Endogenous Risk Aversion and Financial Decision Making

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How general is risk preference

- Is it domain/context specific
- Or is it a true, singular primitives that apply across domains
  - Psychological factors affect risk perception/risk aversion
  - Do these changes due to psychological factors in one domain affect risk-preference in others?

Stock market as the bridge

- Market condition (returns, volatility) = Bridge conditions (swaying)
- Look for decision-making outside of stock market behavior
  - Demand for insurance
  - Hurdle rate for loan applications

Do stock market conditions affect traders?

- Evidence that stock market performance affects emotional state
  - Low and Repin (2002)
    - "Even the most seasoned trader exhibits significant emotional response, as measured by elevated levels of skin conductance and cardiovascular variables, during certain transient market events such as increased price volatility."
  - Engelberg and Parsons (2016)
    - Find an inverse relationship between daily stock returns and contemporaneous hospital admissions.
  - Guiso, Spaienza and Zingales (2018)
    - Individuals had substantially increased risk aversion in both qualitative and quantitative measures following the collapse of Lehman Brothers
    - Experiment in which subjects exhibited increased risk aversion if they were shown a "brief horrifying scene" from a movie.

Increased Risk Aversion

- Volatility increases risk aversion across domains
  - Predictions
    1. More risk aversion = higher demand for insurance
    2. More risk aversion = higher bar for loans
       A. Loans perform better
       B. Loans look better on paper
       C. Fewer loans approved

Empirical challenges

- Identification
- Isolating Mechanism
  - Neoclassical Learning (broadly defined)
    - Relevant information about the future contained in that day's stock market performance
      - Seems unlikely, but easy to test
        - Check for informational content by checking if daily stock market performance, controlling for seasonality, predicts future market performance
    - Unobserved variable(s) correlated with stock market performance and demand for insurance AND makes loan officer more likely to reject marginal loans
      - Again unlikely, but we can try to test
        - Check for robustness to excluding "extreme" days that are the most likely to contain significant new information
  - Other behavioral responses
    - Distraction

Stock Market Participation in China

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Stock Market Participation in China

Prevalent at work (Shangban Chaogu)上班炒股

Prevalent at work

- Google returns 3.36 million results for 上班炒股 (Shangban Chaogu) or “trading on job”
- Recent surveys show:
  - **94.9%** of white collar workers say “***some of their colleagues***” traded on job
  - **48.2%** said “***a lot of colleagues***” traded on the job
  - **33%** said “***almost all of their colleagues***” traded on the job
  - **46%** said they themselves traded on the job
  - **27%** of bosses said they have an explicit rule banning on the job trading

Data

Insurance Data

- Large Chinese retail insurance company
  - Life insurance: combination of term life and annuity
  - Information on number of life insurance policies sold by city
    - N=8,729 city*date
  - Detailed information on subset of policies including cancelations
    - N=353,924

Loan Data (myBank)

- One of the largest banks in China
  - All commercial loans (2006-2010)
  - Precise date for loan extension approvals
    - N=36,701
  - Loan performance measures
    - ~8% of loans default
  - Firm and loan characteristics

Stock Market Data

- Shanghai Stock Exchange Composite Index
  - Daily data from CRISP/CSMAR

Identification

Use high frequency data (daily)

- Contemporaneous response to daily market conditions for *long run* financial decisions
- One day's market info is not very informative (in the *long run*)
  - Robustness check 1: Directly test predictive value
  - Robustness check 2: Drop "extreme" days

Identification

- For buyers of insurance
  - Prices change very infrequently
  - Advertising changes very infrequently
  - Demand driven (call a number to buy insurance)
- For loan officers
  - Hard for firms to time reviews
    - Long lag (several weeks) between application and review
    - Manager told us 1 month lag is considered quite good!
  - Little room for managers or loan officers to time shift reviews
    - Branch managers assign loans to review in the morning to be completed by EOD

Demand for Insurance: Model

$$Log(Policies\ Sold)_{it} = \beta Return_t + \nu Volatility_t + D_{it} + \epsilon_{it}$$

Return	Daily return of the SSECI
Volatility	Daily volatility of SSECI
D	City, DOW, WOY and Year FEs

