-sale constraints will only be binding when past returns are negative.
  - We test by adding "**Max(day return , 0)**" to the regression
  - If there is extrapolation, we expect $\beta_a > 0$.

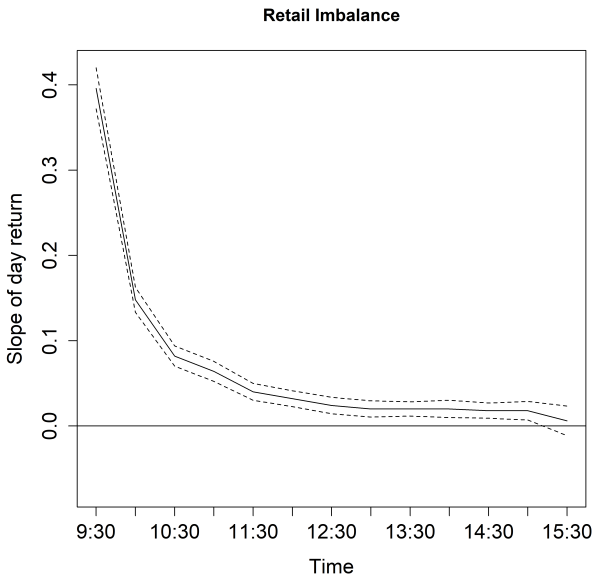
$$\begin{aligned} \text{OIB}_{int,t,i} = \alpha + \beta R_{9:45-3:59,t-1,i} \\ + \beta_a \max(R_{9:45-3:59,t-1,i}, 0) + \text{Control}_{t-1,i} + \epsilon_{int,t,i} \end{aligned}$$

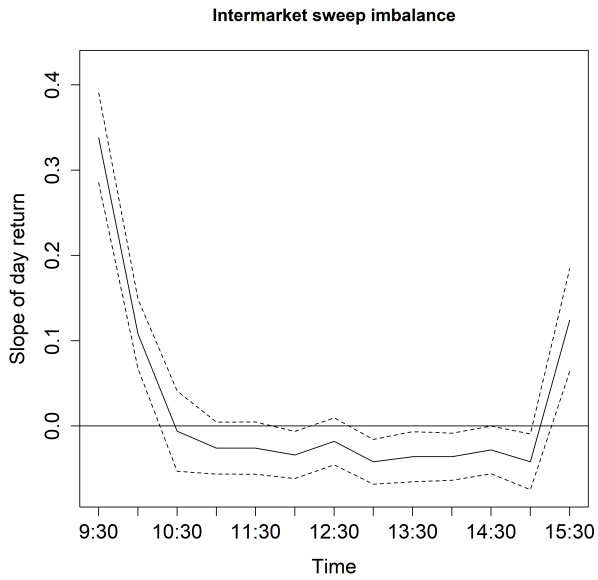
OIB predictability with short sale constraint

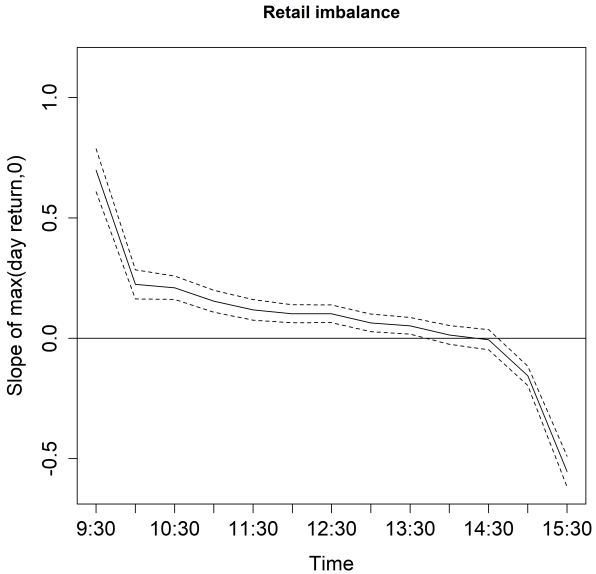
	9:30-9:45	9:45-10:30	10:30-4:00
$R_{9:45-3:59,t-1}$	0.8032	-0.3041	-0.4571
	(5.39)	(-3.98)	(-14.43)
$\max(R_{9:45-3:59,t-1}, 0)$	2.0664	1.3060	0.7893
	(9.56)	(11.66)	(18.14)
Control	Lagged night and week returns		
R^2 (%)	0.70	1.43	3.33

