Leverage Network and Market Contagion

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Motivation

- Leverage (margin trading) plays a crucial role in financial markets
- In standard asset pricing models (e.g., CAPM), investors with different risk preferences
  - lend to and borrow from one another
  - to clear both the risk-free and risky security markets
- However, the benefit of margin trading comes at a substantial cost
  - it makes investors vulnerable to temporary fluctuations in security value, as well as funding conditions

Theoretical Underpinning

- A growing theoretical literature carefully models a two-way interaction between security returns and leverage constraints
  - an initial reduction in security prices lowers the collateral value, making the leverage constraint more binding
  - this leads to selling by levered investors and depresses prices further, triggering even more selling by levered investors and even lower prices
  - this downward spiral can amplify the initial adverse shock
- A similar amplification mechanism, though to a less extent, may also be at work with an initial, positive shock to security value

Theoretical Underpinning

- These models also make predictions in the cross section of assets
  - when faced with pressure to delever, investors may indiscriminately downsize all holdings
  - this indiscriminate selling pressure generates a contagion across assets that are connected solely through common holdings by levered investors (i.e., not because of fundamentals)
  - in other words, idiosyncratic shocks to one security can be amplified and transmitted to other securities through a leverage network
- This transmission mechanism may also work for positive shocks, again to a less extent

Our Setting

- Testing asset pricing implications of margin trading has been empirically challenging (lack of detailed data)
- We exploit unique account-level data in China that cover an extraordinary period, May-Jul 2015
  - overall market size is RMB60T (or $10T), half that of the US
  - the Shanghai Composite Index climbed more than 60% from the beginning of the year to its peak at 5166.35 on June 12th
  - before crashing nearly 30% by the end of July
- Financial media around the world have linked this boom and bust
  - to the growing popularity, and subsequent government crackdown, of margin trading in China

Media Coverage

THE WALL STREET JOURNAL.

