How harmful is insider trading for outsiders? Evidence from the eighteenth century

Mathijs Cosemans (Erasmus)
& Rik Frehen (Tilburg)

January 7th, 2022

Motivation

- Most existing work on insider trading focuses on **insiders**
- Insider trading data is subject to **sample selection issues**:
  1. **Self-reported** insider trades:
     - less profitable and more likely than unobserved insider trades
  2. Insiders **caught by the SEC**:
     - more profitable and less likely than unobserved insider trades
- Unclear how much outsiders expect to lose
  - Depends on the **likelihood** and **profitability** of **unobserved** insider trades
- **Hard to quantify gains** of access to private information
  - Do insiders have more share trading skills than outsiders?
  - Are insiders equally successful when trading other stocks and when trading in non-board years?

What do we contribute?

- **New research question**: what are the **financial consequences** of insider trading for **outsiders**:
  - What is the likelihood that an outsider trades with an insider?
  - How much does an outsider expect to lose due to insider trading?
- We **quantify financial gains** of access to material and non-public information **better**
  1. Control for **traders fixed effects** that absorb time-invariant trader characteristics
  2. Observe insider's trades in **other stocks**
  3. In contrast with earlier work: also observe trades of all outsiders $\rightarrow$ **compare performance of insiders** to that of **outsiders**
- We use early 18th century British stock trading data to **solve sample selection problems** of insider trading data

The advantages of historical data

1. We observe **every** transaction **with buyer and seller identities**
   - Not subject to sample selection issues of modern data because we observe **all** trades of **every** individual trader
2. **No legislative restrictions** on insider trading
   - Insiders can trade freely on material and non-public information
3. Default **insider definition** is trader-company-firm specific:
   - Board members are defined as insiders for that particular company for their board years only
4. **Measure outperformance** due to insider trading **more accurately**:
   - Control for insider fixed effects (skill, IQ)
   - Observe insider's trades in non-board years and other stocks
   - Compare performance to average outsider
5. Nature of the data allows us to ask **new research question**

Main results

1. Insider trades have **predictive power for future returns**
   - Insider trades have **no predictive power** in non-board years and for stocks where they do not serve on the board
   - Seems likely that they are based on material and non-public information
2. Insiders **outperform outsiders by 7% per year** (after including trader FE and time FE)
3. The **unconditional probability of buying from** (selling to) and insider is **small**: 1.72% (1.53%) per transaction
4. **Outsider's expected losses per sell transaction** are **small**:
   - Less than 1 (5) bps weekly (monthly) horizon due to insider trading
   - Less than 4 (10) bps weekly (monthly) horizon due to **informed** insider trading
   - Buys even smaller
   - Losses are relative to trading with another outsider

