Individual Investors and Volatility

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Motivation (1): Understanding volatility

- Understanding the source of volatility is key for many areas in Finance.
- Two views on volatility:
    - Volatility is due to the arrival of information (public or private reflected into trades) on fundamentals.
        - But news alone do not seem to explain price movements (e.g. Shiller (1981)).
    - Volatility is also due to “noise trading” (trades unrelated to change in fundamentals)
- Can we identify *empirically* the role of noise trading on volatility?

Motivation (2) : Volatility in the time-series

- Campbell et al. (2001) uncovers a long-term increase in the idiosyncratic volatility of daily returns at individual stock levels from 1962 to 1997.
  - Potential explanation: "*Day trading by small individual investors may also be an influence on the idiosyncratic volatility of some stocks, particularly at the end of our sample period*"(Campbell et al. (2001), p40).

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- Extending sample to 1920-2007, Brandt&al.(2008) suggest that:
  1. There is no trend, but low frequency fluctuations.
  2. Increase in volatility driven by stocks attracting retail investors (e.g., penny stocks).
  3. Again, potential explanation: "*We there hypothetize that the observed idiosyncratic volatility patterns is at least partially induced by speculative trading on the part of retail investors.*"(Brandt&al. (2008), p.2)

Is it sensible to think retail investors can move prices?

1. Yes, retail investors are a small fraction of volume:
   - $\simeq$3% for large caps, 8% for small caps (Kaniel et al, 2007)
2. Yet, some days with intense individual trading:
   - 15% of volume one day a month for large caps
3. On average, individuals *do* herd (Dorn et al, 2008).
4. Institutions *don't* herd (Lakoshnikov et al., 1992; Wermers, 1999).

$\Longrightarrow$ retail investors may contribute to *imbalance*, if not to volume.

Main Hypothesis and causality issue

Hypothesis: Retail trading increases idiosyncratic volatility.

- Difficult to test this hypothesis because retail traders' participation in a stock is endogeneous (reverse causality issue).
    1. Kumar (2009): individual investors prefer stocks with high idiosyncratic volatility and skewness
    2. High volatility stocks are more likely to grab investors' attention
- How to identify the causal effect of retail trading on volatility?

A quasi natural experiment on the French stock market

- We exploit a reform of the French stock market that restrained individual trading.
    - Until September 2000: the French stock market was a two-tier market featuring:
        - The "**Règlement Mensuel**" (**RM**): a market with end of the month settlement for actively traded stocks.
        - The "Marché Au Comptant:" **a spot market for other stocks, with T+5 days settlement.**
- Since 19th century, most actively traded stocks traded on RM.
- And since the 80s, no spot market for these stocks.
- Main advantage for retail investors: could buy stocks on margin or short-sell stocks very easily.

Monthly settlement on the **RM**

- **Example**: Investor A buys a stock on June 5, 2000 at $P_{June,5}$ =€20. For this month, the settlement date is June 30 and the last trading day for this settlement is June 23. On this day, the closing price is $P_{June,23}$ =€18.(Assume 0% roll-over rate.)

	Cash-Flows		
	June 23	June 30	July 28
Close position on 6/10 at €22	0	€2	0
Roll over position/Close at €24 on 7/5	0	-€2	€6
Take delivery on 6/30	0	-€20	0

The actual reform

- This system was suppressed on September 25, 2000.
- Since this date, all stocks on the French stock market trades in a "spot" market .
- Motivation for the reform:
  - Merger with Amsterdam and Brussels (Announced October 2000, effective January 2002).
  - Line up with international settlements procedures.

An experimental approach

- Effect of this reform on trading cost:
  - Before the reform: buying on margin/short selling is cheap for stocks on forward market
  - After the reform: speculative positions become costly, especially for retail investors.
- Our "experimental" approach:
  - Treatment: stocks from forward to spot market. [155 stocks on average]
  - Control: stocks always traded on spot market. [678 stocks on average]
  - Before-After: September 25th, 2000 – 2/4 years windows.

$\Longrightarrow$ Does restraining retail trading reduce volatility?