Chinese Firms Discover Margin Lending's Downside

Margin debt has been one factor in the recent market slump in China

By Jacky Wong And Chao Deng
Updated June 30, 2015 11:43 a.m. ET

FINANCIAL TIMES

JULY 12, 2015 by: **Charles Clover** in Beijing and Gabriel Wildau in Shanghai

China cracks down on margin lending before markets reopen

The Economist

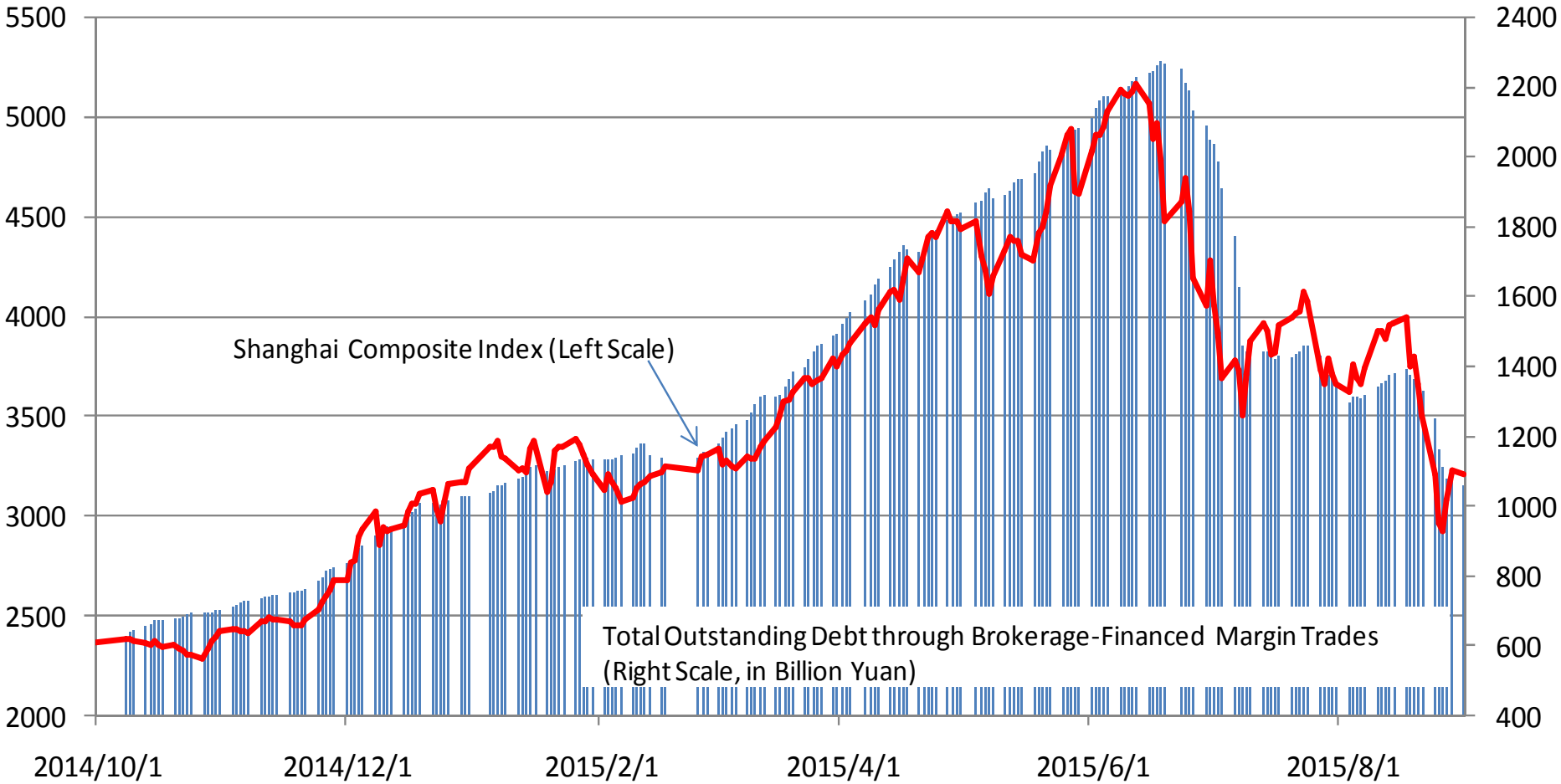
Business and finance ›
Jul 3rd 2015 | SHANGHAI

China's stockmarket crash

Untameable market

The crash has underlined the burgeoning role of debt in Chinese share-trading. Goldman Sachs reckons outstanding margin financing, at 2.2 trillion yuan ($355 billion) earlier this week, was the equivalent of 12% of the value of all freely traded shares on the market, or 3.5% of China's GDP. Both "are easily the highest in the history of global equity markets," its analysts noted. With Chinese shadow banks and peer-to-peer lenders also offering cash to investors, the amount of hidden leverage in the market is estimated to be as much as 50% higher. That debt helped fuel the initial rally. It is now adding to the pain, as leveraged investors rush to sell their holdings to cover their debts.

Market Returns and Margin Trading



Market returns and total margin debt move in near lockstep

Related Literature

- Leverage Constraint and Asset Pricing
  - Gromb and Vayanos (2002, 2017), Geanakoplos (2003), Fostel and Geanakoplos (2008) and Brunnermeier and Pedersen (2009) among others
  - Contagion as a wealth effect (Kyle and Xiong, 2001) is less likely in China due to extremely strong disposition effect
- Excessive Volatility and Return Comovement
  - Greenwood and Thesmar (2011), Boyson, Stahel, and Stulz (2010), Dudley and Nimalendran (2011), Anton and Polk (2014) among others
  - Institutional frictions are less relevant in China since retail trading accounts for more than 85% of the volume
- Network Theory
  - Acemoglu, Carvalho, Ozdaglar, and Tahbaz-Salehi (2012), Gabaix (2011), Ahern (2013), Barrot and Sauvagnat (2016) and Carvalho, Nirei, Saito and Tahbaz-Salehi (2017) among others
- Amplification vs. Contagion
  - Bian, He, Shue, and Zhou (2017)