Demand for Insurance: Results

	(1)	(2)	(3)	(4)
Volatility	99.708**	108.916**	179.316**	182.746**
	(29.999)	(29.456)	(49.962)	(40.928)
Returns	-0.4299	-0.4243	-0.6059	-0.5981
	(0.5828)	(0.6377)	(0.5924)	(0.6395)
R-squared	0.6620	0.6319	0.6622	0.6323
Observations	8,729	8,729	8,729	8,729

Notes: Columns 1 and 3 show the results of OLS regressions with the log of the total number of life insurance policies sold on a given day in a given city. Columns 2 and 4 show the results of Poisson regressions on the total number of insurance policies sold on a given day in a given city. Columns 1 and 2 uses volatility on the date of purchase, while column 3 and 4 use the average volatility on the date of, and the date before, purchase. All regressions included controls for city, day-of-week, week-of-year and year. OLS standard errors are clustered on city and date.
+ significant at 10%, * significant at 5%, ** significant at 1%.

Demand for Insurance: Robustness Check

	Volatility Measures		Date Fixed Effects		
	(1)	(2)	(3)	(4)	(5)
Volatility	2.9890**	5.3114**	91.2369**	31.0639*	34.3005*
	(1.0428)	(1.7143)	(37.4246)	(14.0754)	(13.7064)
Return	-0.6504	-2.1538	-0.5057	-0.4754	-0.2802
	(0.5903)	(1.4412)	(0.7088)	(0.5432)	(0.4675)
R-squared	0.6621	0.6622	0.6495	0.6660	0.6902
Observations	8,729	8,729	8,729	8,729	8,729

Notes: The dependent variable is the log of the total number of life insurance policies sold on a given day. Columns (1) and (2) use the volatility measures described in Parkinson (1980) and Rogers and Satchell (1991) respectively. . Columns (3), (4), and (5) replace the week-of-year and year fixed effects with month and year, month by year, and week by year fixed effects, respectively. All regressions included controls for city, day-of-week, week-of-year and year. Standard errors are clustered on city and date.
+ significant at 10%, * significant at 5%, ** significant at 1%.

Demand for Insurance: Cancelations

Dependent Variable: Indicator equal to 1 if contract is canceled		
% of Contracts canceled	9.05%	9.05%
Relative volatility	-18.842**	
	(7.816)	
Order-date volatility		-3.423
		(6.975)
1(CoP volatility<Order-date volatility)		0.008**
		(0.002)
Adj. R-squared	0.008	0.008
Observations	353,924	353,924

Notes: For each column, the dependent variable is whether an insurance contract is canceled during the cooling-off period. All coefficients represent the marginal effects from a probit regression. *Relative volatility* is the average volatility during the cooling off period minus the order date volatility. All regressions included controls for city, day of week, week of year, and year. Standard errors are clustered on city*date.
+ significant at 10%, * significant at 5%, ** significant at 1%.

Loans: Empirical Strategy

Key Identifying Assumption

- The portfolio of loan applications reviewed on a given day is uncorrelated with concurrent market performance
  - Loan applications are at least several days old
    - Manager said one month lag is considered quite good
  - Loans assigned by bank manager to loan officers at the start of the workday
    - Before market opens!
  - Loan applications are to be completed by end of day
- Future performance of individual loans reviewed on a given day is unrelated to that day's market conditions

Loans: Model

$$Distress_i = \beta Return_t + \nu Volatility_t + X_{it}\gamma + D_t + \epsilon_{it}$$

Return	Daily return of the SSECI
Volatility	Intraday volatility of SSECI
X	Firm and Loan characteristics
D	DOW, WOY and Year FEs

Loan Performance

Dependent Variable: Indicator equal to 1 if loan defaults

	(1)	(2)	(3)	(4)
Return	-0.2003		-0.2231+	-0.2031
	(0.1301)		(0.1300)	(0.1335)
Volatility		-8.2216**	-8.6089**	-8.2881**
		(1.9390)	(2.0487)	(2.3098)
Return t-1				0.0152
				(0.1200)
Return t+1				0.0245
				(0.1536)
Volatility t-1				-3.5985
				(3.1128)
Volatility t+1				-1.7226
				(1.6031)
Adjusted R-squared	0.0468	0.0471	0.0473	0.0474
Observations	36,701	36,701	36,701	36,701

Notes: All columns present the results from ordinary least square regressions. All regressions included controls for market open, day-of-week, week-of-year and year. Standard errors are 2-way clustered on date and region.
+ significant at 10%, * significant at 5%, ** significant at 1%.