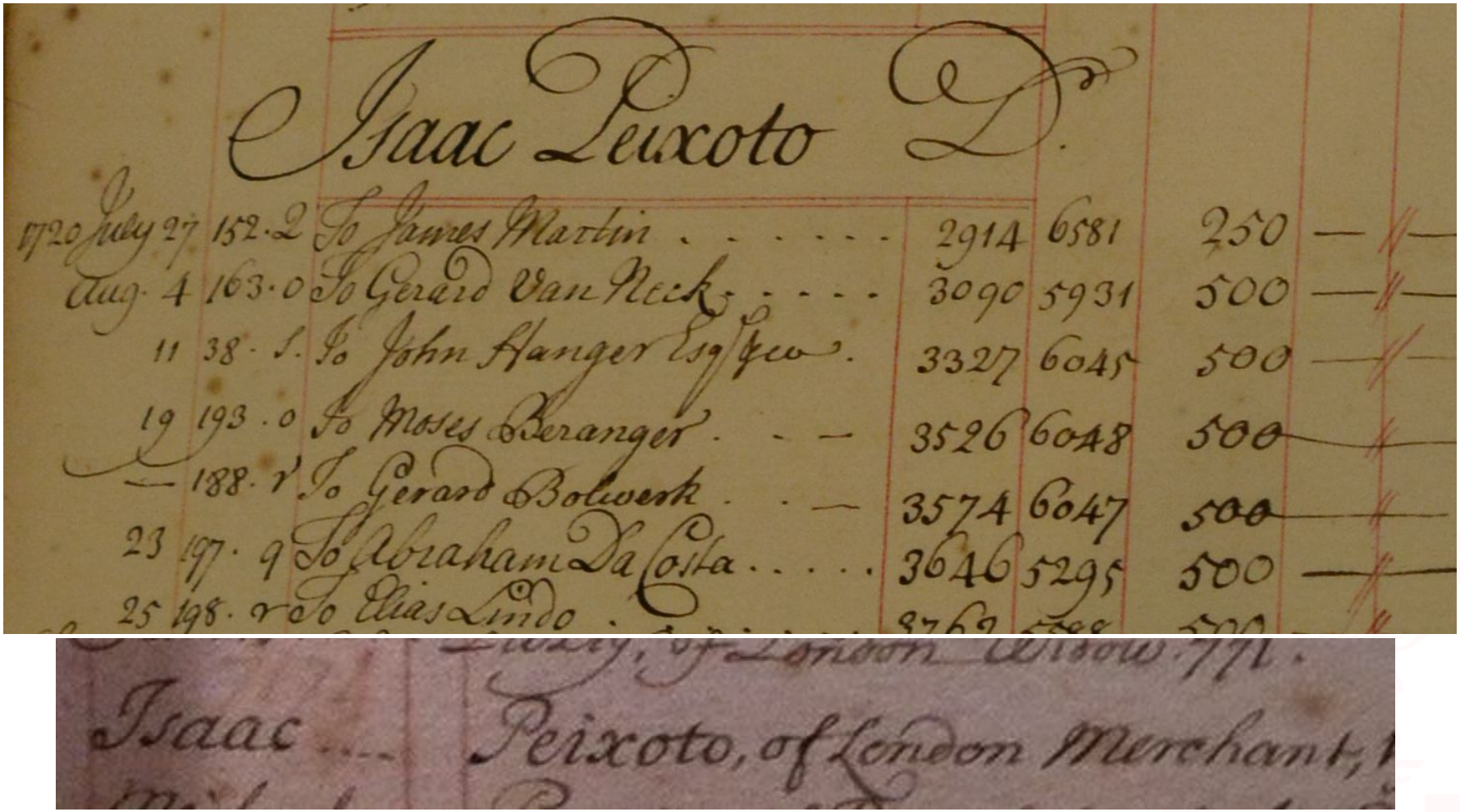
External validity

- Historical data naturally raises external validity concerns because markets and trading have changed dramatically over the last three centuries
- Traders can execute trades **anonymously** in our sample period
- Outsider's expected losses due to insider trading likely **even smaller** in today's market:
  1. Number of outsiders has grown rapidly
  2. Number of insiders has remained constant (see Ahern (2017))
  3. Insider trading legislation limits the number of opportunities to capitalize on private information
  4. Legislation also reduces the profitability of insider trades $\rightarrow$ more profitable trades more likely to get caught

Data

1. Every individual equity transaction with buyer and seller identity:
   - Bank of England Aug 1715 - Oct 1725
   - East India Company Jul 1715 - Mar 1723
   - Royal African Company May 1720 - Oct 1720
2. Cover more than 40% of the market $\rightarrow$ **representative** sample
3. For **every trader** and **every day** we observe:
   - Buys and sells (with counterparty identities)
   - Holdings for each share
4. Compute **realized** trading revenues for every trader over a weekly and monthly horizon
5. Often observe trader characteristics (e.g. occupation, street address)
6. Extract insiders (board composition) from each company's minutes of the board of directors

Ledger and index data



Summary statistics

- 14,116 traders between August 1715 - September 1725
- Default insider definition time-varying and stock-specific
  - Example: William Dawsonne is an insider for the Bank of England in 1718 (but not in 1717 and 1719)
- 123 insiders (defined as 24-26 board members per year)
- 54,140 transactions (3,350 by insiders)
- Insiders are more active and hold larger positions than outsiders

Do insiders outperform outsiders? (I)

	R^{MW}_{i,t_0+T}	R^{MW}_{i,t_0+T}	R^{MW}_{i,t_0+T}	R^{MW}_{i,t_0+T}	R^{MW}_{i,t_0+T}	R^{MW}_{i,t_0+T}
Frequency	Week	Week	Week	Month	Month	Month
Companies	All	No RAC	All	All	No RAC	All
Bubble period	Incl.	Incl.	Excl.	Incl.	Incl.	Excl.
	(1)	(2)	(3)	(4)	(5)	(6)
InsDum	0.14	0.10	0.07	0.45	0.39	0.42
	(3.73)	(3.01)	(1.81)	(3.30)	(3.07)	(3.27)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Trader FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	25.13	21.77	12.62	34.48	32.46	19.66
# Obs.	2,744,383	2,715,834	2,453,306	643,981	636,302	573,114