History of Margin Trading in China

- Broker-financed margin trading
  - first authorized in Oct 2011, for about 900 stocks
  - account age $>$ 18 months, total value $>$ RMB500K (USD80K)
  - maximum initial margin (equity/total value): 50%
  - maintenance margin: 23%, i.e., max leverage of $1/0.23 = 4.35$
  - total margin debt: RMB2T, 3-4% of total market cap
- Shadow-financed margin trading
  - web-based trading platforms offer margin financing capability on all stocks
  - price and quantity are negotiated bilaterally
  - **unregulated**, effective leverage is much higher than broker-financed
  - estimated to be as large as broker-financed

Our Account-Level Data

- From a leading brokerage firm
  - cover the period of May to July 2015
  - about 6 million accounts with about 180K having margin trading
  - detailed information on account value, holdings, order submissions, trades, and leverage ratio, all at a daily frequency
  - as placebos, pick the largest 400K non-margin accounts and also examine boom / bust in 2007 when no margin trading was allowed
- From a major web-based trading platform
  - cover the period January to July 2015
  - about 150K accounts, all are levered
  - again, daily account value, holdings, order submissions and trades
  - observe initial borrowing, as well as subsequent inflow and outflow of cash, daily leverage ratio needs to be estimated

Account Summary Statistics

	Broker-Financed Margin Accounts		Large Broker Non-Margin Accounts		Shadow-Financed Margin Accounts	
Panel A: Full Sample Summary						
	Mean	Median	Mean	Median	Mean	Median
# of Accounts	177,571	177,571	400,000	400,000	153,381	153,381
¥DEBT (10^9)	99.41	105.99	0.00	0.00	44.21	43.85
¥HOLDINGS (10^9)	354.96	363.29	385.06	383.50	64.16	62.02
Panel B: Accounts Characteristics						
#HOLDINGS (10^3)	31.96	6.50	6.61	2.42	7.19	0.97
¥HOLDINGS (10^4)	626.47	122.99	118.91	38.78	149.37	22.13
#TRADING (10^3)	130.19	13.80	20.02	6.00	33.43	6.90
¥TRADING (10^4)	213.86	25.60	34.20	10.94	60.93	13.14
#SUBMISSIONS	17.07	7.00	8.16	5.00	7.70	5.00
LEVERAGE	1.60	1.54	1.00	1.00	6.95	4.29

Panel B: Dependent Variable = Stock-level Leverage Ratio							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DRET	-4.867***						-3.558***
	(-7.74)						(-6.12)
BMRATIO		-0.178					0.019
		(-1.24)					(0.74)
MOMENTUM			0.048				-0.169***
			(1.00)				(-3.51)
TURNOVER				18.739***			10.403*
				(3.23)			(1.95)
IDVOL					50.678***		44.630***
					(7.84)		(5.75)
MCAP						1.189***	0.704***
						(6.27)	(3.59)
Adj. R^2	0.25	0.29	0.28	0.29	0.29	0.29	0.26
No. Obs.	176833	176833	176833	176833	176833	176833	176833

Levered investors take more speculative bets
Stocks with higher turnover and idiosyncratic volatilities

Some Simple Algebra

- Start with the account level (ignore the composition for now)
- Define $L_0 = \frac{A_0}{E_0} = \frac{A_0}{A_0 - D_0}$
- During the day, market fluctuates, leverage changes to $\frac{A_0 * (1+r_1)}{A_0 * (1+r_1) - D_0}$
- Assume investors maintain $L_1 = L_0$ by levering up or down by X_1
- Or set $\frac{A_0 * (1+r_1) - X_1}{A_0 * (1+r_1) - D_0} = \frac{A_0}{A_0 - D_0}$
- Solve for X_1, we get $X_1 = A_0 * (L_0 - 1) * r_1$
- Put differently, $\frac{X_1}{A_0} = L_0' * r_1$, where $L_0' = \frac{D_0}{E_0}$