Loan Performance (robustness)

Dependent Variable: Indicator equal to 1 if loan defaults

	Volatility Measures		Distress Measures		Truncated Samples		Time Fixed Effects		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Return	-0.2252+	-0.0842	-0.2332+	-0.1149	-0.2636	-0.2436	-0.2618+	-0.1598	-0.1260
	(0.1267)	(0.1457)	(0.1295)	(0.1124)	(0.2212)	(0.1700)	(0.1354)	(0.1287)	(0.0936)
Volatility	-0.3776**	-0.4740*	-8.8976**	-3.9954+	-21.4900**	-13.6567**	-8.9100**	-4.4512*	-3.2329*
	(0.1297)	(0.1988)	(2.3606)	(2.1804)	(4.5667)	(4.3545)	(2.4090)	(1.7713)	(1.5003)
Adjusted R-squared	0.0471	0.0471	0.0566	0.0383	0.0485	0.0476	0.0362	0.0453	0.0640
Observations	36,701	36,701	36,701	36,701	34,886	36,292	36,701	36,701	36,701

Notes: All columns present the results from ordinary least square regressions. Columns (1) and (2) use the intraday volatilty measures as described in Parkinson (1980) and Rogers and Satchell (1991) respectively. Column (3) includes loans classified as Sub-loan, Suspicious and Loss and being in distress. Column (4) includes only loans classified as Loss as being in distress. Columns (5) and (6) drop days corresponding to the top 1% and 5% of the distribution of daily volatility. All regressions include a control for market open. Regressions in columns (1) through (6) included dummy variables for day-of-week, week-of-year and year. In columns (7), (8), and (9) week-of-year and year fixed effects are replaced with fixed effects for month and year, month-by-year and week-by-year respectively. Standard errors are 2-way clustered on date and region.

Loan and Firm Characteristics

	Loan Size	*Branch*	*State Owned*	*Credit Rating*
	(1)	(2)	(3)	(4)
Return	2.2901+	0.0512	0.1288	0.1693
	(1.3483)	(0.2382)	(0.2262)	(2.1519)
Volatility	80.5430*	-9.8771	-11.3418*	136.1311**
	(36.5730)	(6.4830)	(5.5163)	(51.7379)
Adjusted R-squared	0.1448	0.0183	0.0317	0.1111
Observations	36,701	36,701	36,701	17,865

Notes: All columns present the results from ordinary least square regressions. Loan size is the log of the loan amount in RMB. County branch is a dummy equal to 1 if the loan originated from outside a region's main office. State owned is a dummy equal to one if the firm is a SOE. Credit rating is a numerical rating between 0 and 11, with higher numbers indicating higher credit worthiness. All regressions included controls for market open, day-of-week, week-of-year and year. Standard errors are 2-way clustered on date and region.
+ significant at 10%, * significant at 5%, ** significant at 1%.

Number of Loan Approvals

	Poisson		*Negative Binomial*	
	All	*Defaulted*	*All*	*Defaulted*
	(1)	(2)	(3)	(4)
Return	0.7647*	-1.8264	0.3213	-3.2998
	(0.3030)	(1.3176)	(0.8729)	(2.1995)
Volatility	-30.039**	-182.079**	-4.2357	-160.998**
	(8.0903)	(41.3257)	(21.0587)	(58.5218)
Pseudo R-squared	0.5904	0.6116	0.1274	0.2567
Observations	1,215	1,215	1,215	1,215

Notes: The dependent variable for columns 1 and 3 is the total number of daily loan extention. The dependent variable for columns 2 and 4 is the total number of daily loan extensions approved that eventually default. All regressions included controls for market open, day-of-week, week-of-year and year.
+ significant at 10%, * significant at 5%, ** significant at 1%.

What's going on?