Data

- All stocks listed on the French stock market from September 1998 to September 2002.
- Data on all trades by retail investors at a major French on-line broker: 111,264 households from 1999-2002.
  - Broker's market share over 1999-2002: 40%.
  - On-line brokers accounts for 18% of all trades.

Methodology (1)

- Standard differences-in-differences:

$$Y_{it} = \alpha + \beta_0 T_i + \beta_1 POST_t + \beta_2 T_i \times POST_t + \varepsilon_{it}$$

- Identifying assumption: Treatment is exogenous to future outcome.
  $\Longrightarrow$ β_2 is the causal impact of the reform on Y_{it}:
- But treatment depends on observable characteristics (size and turnover) that may affect future outcome.
  $\Longrightarrow$ Matching approaches: (1) Quartile Matching (2) Percentage difference matching (3) Propensity score matching.

Methodology (2)

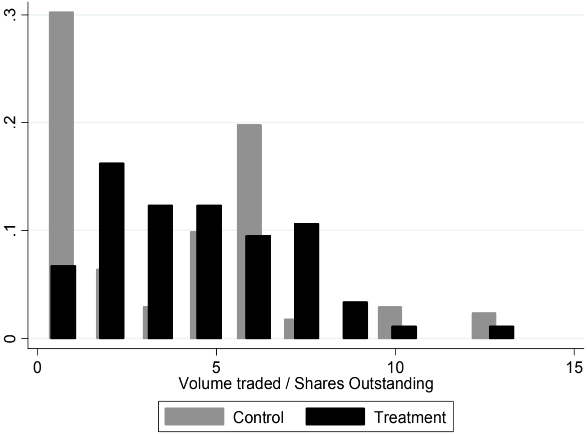


Figure 1: Matched Sample (Propensity Score Matching)

Methodology (3)

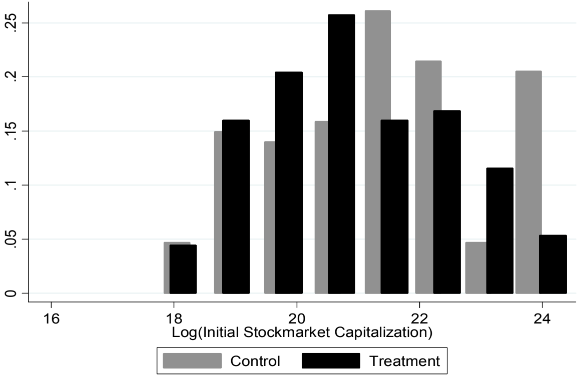
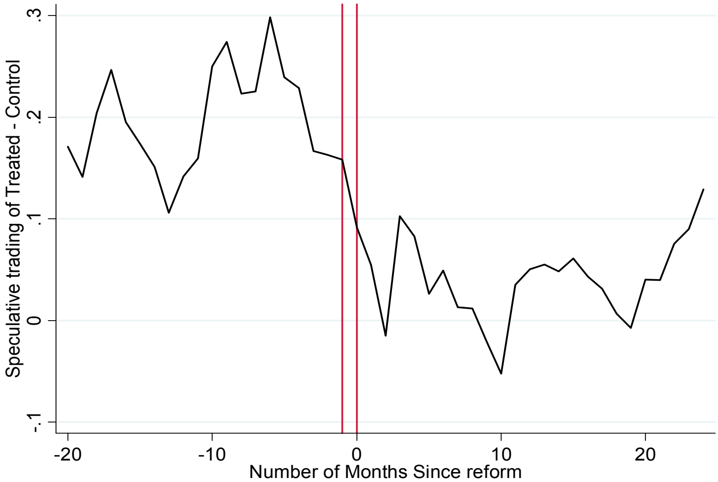


Figure 2: Matched Sample (Propensity Score Matching)

First-stage: Does the reform affect retail trading?



First-stage: Does the reform affect retail trading? (2)

- **YES:** Retail trading activity measures fall by about 2% after the reform.