Some Simple Algebra

- Now to the stock level: assume proportional scaling of holdings
- Trading in stock i: $X_{1,i} = A_0 * \omega_{0,i} * L'_0 * r_1$

- Express r_1 with stock returns, and focus on investor j,
  $X_{1,i,j} = A_{0,j} * \omega_{0,i,j} * L'_{0,j} * (r_{1,i} * \omega_{0,i,j} + r^{\perp}_{1,i,j} * \omega^{\perp}_{0,i,j})$
  - leverage-induced trading determined by: lagged holding size, leverage ratio, own returns (amplification), returns of stocks in the same portfolio (contagion)

- Now aggregate across M margin accounts
- $X_{1,i} = \Sigma_{j=1}^{M}[A_{0,j} * \omega_{0,i,j} * L'_{0,j} * (r_{1,i} * \omega_{0,i,j} + r^{\perp}_{1,i,j} * \omega^{\perp}_{0,i,j})]$

Matrix Representation

R: NX1 vector of stock returns

Ω: MXN matrix of portfolio weights, each row sums up to 1

$diag(A_0)$: MXM diagonal matrix, diagonal terms are A_0

$diag(L_0)$: MXM diagonal matrix, diagonal terms are L_0'

$diag(M_0)$: NXN diagonal matrix, diagonal terms are M_0, market cap of each stock (or some other measure of liquidity)

Leverage-induced price pressure (LIPP):

$$LIPP = diag(M_0)^{-1} * \Omega' * diag(A_0) * diag(L_0) * \Omega * R$$

Label $diag(M_0)^{-1} * \Omega' * diag(A_0) * diag(L_0) * \Omega$ the transmission matrix T. Set the diagonal terms in T to zeros to get T_0 to isolate contagion effect

Contagion through Margin Account Holdings

- Predictions on trading
  - The interaction between account leverage and lagged account returns ($L_0' * r_1$) forecast subsequent trading
  - examine the characteristics of stocks traded by margin investors
- Predictions on stock returns
  - Margin-induced trading ($T_0 * R$) should help forecast future stock returns (with a subsequent reversal)
- Predictions on comovments
  - Stock pairs that are commonly held by more levered investors ($T_0(i,j)$) should comove more, above and beyond what their fundamentals would suggest, more so in market downturns
- Predictions on systemic risk
  - Central stocks in the leverage network are likely source of systemic risk: larger downside betas
  - (Eigenvalue) centrality can be computed by taking $T_0^n * R$ to the limit (in absolute term after normalization)

The Effect of Leverage

	Brokerage-Financed	Shadow-Financed	
	(1)	(2)	(3)
Positive Account Return (t-1)	-0.511***	0.003***	-0.671***
	(-6.81)	(5.74)	(-13.61)
*Positive Account Return (t-1) * LEVERAGE*	0.056	-0.016	
	(1.44)	(-1.15)	
*Positive Account Return (t-1) * DISTANCE*			0.013
			(1.07)
Negative Account Return (t-1)	-0.046	-0.078	1.245***
	(-0.78)	(-0.65)	(6.54)
*Negative Account Return (t-1) * LEVERAGE*	0.150***	0.211***	
	(3.39)	(7.06)	
*Negative Account Return (t-1) * DISTANCE*			-0.157***
			(-6.21)
LEVERAGE	-0.002	0.007***	
	(-1.04)	(9.28)	
DISTANCE			-0.0004
			(-0.52)
Adj. R^2	0.14	0.24	0.22
No. Obs.	2,019,636	1,253,523	1,073,608