Do insiders outperform outsiders? (II)

1. Default insider definition time-varying and stock-specific
2. Allows us include trader fixed effects and control for time-invariant trader characteristics
3. Insiders outperform outsiders by approximately 7% per year
4. Outperformance exclusively realized during the board years
5. Robust to changes in the horizon (weekly, monthly) and insider definition

Outsiders' expected losses due to informed trading?(I)

$$E\left(L_B\right) = -\pi_B^{ins}\left[E\left(R_B^{ins}\right) - E\left(R_B^{out}\right)\right]$$

- π_B^{ins} is the unconditional probability that an outsider buys from an insider
- $E\left(R_B^{ins}\right)$ the average stock return in the week/month after an outsider buys from an insider
- $E\left(R_B^{out}\right)$ the average stock return in the week/month after an outsider buys from another outsider
- If insider sales are informative: $E\left(R_B^{ins}\right) < E\left(R_B^{out}\right)$ and $E\left(L_B\right) > 0$
- $E\left(L_S\right)$ is defined equivalently for outsider sells

Outsiders' expected losses due to informed trading?(II)

Holding period	Week			
	π_k^n	$E(R_k^n)$	$\pm\pi_k^n \times E(R_k^n)$	$E(L_k)$
	(1)	(2)	(3)	(4)
Sell to insider ($k = S, n = ins$)	1.72%	0.99%	-1.69 bps	0.93 bps
Sell to outsider ($k = S, n = out$)	98.28%	0.45%	-43.92 bps	
Buy from insider ($k = B, n = ins$)	1.53%	0.43%	0.65 bps	0.03 bps
Buy from outsider ($k = B, n = out$)	98.47%	0.45%	44.01 bps	

Holding period	Month			
	π_k^n	$E(R_k^n)$	$\pm\pi_k^n \times E(R_k^n)$	$E(L_k)$
	(1)	(2)	(3)	(4)
Sell to insider ($k = S, n = ins$)	1.72%	3.26%	-5.61 bps	4.54 bps
Sell to outsider ($k = S, n = out$)	98.28%	0.62%	-61.34 bps	
Buy from insider ($k = B, n = ins$)	1.53%	0.43%	0.66 bps	0.29 bps
Buy from outsider ($k = B, n = out$)	98.47%	0.62%	61.46 bps	

Additional findings

- Some corporate events create large information asymmetries between insiders and outsiders and insiders take advantage of these events
  - For instance: the opportunity to collateralize stocks for cash
- Results robust to changes in insider definition
  - Including politicians, brokers, neighbours, friends and family as insiders
- Main findings do not change when focusing on the most profitable insider trades
  - Where most profitable insider trades proxy for informed trades