- Our Hypothesis: Emotional Carryover
  - Visceral response to volatility in one domain transfers to decision making in other domains
- Neoclassical
  - Hypothesis 1: Learning (broadly defined)
    - Relevant information about the future contained in that day's stock market performance or by unobserved variable correlated with stock market performance
- Behavioral
  - Hypothesis 2: Distraction
    - Less time/effort exerted by on days with a lot of volatility
    - Story gets pretty convoluted pretty fast

Our Hypothesis

- Emotional-Carryover
  - Visceral response to volatility transfers to decision making in other domains
  - Alternatively, risk-aversion is a primitive (not domain specific) and psychological factors that affect it (in one domain)
  - Rich literature in the lab
    - E.g., Johnson and Tversky (1983); Lerner, Small and Loewenstein (2004); Lerner et al. (2014) review article
  - Evidence that stock market performance affects emotional state
    - Low and Repin (2002)
      - "Even the most seasoned trader exhibits significant emotional response, as measured by elevated levels of skin conductance and cardiovascular variables, during certain transient market events such as increased price volatility."
    - Cohn, Engelmann, Fehr and Marechal (2015)
      - Experienced traders "primed with a financial bust were substantially more fearful and risk adverse than those primed with a boom."
    - Engelberg and Parsons (2016)
      - ONLY other evidence from outside the lab: Find an inverse relationship between daily stock returns and contemporaneous hospital admissions.

Increased Risk Aversion

- Volatility increases risk aversion through carryover
  - Guiso, Spaienza and Zingales (2018)
    - Individuals had substantially increased risk aversion in both qualitative and quantitative measures following the collapse of Lehman Brothers
    - Experiment in which subjects exhibited increased risk aversion if they were shown a "brief horrifying scene" from a movie.
    - Predictions:
      - Buy more insurance
      - Approve fewer marginal loans
        - Fewer loans approved
        - Loans perform better
        - Loans look better on paper Predictions

Alternative mechanism: Information

- Neoclassical Learning (broadly defined)
  - Relevant information about the future contained in that day's stock market performance
    - Seems unlikely, but easy to test
      - Check for informational content by checking if daily stock market performance, controlling for seasonality, predicts future market performance
  - Unobserved variable(s) correlated with stock market performance and demand for insurance AND makes loan officer more likely to reject marginal loans
    - Again unlikely, but we can try to test
      - Check for robustness to excluding "extreme" days that are the most likely to contain significant new information

Is there information in daily volatility?

Dependent Variable: Percent Cumulative Return

	One Month	One Quarter	Half Year	One Year
	(1)	(2)	(3)	(4)
Return	0.6755**	0.4234*	0.4420	0.1861
	(0.1322)	(0.2100)	(0.2958)	(0.3063)
Volatility	0.9277	3.6754	-2.0021	-7.5667
	(3.4252)	(4.8357)	(6.6647)	(6.7833)
Adjusted R-squared	0.4474	0.6665	0.7350	0.9430
Observations	1,092	1,063	999	744

Notes: All columns present the results from ordinary least square regressions with robust standard errors. All regressions included controls for market open, day-of-week, week-of-year and year.
+ significant at 10%, * significant at 5%, ** significant at 1%.

Is it driven by "extreme" days?

Demand for Insurance

			Truncarted Samples	
	(1)	(2)	(3)	(4)
Return	-0.0951	-0.3465	-0.0072	0.0319
	(1.2512)	(1.2534)	(1.2756)	(0.9663)
Volatility	135.741**	243.232**	128.221*	195.925*
	(52.105)	(70.866)	(64.140)	(92.483)
R-squared	0.0463	0.0467	0.661	0.6586
Observations	8,729	8,729	8,636	8,288

Is it driven by "extreme" days?

The Effect of Volatility on Cancellations

Dependent Variable: Indicator equal to 1 if contract is canceled

		Truncated Samples	
	(3)	(5)	(6)
Return	-0.2231+	-0.2636	-0.2436
	(0.1300)	(0.2212)	(0.1700)
Volatility	-8.6089**	-21.4900**	-13.6567**
	(2.0487)	(4.5667)	(4.3545)
R-squared	0.0473	0.0485	0.0476
Observations	36,701	34,886	36,292

Is it driven by "extreme" days?