Sensitivity to negative returns strongly increases in leverage

The Effect of Leverage Constraint

	Brokerage-Financed		Shadow-Financed
	(1)	(2)	(3)
Positive Account Return (t-1)	-0.511***	0.003***	-0.671***
	(-6.81)	(5.74)	(-13.61)
*Positive Account Return (t-1) * LEVERAGE*	0.056	-0.016	
	(1.44)	(-1.15)	
*Positive Account Return (t-1) * DISTANCE*			0.013
			(1.07)
Negative Account Return (t-1)	-0.046	-0.078	1.245***
	(-0.78)	(-0.65)	(6.54)
*Negative Account Return (t-1) * LEVERAGE*	0.150***	0.211***	
	(3.39)	(7.06)	
*Negative Account Return (t-1) * DISTANCE*			-0.157***
			(-6.21)
LEVERAGE	-0.002	0.007***	
	(-1.04)	(9.28)	
DISTANCE			-0.0004
			(-0.52)
Adj. R^2	0.14	0.24	0.22
No. Obs.	2,019,636	1,253,523	1,073,608

The effect is stronger when leverage constraint is more binding, holding leverage constant

Characteristics of Stocks Traded

Stocks Traded by Margin Investors		
	Brokerage-Financed	Shadow-Financed
	(1)	(2)
Triple-interaction terms:		
*Account Return * LEVERAGE*	-0.063	-0.012
** MOMENTUM*	(-1.31)	(-0.85)
*Account Return * LEVERAGE*	-0.031***	0.014**
** MCAP*	(-3.35)	(2.57)
*Account Return * LEVERAGE*	0.007	-0.020**
** BMRATIO*	(0.39)	(-2.47)
*Account Return * LEVERAGE*	-0.52	0.468**
** TURNOVER*	(-1.43)	(2.35)
*Account Return * LEVERAGE*	3.662	-2.035
** IDVOL*	(0.74)	(-0.94)
*Account Return * LEVERAGE*	0.279***	-0.075**
** WEIGHT*	(2.68)	(-2.41)
Adj. R^2	0.01	0.04
No. Obs.	7785597	5574117

Broker-financed accounts scale down risky bets
Shadow-financed accounts scale down liquid holdings

Forecasting Future Stock Returns

	Dependent Variable = Stock returns on day *t+1*					
	Whole Sample		Boom		Bust	
	(1)	(2)	(3)	(4)	(5)	(6)
MLPR	0.009**	0.009**	0.001	0.001	0.017***	0.016***
	(2.24)	(2.25)	(0.19)	(0.16)	(3.19)	(3.18)
NMLPR		0.0001		0.001		0.00004
		(1.11)		(1.33)		(0.15)
LEVERAGE	-0.001	-0.001	-0.001	-0.001	0.000	0.000
	(-1.27)	(-1.28)	(-1.08)	(-1.09)	(-0.88)	(-0.88)
DRET	0.274***	0.273***	0.196***	0.195***	0.352***	0.351***
	(7.70)	(7.70)	(11.39)	(11.44)	(6.20)	(6.20)
BMRATIO	0.00003	0.00003	-0.00001	-0.00001	0.0001	0.0001
	(1.04)	(1.04)	(-0.57)	(-0.57)	(1.62)	(1.63)
MOMENTUM	-0.001	-0.001	0.001	0.001	-0.002**	-0.002**
	(-0.85)	(-0.85)	(1.58)	(1.58)	(-2.56)	(-2.56)
TURNOVER	0.054**	0.054**	0.040*	0.040*	0.068*	0.068*
	(2.47)	(2.47)	(1.82)	(1.83)	(1.69)	(1.69)
IDVOL	-0.324***	-0.324***	-0.628***	-0.627***	-0.020	-0.020
	(-3.10)	(-3.10)	(-3.94)	(-3.95)	(-0.22)	(-0.22)
MCAP	-0.002	-0.002	-0.004***	-0.004***	0.001	0.001
	(-1.56)	(-1.57)	(-5.11)	(-5.10)	(0.61)	(0.60)
Adj. R^2	0.18	0.18	0.15	0.15	0.21	0.21
No. Obs.	173836	173836	86038	86038	87798	87798