Conclusions

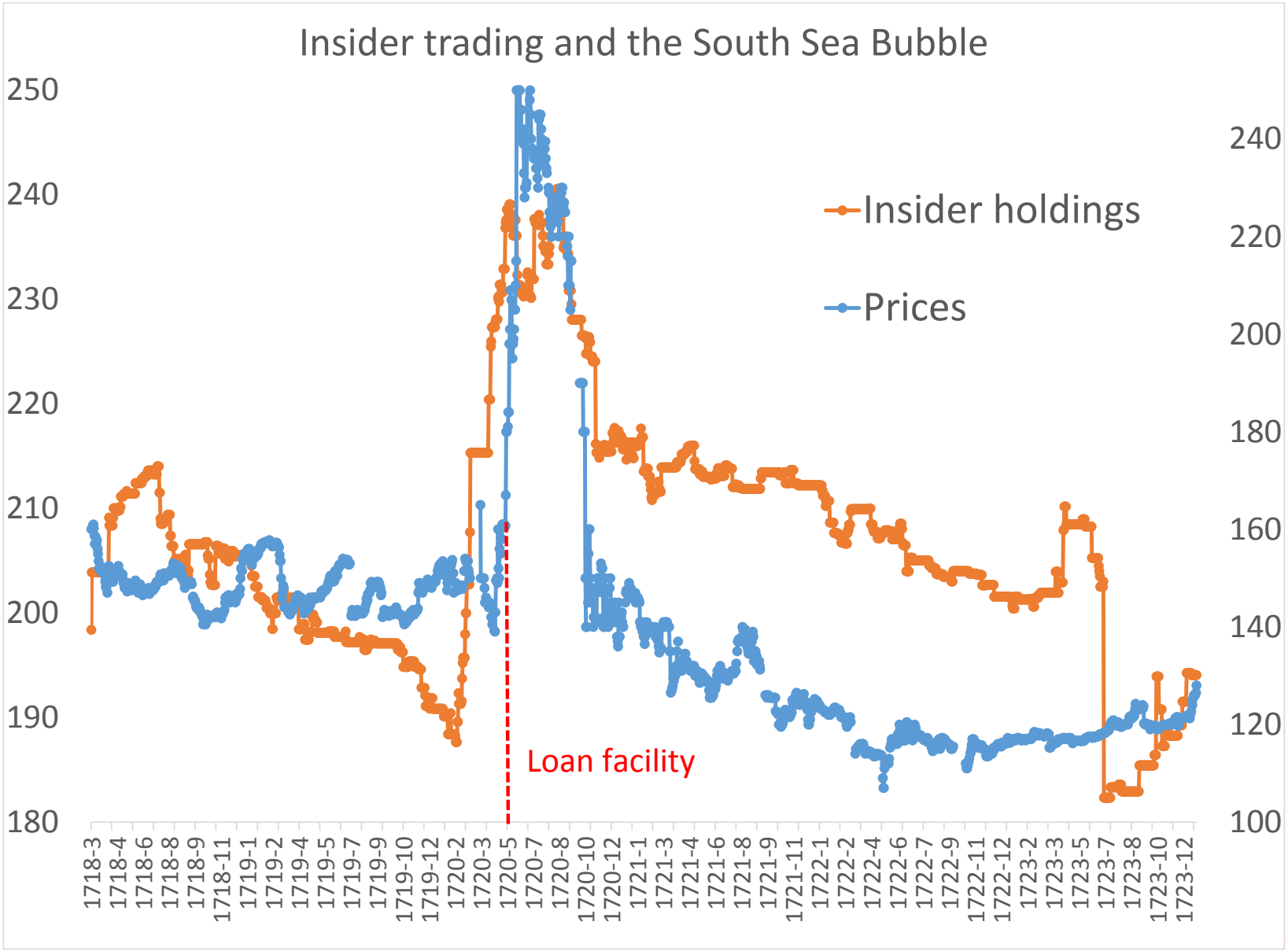
1. Insider trades predict stock returns
   - No predictive power in non-board years
   - No predictive power for other shares
2. Insiders outperform outsiders by 7% per year (after including trader FE and time FE)
3. Nevertheless, outsiders' expected losses are small because probability of trading with an insider are small $\leftrightarrow$ 25 basis points brokerage fee per transaction
4. Outsider expects to lose less than a few basis points per transaction due to (informed) insider trading

Changing the insider definition

1. *Board + Pre&Post Board*: Also defines directors as insiders for the years prior to accessing and after leaving the board
2. *Board + Other board*: Defines traders as insiders also for the other companies during their board years
3. *Boards + Neighbours*: Also defines traders who live in the same neighbourhood (ward) as the insider and trade in the same direction as insider
4. *Board + Friends*: Also defines outsiders who replicate the insiders' most profitable trades as insider
5. *Board + Politicians*: Also defines all members of the British parliament as insider

Example informed trading (I)

- Did insiders anticipate the price run up?
- Scott (1912): *"The effect of these loans [on stock] was to bring about a rapid rise in quotations. The increase in resources available for making purchase added to the demand; while at the same time, it was necessary for the borrowers to deposit with the company stock which had a larger market value than the sums lent on it. Thus, while the demand was increased, the supply was artificially restricted."*
- In a related paper (Braggion, Frehen and Jerphanion (2021)) we show that loan holders indeed fueled the bubble


Insider trading and the South Sea Bubble
Insider holdings
Prices
Loan facility
250
240
230
220
210
200
190
180
240
220
200
180
160
140
120
100
1718-3
1718-4
1718-6
1718-8
1718-9
1718-11
1719-1
1719-2
1719-4
1719-5
1719-7
1719-9
1719-10
1719-12
1720-2
1720-3
1720-5
1720-7
1720-8
1720-10
1720-12
1721-1
1721-3
1721-4
1721-6
1721-8
1721-9
1721-11
1722-1
1722-2
1722-4
1722-6
1722-7
1722-9
1722-11
1722-12
1723-2
1723-3
1723-5
1723-7
1723-8
1723-10
1723-12

Example of informed trading (II)