Dependent Variable: Indicator equal to 1 if loan defaults

	Volatility Measures		Distress Measures		Truncated Samples		Time Fixed Effects		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Return	-0.2252+	-0.0842	-0.2332+	-0.1149	-0.2636	-0.2436	-0.2618+	-0.1598	-0.1260
	(0.1267)	(0.1457)	(0.1295)	(0.1124)	(0.2212)	(0.1700)	(0.1354)	(0.1287)	(0.0936)
Volatility	-0.3776**	-0.4740*	-8.8976**	-3.9954+	-21.4900**	-13.6567**	-8.9100**	-4.4512*	-3.2329*
	(0.1297)	(0.1988)	(2.3606)	(2.1804)	(4.5667)	(4.3545)	(2.4090)	(1.7713)	(1.5003)
Adjusted R-squared	0.0471	0.0471	0.0566	0.0383	0.0485	0.0476	0.0362	0.0453	0.0640
Observations	36,701	36,701	36,701	36,701	34,886	36,292	36,701	36,701	36,701

Notes: All columns present the results from ordinary least square regressions. Columns (1) and (2) use the intraday volatilty measures as described in Parkinson (1980) and Rogers and Satchell (1991) respectively. Column (3) includes loans classified as Sub-loan, Suspicious and Loss and being in distress. Column (4) includes only loans classified as Loss as being in distress. Columns (5) and (6) drop days corresponding to the top 1% and 5% of the distribution of daily volatility. All regressions include a control for market open. Regressions in columns (1) through (6) included dummy variables for day-of-week, week-of-year and year. In columns (7), (8), and (9) week-of-year and year fixed effects are replaced with fixed effects for month and year, month-by-year and week-by-year respectively. Standard errors are 2-way clustered on date and region.

Alternative mechanism: Distractions

- Hypothesis 2: Distraction
  - Less time/effort exerted by on days with a lot of volatility
  - Story gets pretty convoluted pretty fast
- Distraction
  - Less time/effort exerted by on days with a lot of volatility
    - Approve fewer (marginal) loans
    - But more likely to buy life insurance…?
  - Also effect on loans is non-linear in the wrong direction
    - Less likely to be distracted on extremely high volatility days (top 1%, 5%)!