A one-std change in MLPR increases next-day return by 19bp
This effect is entirely coming from the bust period

Forecasting Future Stock Returns

	Dependent Variable = Stock returns on day *t+1*					
	Whole Sample		Boom		Bust	
	(1)	(2)	(3)	(4)	(5)	(6)
MLPR	0.009**	0.009**	0.001	0.001	0.017***	0.016***
	(2.24)	(2.25)	(0.19)	(0.16)	(3.19)	(3.18)
NMLPR		0.0001		0.001		0.00004
		(1.11)		(1.33)		(0.15)
LEVERAGE	-0.001	-0.001	-0.001	-0.001	0.000	0.000
	(-1.27)	(-1.28)	(-1.08)	(-1.09)	(-0.88)	(-0.88)
DRET	0.274***	0.273***	0.196***	0.195***	0.352***	0.351***
	(7.70)	(7.70)	(11.39)	(11.44)	(6.20)	(6.20)
BMRATIO	0.00003	0.00003	-0.00001	-0.00001	0.0001	0.0001
	(1.04)	(1.04)	(-0.57)	(-0.57)	(1.62)	(1.63)
MOMENTUM	-0.001	-0.001	0.001	0.001	-0.002**	-0.002**
	(-0.85)	(-0.85)	(1.58)	(1.58)	(-2.56)	(-2.56)
TURNOVER	0.054**	0.054**	0.040*	0.040*	0.068*	0.068*
	(2.47)	(2.47)	(1.82)	(1.83)	(1.69)	(1.69)
IDVOL	-0.324***	-0.324***	-0.628***	-0.627***	-0.020	-0.020
	(-3.10)	(-3.10)	(-3.94)	(-3.95)	(-0.22)	(-0.22)
MCAP	-0.002	-0.002	-0.004***	-0.004***	0.001	0.001
	(-1.56)	(-1.57)	(-5.11)	(-5.10)	(0.61)	(0.60)
Adj. R^2	0.18	0.18	0.15	0.15	0.21	0.21
No. Obs.	173836	173836	86038	86038	87798	87798

In sharp contrast, the effect from non-margin account trading comes from boom, not bust

Similar result in a placebo boom / bust period in 2007 when there was no margin trading

"Long-Run" Reversal

Panel A: Market Bust Period						
	(1, k=1)	(2,k=2)	(3,k=5)	(4,k=7)	(5, k=9)	(6, k=10)
MLPR	0.017***	0.029***	0.031*	0.036	0.033	0.031
	(3.19)	(4.25)	(1.66)	(1.39)	(0.92)	(0.81)
LEVERAGE	-0.0003	-0.0004	-0.0004	-0.00003	0.0001	-0.00001
	(-0.88)	(-0.73)	(-0.45)	(-0.04)	(0.08)	(-0.01)
DRET	0.352***	0.453***	0.572***	0.550***	0.504***	0.434***
	(6.20)	(5.52)	(4.86)	(3.68)	(3.22)	(2.96)
BMRATIO	0.0001	0.0001	0.0001	0.0001	0.0001	-0.00002
	(1.62)	(0.74)	(0.48)	(0.35)	(0.20)	(-0.08)
MOMENTUM	-0.002**	-0.004***	-0.009***	-0.013***	-0.015***	-0.017***
	(-2.56)	(-2.95)	(-3.01)	(-3.68)	(-3.98)	(-4.24)
TURNOVER	0.068*	0.111	0.274*	0.346*	0.366*	0.405**
	(1.69)	(1.46)	(1.85)	(1.87)	(1.86)	(1.97)
DVOL	-0.020	-0.064	-0.324	-0.329	-0.252	-0.272
	(-0.22)	(-0.29)	(-0.56)	(-0.42)	(-0.28)	(-0.28)
MCAP	0.001	0.000	-0.001	-0.002	-0.004	-0.005
	(0.61)	(0.12)	(-0.22)	(-0.27)	(-0.52)	(-0.54)
Adj. R^2	0.21	0.17	0.16	0.15	0.15	0.14
No. Obs	87798	87798	87798	87798	87798	87798