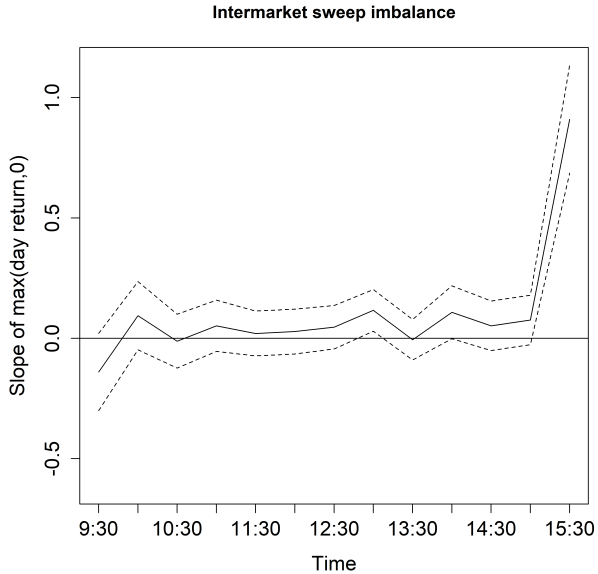


Retail (left) vs Institutional (right) Trade









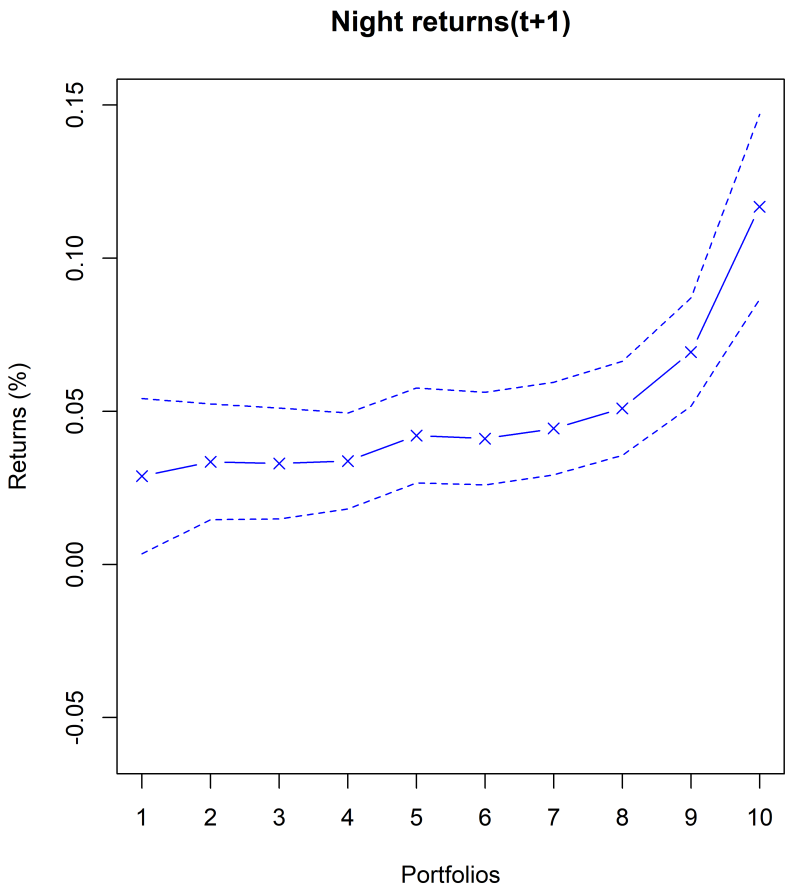
Return predictability - FM approach

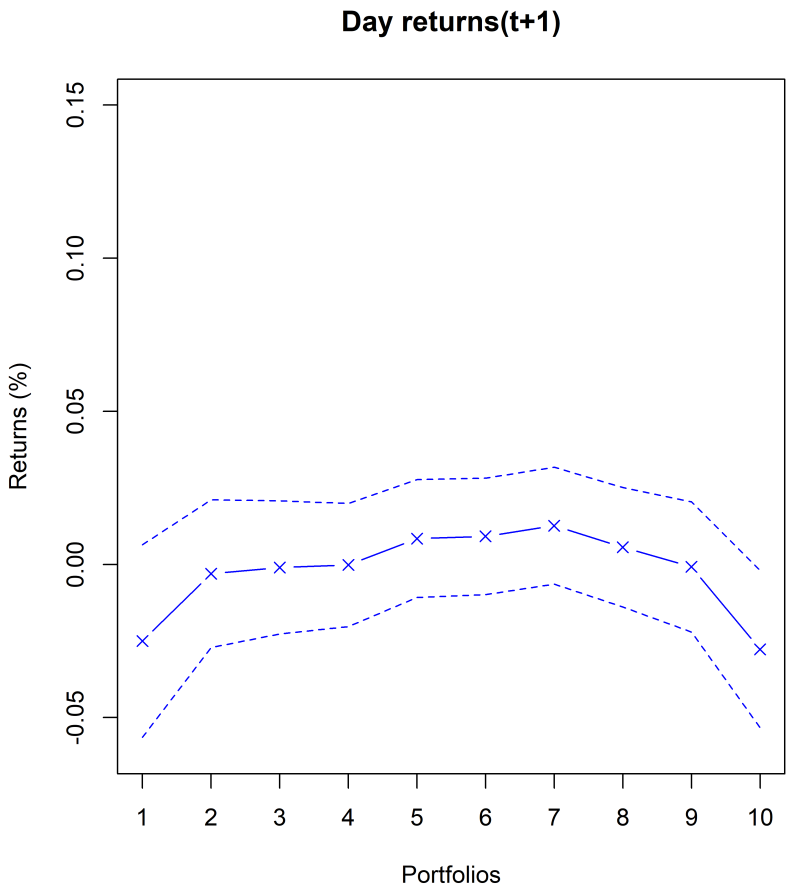
- To avoid mechanical reversal due to illiquidity and program trading, we use lagged day returns ending 3PM.

Dependent variable	Night returns: $R_{3:59-9:45,t}$				$R_{9:45-3:59,t}$
$R_{9:45-3:59,t-1}$	-0.1000				
	(-0.87)				
$R_{9:45-3:00,t-1}$		0.9533	0.8807	-0.3839	1.1716
		(8.12)	(7.92)	(-2.76)	(6.89)
$\max(R_{9:45-3:00,t-1}, 0)$				1.0215	-0.2479
				(4.72)	(-1.05)
$R_{3:59-9:45,t-1}$			3.1559	3.7447	-3.2472
			(10.29)	(30.05)	(-23.00)
Characteristic controls	N	N	N	Y	Y
R^2 (%)	0.00	0.03	0.05	0.14	0.06

Portfolio sorted by 3PM daytime returns (t)

Value-weighted portfolio returns





Morning extrapolation stronger for retail-focused stocks?