	# Buys	#Sells	#Spectrades
	(1)	(2)	(3)
Treated× Post (β_2)	-0.020	-0.022	-0.014
	[-4.15]	[-4.77]	[-6.20]
Treated	0.002	0.009	0.011
	[0.37]	[1.61]	[4.56]
Post	-0.009	-0.005	-0.000
	[-1.81]	[-1.14]	[-0.06]
Constant	0.046	0.038	0.011
	[9.35]	[8.19]	[5.86]
Observations	29214	29214	29214
R^2	0.01	0.01	0.01

Are retail investors a source of volatility?

	DD	Quartile matching	% difference matching	Propensity score matching
Dependent variable: Volatility (Implication #1)				
Treated×Post	-0.297	-	-	-
	[-5.47]			
Treated	-0.472	-	-	-
	[-8.52]			
Post	0.200	-0.194	-0.172	-0.274
	[1.60]	[-2.97]	[-2.71]	[-3.25]
Constant	2.877	-0.227	-0.192	-0.238
	[30.80]	[-4.41]	[-3.31]	[-3.52]
Observations	30181	7398	4552	5652
R^2	0.06	0.01	0.01	0.01

- Drop in volatility between 34% to 11% of the standard deviation of the pre-reform volatility of treated stocks .

Interpreting this result: retail investors as “noise” traders

How can we make sense of this result?

- Retail trading can become a source of volatility:
  - If retail investors trade for reasons $\perp$ fundamentals.
  - And if there are limits to arbitrage.

- **Individual investors do not seem to trade for fundamental reasons only:**
  1. Stocks heavily purchased (sold) by individuals underperform (overperform) (Barber et al.(2006); Hvidkjaer (2006)).
  2. Individuals make trading mistakes (see Barber and Odean (2001, 2002, 2004)).

$\Longrightarrow$ We explore this idea in a model of noise trading a la DSSW.

A simple model of noise trading

- **Simple extension of DSSW with:**
  1. Uncertain dividends.
  2. Differential trading costs for noise traders and sophisticated investors
- What happens when trading costs increase more for noise traders relative to sophisticated investors? (i.e. in the RM vs. the spot market?)
- Note: Not necessarily a "behavioral", but a reduced form, model:
  - Similar predictions could be derived with endowment shocks, shocks to risk aversion (CGW, 93) or liquidity shock.

Testable implications from the model

- Prediction #1: The volatility of stock returns ($Var(R_{t+1})$) is smaller in the spot market than on the RM.
  - Noise traders take smaller (long or short) positions when trading is more costly for them $\Longrightarrow$ Swings in noise traders' sentiment have less impact on prices.
- Prediction #2: The absolute auto-covariance of stock returns is smaller in the spot market than on the RM.
  - Suppose high noise traders' sentiment at date $t \Longrightarrow$ High price at date $t \Longrightarrow$ High return from date $t-1$ to date t on average but low return from date t to date $t+1$ on average as investors' sentiment is not persistent.
    $\Longrightarrow$ Noise trading induces reversals in stock returns.
  - A smaller sensitivity of prices to investor's sentiment (higher trading restraint) $\Longrightarrow$ magnitude of reversals is smaller.

Testable implications from the model (2)

- Prediction #3: The price impact of noise traders' order imbalances is smaller on the spot market than on the RM.
  - Greater costs on noise traders
    $\Longrightarrow$ less volatility
    $\Longrightarrow$ sophisticated investors face less "inventory" risk
    $\Longrightarrow$ They demand a smaller compensation to absorb a given order imbalance from noise traders.

Testing prediction #2

- Prediction #2: In absolute value, the autocovariance of treated stocks relative to control stocks declines after the reform.

	DD	Quartile matching	% difference matching	Propensity score matching
Panel B: Dependent variable: Autocovariance of Returns (Implication #2)				
Treated×Post	0.293	-	-	-
	[3.24]			
Treated	0.109	-	-	-
	[1.74]			
Post	-0.484	0.611	0.329	0.437
	[-5.19]	[4.06]	[2.18]	[2.26]
Constant	-0.231	-0.137	-0.172	-0.118
	[-2.81]	[-1.27]	[-1.85]	[-1.06]
Observations	29325	7378	4512	5578
R^2	0.01	0.02	0.00	0.01

Testing prediction #3

- Prediction #3: The Amihud ratio for treated stocks relative to control stocks declines after the reform, i.e., $\beta_2 < 0$.