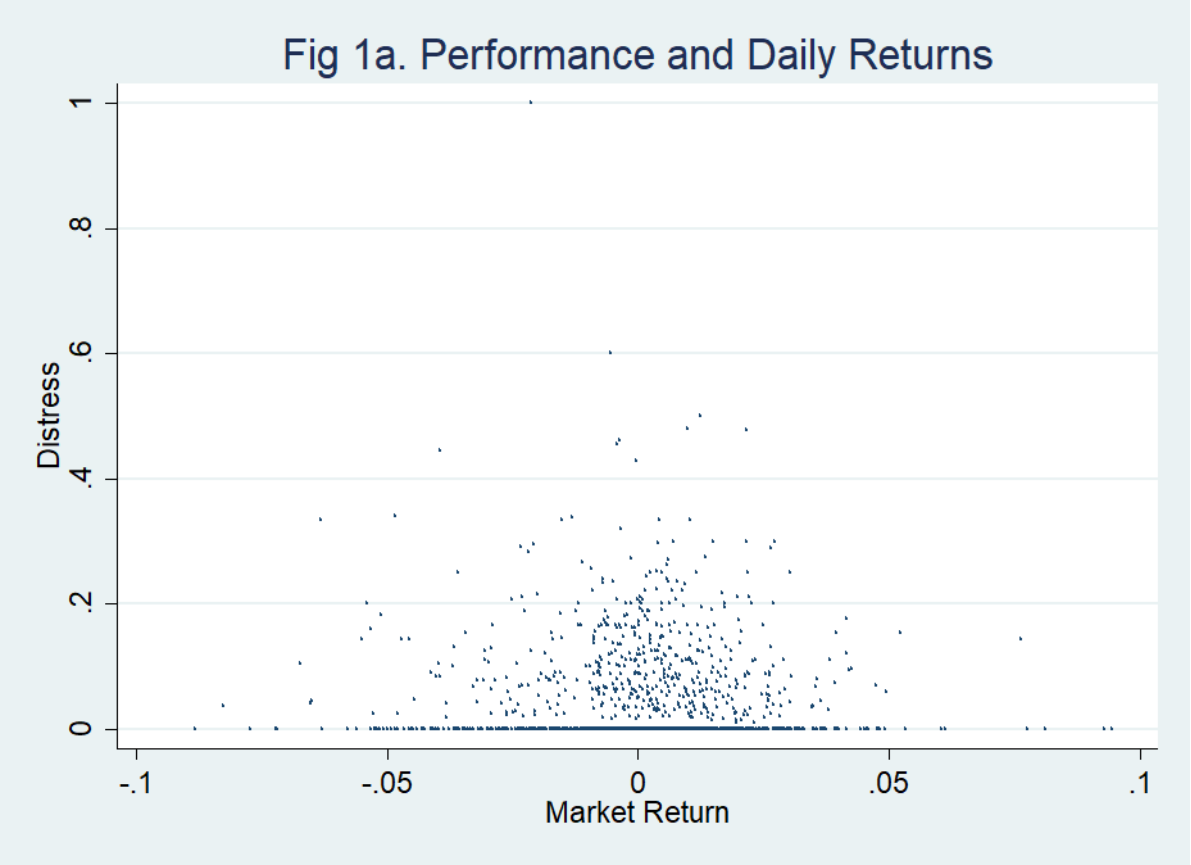
Summary

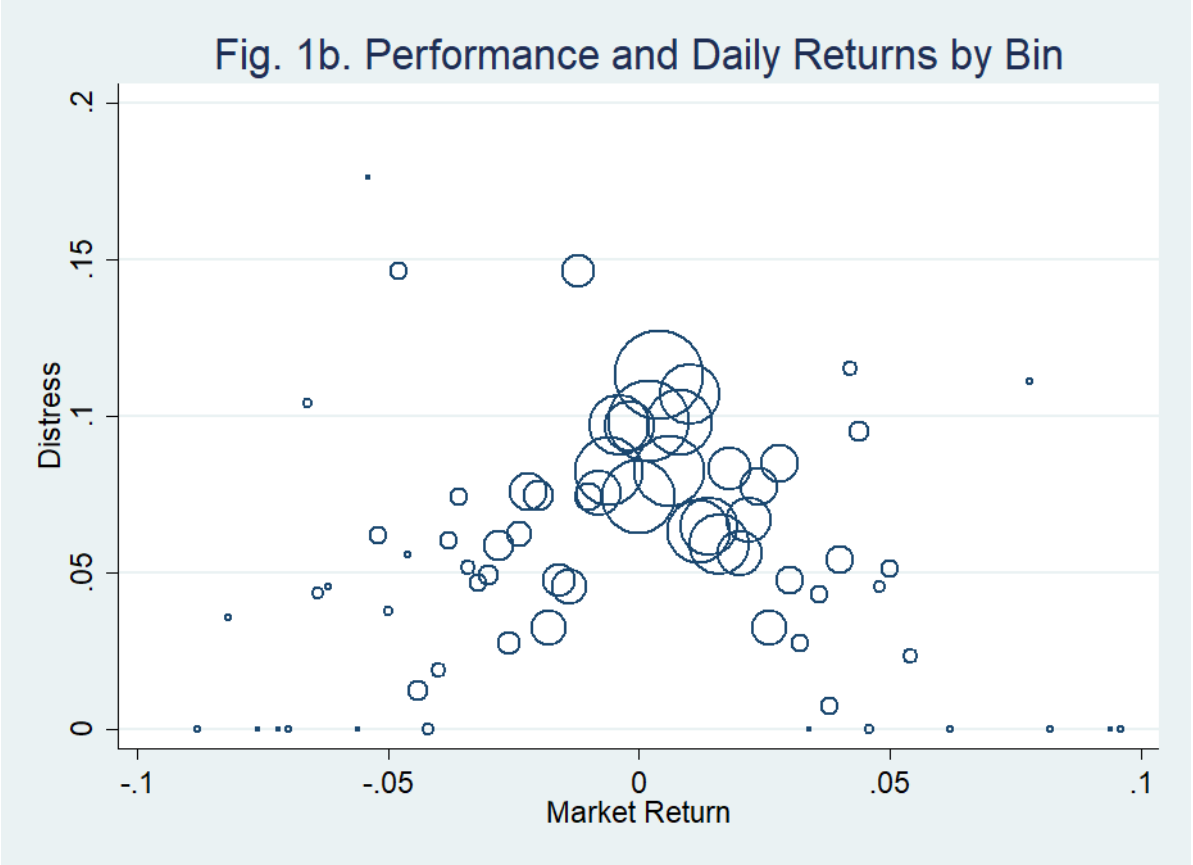
Daily stock market volatility affects decision making of consumers and commercial loan officers

- Economically meaningfully effects
  - One s.d. increase in volatility ➔ 2.5% increase in life insurance purchases
    ➔ 0.8% decrease in loan approval, 7.7% decrease in defaults
  - Evidence that stock market conditions significantly affects the long-run financial decision making of consumers and financial professionals
- Results most consistent with "fear" induced risk aversion
  - We rule out
    - Rational Choice/Learning
    - Distraction
    - Other ideas?
- Provide evidence of the neglected portion of the feedback loop between the real economy and stock markets
  - Significantly, our results say it's not just about big booms and busts!
    - Excess high-frequency volatility
    - The significant time-variation in aggregate risk aversion implied by historic data (Campbell and Cochrane 1999).