Regression of Order Imbalance

	Z=Mispricing		Z=Google Search Vol		Z=% Retail volume	
	9:30-9:45	10:30-4:00	9:30-9:45	10:30-4:00	9:30-9:45	10:30-4:00
$R_{9:45-3:59,t-1}$	0.9892	0.0969	2.4352	2.4352	0.4656	0.4903
	(4.07)	(1.96)	(28.55)	(-2.19)	(2.96)	(18.44)
Z $\times R_{9:45-3:00,t-1}$	0.0132	-0.0056	11.0916	-2.8402	46.2576	-8.7669
	(2.69)	(-5.75)	(5.39)	(-9.03)	(13.21)	(-17.63)
Z	0.0004	0.0003	0.1028	0.1028	-0.1656	0.0068
	(5.05)	(15.71)	(4.3)	(5.47)	(-2.46)	(0.57)

Regression of Returns

	Z=Mispricing		Z=Google Search Vol		Z=% Retail volume	
	Night	Day	Night	Day	Night	Day
$R_{9:45-3:59,t-1}$	-2.7646	-0.5491	-1.0307	-2.1700	-2.7459	0.6721
	(-2.15)	(-1.17)	(-2.72)	(-0.83)	(-3.62)	(2.58)
Z $\times R_{9:45-3:00,t-1}$	0.0642	0.0323	13.6811	1.3157	33.1346	-8.6307
	(2.93)	(3.09)	(6.74)	(0.13)	(6.12)	(-2.71)
Z	-0.0004	-0.0009	0.0322	-3.8893	0.3486	-0.4663
	(-0.89)	(-4.26)	(0.87)	(-1.03)	(3.82)	(-4.25)

Characteristic-sorted portfolios (13 × 10 portfolios)

- ▷ The short-sale constraint is captured by return dispersion of the portfolio
  - If the fraction of stocks with positive returns are higher, cross-sectional dispersion will increase

	OIB (× 1000)				Returns			
$R_{t-1,9:45-3:00}$	0.979	-0.713	0.929	-0.660	0.030	0.008	0.021	0.004
	(6.67)	(-23.27)	(6.58)	(-23.37)	(8.39)	(1.62)	(6.4)	(1.09)
Lag disp.			0.946	0.405			0.026	-0.039
			(6.16)	(12.96)			(7.67)	(-7.68)
$R_{t-1,3:59-9:45}$	0.030	-0.078	-0.014	-0.098	0.040	0.016	0.038	0.013
	(0.17)	(-1.94)	(-0.09)	(-2.62)	(8.87)	(2.59)	(9.25)	(2.45)
R^2 (%)	12.59	35.62	12.59	36.05	0.49	0.06	0.55	0.26

Extrapolation and overpriced stocks

- We further investigate whether market-wide extrapolation is more prevalent for overpriced stocks
- Characteristics are defined so that high (portfolio 10) is underpriced (positive alpha)
- Replace portfolio returns and dispersion with market-wide measure

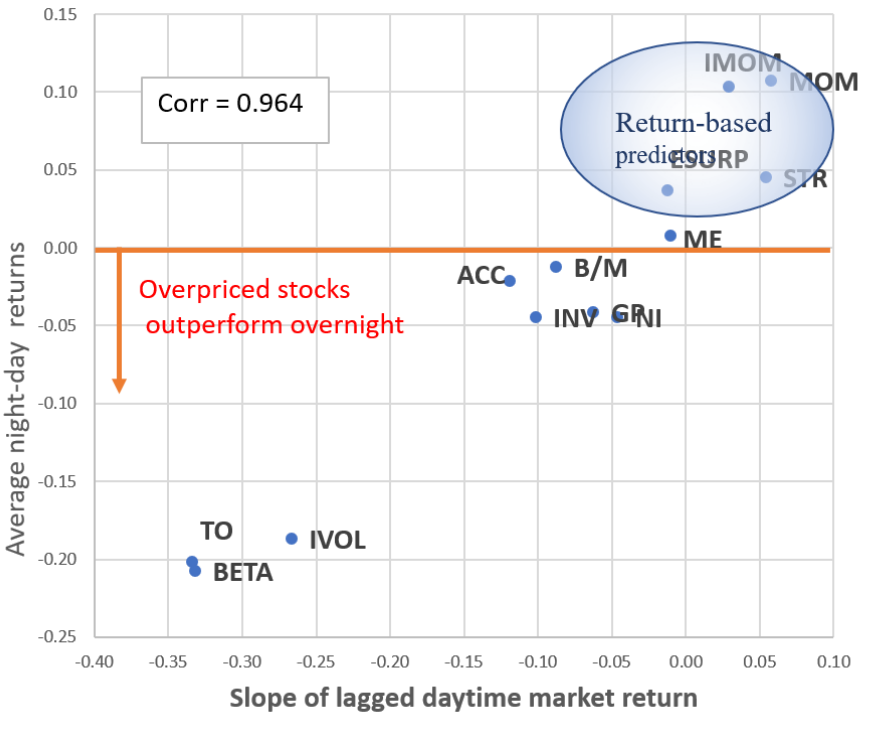
$$HML_{c,t+1} = \alpha_c + \beta_c R_{m,t} + \gamma_c \text{Disp}_{m,t} + \epsilon_{c,t+1},$$