	DD	Quartile matching	% difference matching	Propensity score matching
Panel C: Dependent variable: Amihud Ratio (Implication #3)				
Treatment×Post	-4.029	-	-	-
	[-4.36]			
Treated	-8.120	-	-	-
	[-11.73]			
Post	4.119	-1.455	-2.087	-0.776
	[4.47]	[-4.78]	[-3.05]	[-1.62]
Constant	8.173	-0.630	-0.776	-0.308
	[11.81]	[-4.83]	[-4.01]	[-3.62]
Observations	31716	7484	4680	5818
R^2	0.04	0.04	0.01	0.00

Quantifying the effect (1): IV approach

- We use the reform as an instrument for retail trading activity in a regression of volatility on retail trading :

Dep. Variable	#Trades	Volatility	Volatility
Treated×Post	-0.041	-	-
	[-5.02]		
Post	-0.015	0.220	0.305
	[-3.76]	[9.39]	[5.93]
Treated	0.010	-0.686	-0.633
	[0.98]	[-17.41]	[-10.71]
#Trades	-	2.966	6.315
		[23.59]	[3.76]
Constant	0.084	2.701	2.385
	[19.96]	[88.83]	[14.96]
R^2	0.01	0.20	0.04

Size of the effects

- #Trades fall by about 4% due to the reform $\Longrightarrow$ Total effect of the reform on volatility: $-6.31*4\% = -0.25$ (twenty five basis points), as in Diff-in-Diff approach.
- How much volatility is due to retail traders?
  1. #Trades=9% in 2000.
  2. Thus, if we shut down retail trading volatility would drop by: $-6.31*9\% = -0.56$, i.e., 56 basis points or 23% of pre-reform volatility.
  3. Not large but in line with other empirical studies that attempt to measure the contribution of noise trading to volatility (e.g., Roll (1988), French and Roll (1986)).

Robustness checks

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- Improvement in liquidity of treated stocks unrelated to change in the amount of noise trading?

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  - Yet, the effect of the reform is robust to controlling for stock returns?

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  - Yet, no change in bid/ask spread following the reform.
- Positive contemporaneous relationship between volatility and returns at individual stock levels (e.g., Duffee (1995)).
  - Yet, the effect of the reform is robust to controlling for stock returns?
- The choice of the sample period around the reform?
  - Yet, results robust to various windows around the event.

Conclusion

- Our findings support the hypothesis that retail trading is a cause of volatility.
- **But we do not identify the drivers of retail trading and its impact on volatility:**
  1. Irrationality?
  2. Correlated hedging needs?

THANK YOU

THANK YOU

Back-up slides

Correlation between volatility and retail trading

- **We first estimate the following regression:**
  $\text{Volatility}_{it} = \alpha_i + \lambda_t + \beta_1 TA_{it} + \varepsilon_{it}$, to check whether volatility and retail trading activity are positively associated in our sample.

($\times$100)			**Monthly Volatility**			
#Trades=#Buys+#Sells	3.0***	2.0***	1.8***			
	[16.1]	[22.4]	[11.6]			
#Spectrades				10.5***	7.2***	6.0***
				[17.2]	[11.4]	[16.2]
Stock FE	No	Yes	Yes	No	Yes	Yes
Time FE	No	No	Yes	No	No	Yes
Observations	24,625	24,625	24,625	24,625	24,625	24,625

Changing the window size

Window	36-months			24-months		
	Volatility	Autocov.	PImpact	Volatility	Autocov.	PImpact
Post	-0.275	0.483	-0.861	-0.248	0.290	-0.810
	[-3.51]	[2.21]	[-1.44]	[-3.33]	[1.14]	[-1.28]
Constant	-0.288	-0.175	-0.354	-0.346	-0.162	-0.414
	[-3.93]	[-1.65]	[-3.45]	[-4.11]	[-1.07]	[-3.08]
N	4309	4255	4436	2916	2867	3022