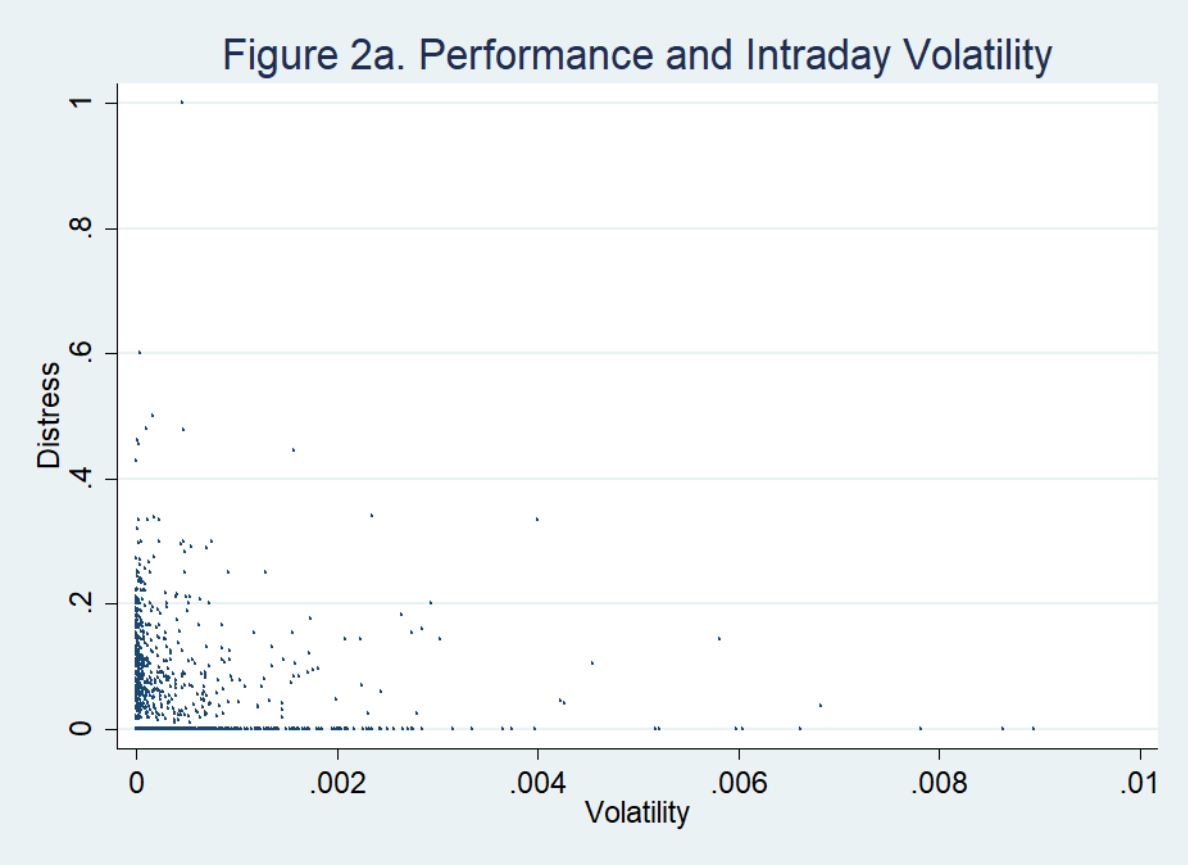
Thanks!