	Insider trading activity			
	Buy		Sell	
	c	$D_{Apr1720}$	c	$D_{Apr1720}$
# Insider trades	3.42	24.58	3.47	-2.47
	(4.24)	(30.49)	(5.37)	(-3.82)
Insider trading volume	47.53	299.97	50.59	-40.59
	(5.30)	(33.46)	(5.13)	(-4.12)
# Insiders trading	2.59	10.41	2.45	-1.45
	(5.01)	(20.18)	(5.63)	(-3.33)

	Outsider trading activity			
	Buy		Sell	
	c	$D_{Apr1720}$	c	$D_{Apr1720}$
# Outsider trades	227.42	520.58	227.37	547.63
	(7.62)	(17.45)	(7.58)	(18.26)
Outsider trading volume	1984.94	4575.81	1981.87	4916.38
	(7.23)	(16.66)	(7.19)	(17.83)
# Outsiders trading	189.50	302.50	178.39	409.61
	(8.48)	(13.54)	(8.32)	(19.11)

What is the likelihood of trading with an insider? (I)

	#	Buy	Sell	Buy/Sell
All companies	0	95.61	95.29	92.42
	1	3.11	3.40	5.36
	2	0.50	0.53	0.85
Bank of England	0	96.67	96.47	94.13
	1	2.40	2.61	4.26
	2	0.42	0.42	0.70
East India Company	0	95.27	93.97	91.10
	1	3.30	4.39	6.26
	2	0.62	0.62	0.98
Royal African Company	0	95.81	97.17	93.66
	1	3.46	2.29	5.12
	2	0.24	0.29	0.54

What is the likelihood of trading with an insider? (II)

1. 90% of all outsiders never trades with an insider
2. More than 97% trades at most once with an insider during our sample period
3. Note that not all insider trades are informed
4. The percentage of outsiders that trades with an *informed* insider is even smaller
5. These percentages do not vary a lot across companies

Performance measure

$$R^{MW}_{i,t_0+T} = \frac{H_{iT} + \sum_{t\in[t_0,T]} D_{it} - \left(H_{i0} + \sum_{t\in[t_0,T]} CF_{it}\right)}{H_{i0} + \sum_{t\in[t_0,T]} w_t CF_{it}}$$

$$H_{i0} = \sum_{j\in J} P_{j0} Q_{ij0} \qquad H_{iT} = \sum_{j\in J} P_{jT} Q_{ijT}$$

$$CF_{it} = \sum_{j\in J} P_{jt} Buys^N_{ijt} - \sum_{j\in J} Sells^N_{ijt} \qquad w_t = \frac{T-t}{T-t_0}$$

with

- Q_{ijt} the number of shares j purchased by trader i at t
- D_{it} dividends received by trader i at t
- P_{jt} the price of share j at t

Outsider losses due to **informed** insider trading? (I)

$$E\left(L_B^{inf}\right) = -\pi_B^{ins}\pi_B^{inf}\left[E\left(R_B^{inf}\right) - E\left(R_B^{out}\right)\right]$$

- $E(L_B^{inf})$ is the outsider's expected loss due to buying from an informed insider
- An insider buy is **informed** if the return after the outsider's purchase is below $-R^{th}$
- π_B^{ins} the unconditional probability of buying from an insider
- π_B^{inf} the unconditional probability that the purchase is **informed**
- R_B^{out} is the average return after buying from another outsider

Outsider losses due to **informed** insider trading? (II)

R^{th}	π_S^{ins}	π_S^{inf}	$\pi_S^{ins} \times \pi_S^{inf}$	$E(R_S^{inf})$	$E(L_S^{inf})$
	(1)	(2)	(3)	(4)	(5)
			Week		
0%	1.72%	50.29%	0.87%	4.28%	3.32 bps
3%	1.72%	17.83%	0.31%	10.26%	3.02 bps
6%	1.72%	9.94%	0.17%	15.10%	2.51 bps
9%	1.72%	6.29%	0.11%	19.48%	2.06 bps
12%	1.72%	4.23%	0.07%	23.92%	1.71 bps
15%	1.72%	2.40%	0.04%	31.36%	1.28 bps
			Month		
0%	1.72%	54.63%	0.94%	10.33%	9.14 bps
3%	1.72%	31.66%	0.55%	16.77%	8.81 bps
6%	1.72%	19.66%	0.34%	24.33%	8.03 bps
9%	1.72%	15.77%	0.27%	28.51%	7.58 bps
12%	1.72%	14.17%	0.24%	30.52%	7.31 bps
15%	1.72%	13.26%	0.23%	31.61%	7.08 bps