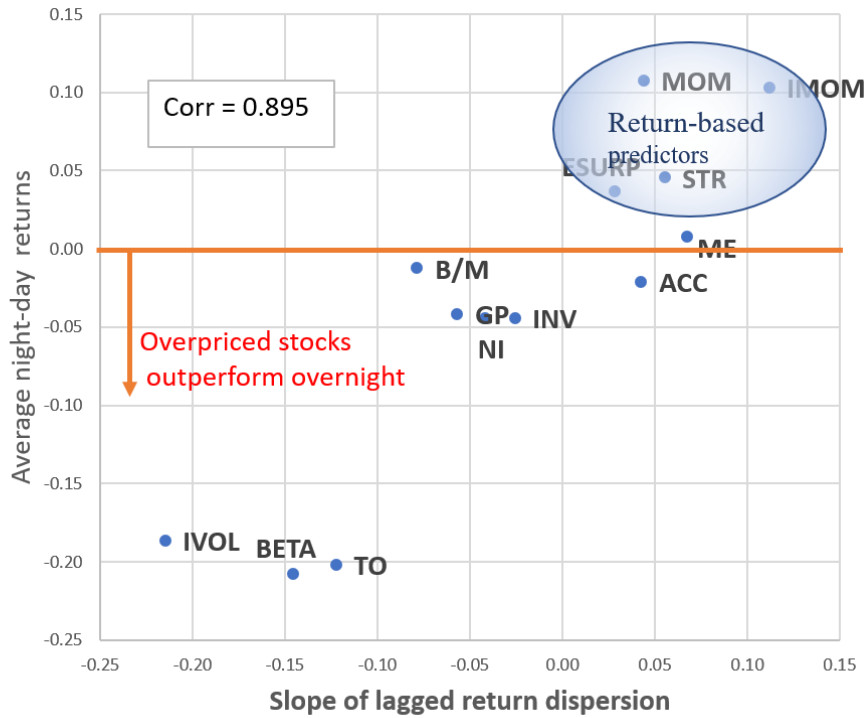
HML $=$ night $-$ day returns of the HML portfolio

- Compare the slope of this regression (β_c and γ_c) with the night-day return difference (as in LPS).