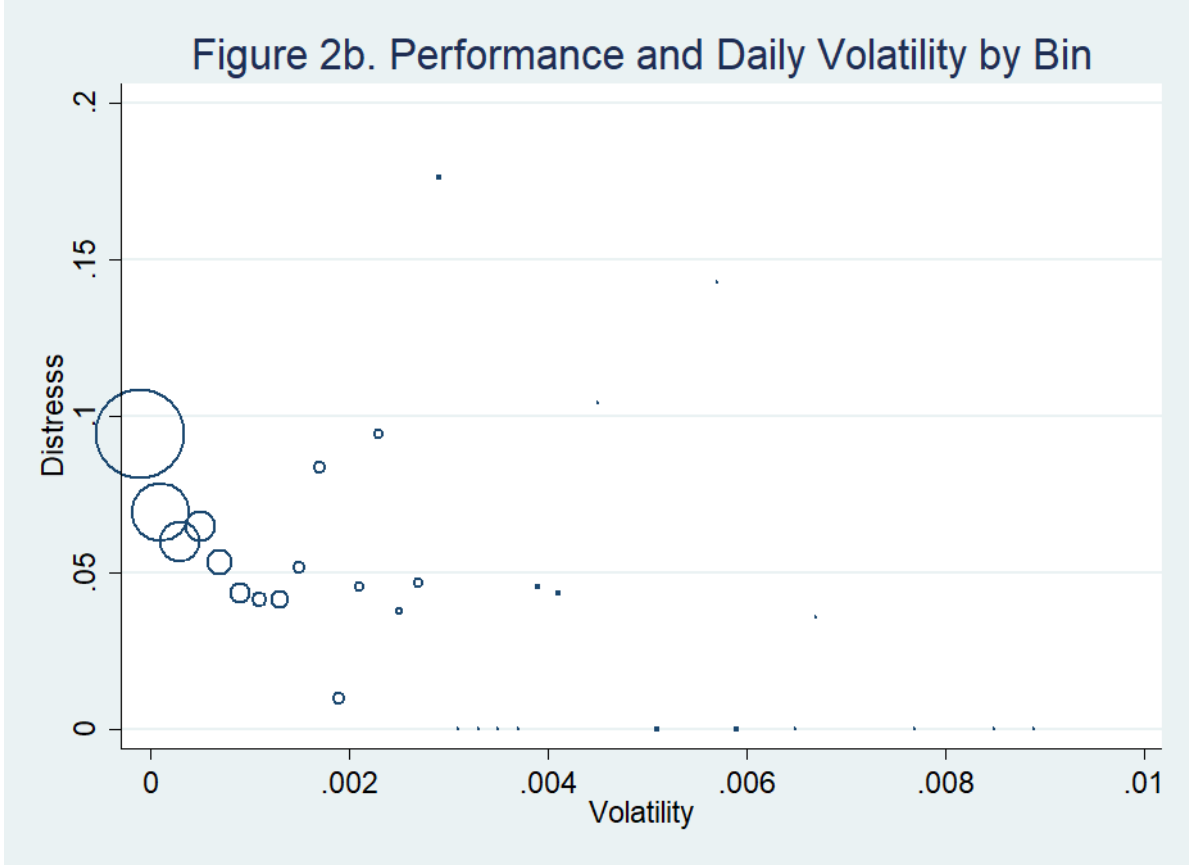
Loan Performance (returns)





Loan Performance (volatility)





Varying FEs

Dependent Variable: Indicator equal to 1 if loan defaults

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Return	-0.2231+	-0.2261+	-0.2035+	-0.1998	-0.1705	-0.0157	-0.1087
	(0.1300)	(0.1236)	(0.1207)	(0.1232)	(0.1158)	(0.1462)	(0.1145)
Volatility	-8.6089**	-8.0186**	-6.4656**	-6.6124**	-5.4566**	-5.6375**	-4.6584**
	(2.0487)	(1.9228)	(1.7052)	(1.6394)	(1.3580)	(1.2067)	(1.2026)
Adjusted R-squared	0.0473	0.0576	0.1712	0.1721	0.1796	0.1454	0.1916
Observations	36,701	36,701	36,701	36,701	36,701	17,865	17,865
Branch		✓	✓	✓	✓	✓	✓
Region FEs			✓	✓	✓	✓	✓
State Owned				✓	✓	✓	✓
Loan Size					✓	✓	✓
Credit Ratings						✓	✓
Industry FEs							✓

Notes: All columns present the results from ordinary least square regressions. All regressions include a control for marketv open, day-of-week, week-of-year and year. Standard errors are 2-way clustered on date and region.
+ significant at 10%, * significant at 5%, ** significant at 1%.