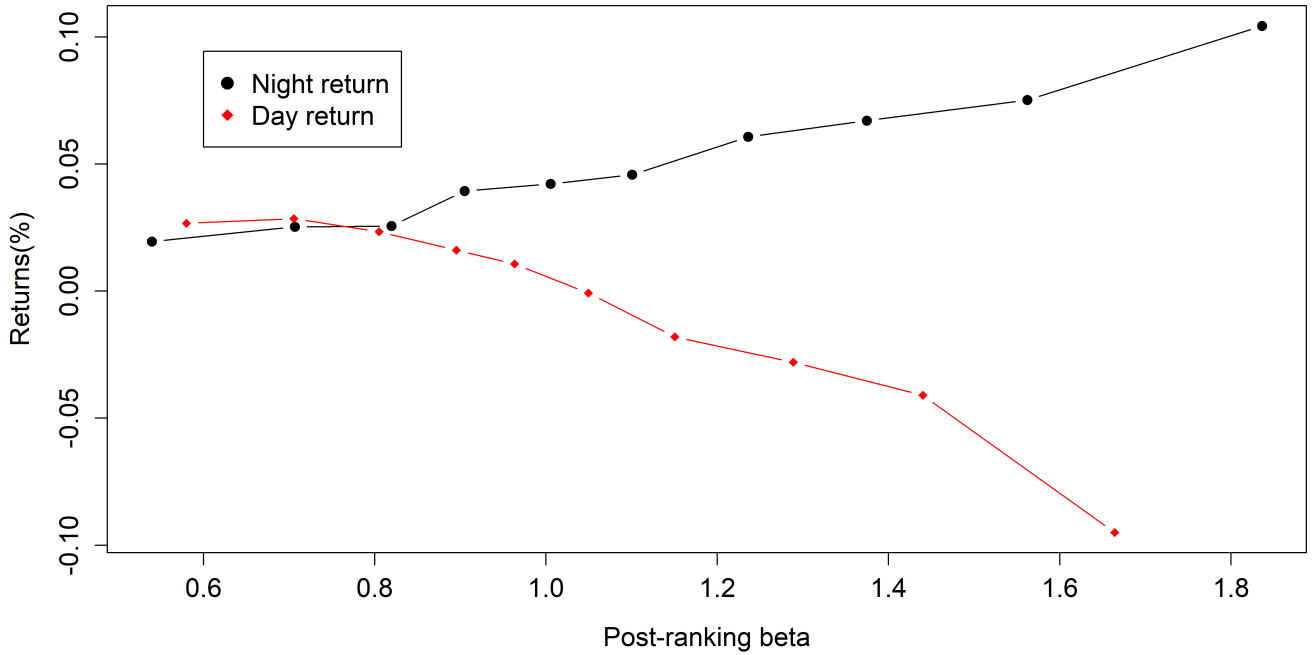
Day/night returns (y) vs. slopes of regression(x)

$$HML_{c,t+1} = \alpha_c + \beta_c R_{m,t} + \gamma_c \text{Disp}_{m,t} + \epsilon_{c,t+1}$$



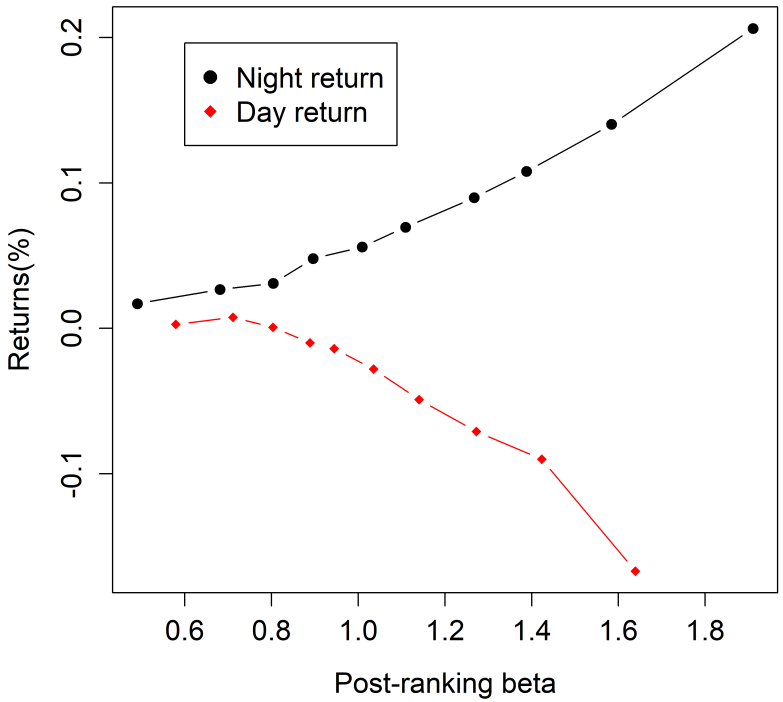


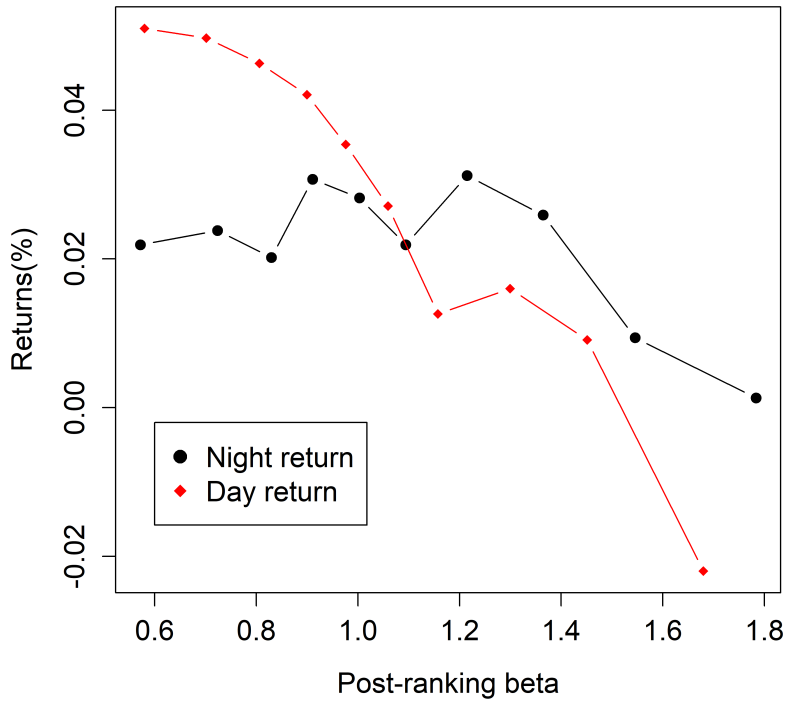
Security Market Line (SML) around the day



- Hendershott, Livdan, and Roesch (2020) argue that high beta stocks require *overnight risk premium*
- Also consistent with *extrapolating market returns* since market returns are on average positive
- If these patterns are driven by return extrapolation, we expect the overnight SML to be steeper following positive day returns

SML conditional on previous daytime returns





Following positive returns (left) and negative returns (right)

Market return extrapolation at the aggregate level

	Order Imbalance					
	9:30-9:45		10:30-4:00		Difference	
$R_{m,9:45-3:00,t-1}$	2.102	1.969	-0.151	-0.242	2.253	2.211
	(6.44)	(5.66)	(-1.26)	(-1.91)	(7.55)	(7.24)
Dispersion$(t-1)$		5.002		3.419		1.584
		(11.89)		(20.31)		(4.86)
R^2 (%)	1.06	6.56	0.03	21.62	1.49	2.15

	Returns					
	Night		Day		Night minus day	
$R_{m,9:45-3:00,t-1}$	0.039	0.039	-0.055	-0.055	0.094	0.094
	(2.04)	(2.07)	(-2.00)	(-2.00)	(2.90)	(2.91)
Dispersion$(t-1)$		-0.019		0.010		-0.028
		(-0.91)		(0.35)		(-0.88)
R^2 (%)	0.17	0.19	0.19	0.18	0.39	0.41

Conclusion

- ▷ We find strong evidence of extrapolative trading near the open.
- ▷ Our results explains:
  - Higher returns at the open for stocks that performed well the past day
  - Higher returns at the open for overpriced stocks
  - Steep SML for overnight returns