Price pressure reverts in 2 weeks

Forecasting Pairwise Return Correlation

	Whole Sample	BOOM	BUST
	(1)	(2)	(3)
MARHOLD	0.238***	0.154***	0.325***
	(6.27)	(3.56)	(5.87)
BMDIFF	0.009***	0.011***	0.007***
	(7.64)	(5.99)	(5.40)
COMANALY	0.001***	0.002***	0.001***
	(7.96)	(7.58)	(4.07)
MOMDIFF	0.005***	0.005***	0.006**
	(4.35)	(5.84)	(2.45)
SAMEIND	0.036***	0.038***	0.033***
	(7.38)	(7.05)	(4.24)
SIZE1	-0.0001	-0.030***	0.031**
	(-0.01)	(-3.74)	(2.73)
*SIZE1*SIZE2*	-0.002	-0.003**	-0.007
	(-1.19)	(-2.49)	(-3.44)
SIZE2	0.0001	-0.030***	0.031**
	(0.01)	(-3.74)	(2.75)
SIZEDIFF	0.013**	-0.002	0.029***
	(2.65)	(-0.57)	(3.67)
Adj. R^2	0.03	0.02	0.04
No. Obs. (*1000)	31887	16200	15687

... impact on return correlation twice as high in crash than boom

Centrality and Future Stock Returns

Panel A: Dependent Variable = Stock returns on day t+1						
	BOOM			BUST		
	(1)	(2)	(3)	(4)	(5)	(6)
CENT	0.0001	0.0001	0.0001	-0.001***	-0.001**	-0.0002
	(1.21)	(0.02)	(0.38)	(-5.30)	(-2.24)	(-0.79)
*MRET * CENT*			-0.02			0.300***
			(-0.19)			(4.09)
LEVERAGE		-0.001			0.000	
		(-1.24)			(-1.10)	
DRET		0.198***			0.363***	
		(11.25)			(6.29)	
BMRATIO		0.000			0.000	
		(-0.32)			(1.79)	
MOMENTUM		0.001			-0.002***	
		(1.61)			(-2.56)	
TURNOVER		0.038*			0.063	
		(1.74)			(1.64)	
IDVOL		-0.624***			-0.003	
		(-3.93)			(-0.03)	
MCAP		-0.004***			0.001	
		(-5.22)			(0.52)	
Date FE	No	No	Yes	No	No	Yes
Adj. R^2	0.001	0.15	0.22	0.003	0.20	0.63
No. Obs.	86038	86038	86038	87798	87798	87798

Central stocks have lower average returns in the bust period

Centrality and Downside Market Beta

Panel A: Dependent Variable = Stock returns on day t+1						
	BOOM			BUST		
	(1)	(2)	(3)	(4)	(5)	(6)
CENT	0.0001	0.0001	0.0001	-0.001***	-0.001**	-0.0002
	(1.21)	(0.02)	(0.38)	(-5.30)	(-2.24)	(-0.79)
*MRET * CENT*			-0.02			0.300***
			(-0.19)			(4.09)
LEVERAGE		-0.001			0.000	
		(-1.24)			(-1.10)	
DRET		0.198***			0.363***	
		(11.25)			(6.29)	
BMRATIO		0.000			0.000	
		(-0.32)			(1.79)	
MOMENTUM		0.001			-0.002***	
		(1.61)			(-2.56)	
TURNOVER		0.038*			0.063	
		(1.74)			(1.64)	
IDVOL		-0.624***			-0.003	
		(-3.93)			(-0.03)	
MCAP		-0.004***			0.001	
		(-5.22)			(0.52)	
Date FE	No	No	Yes	No	No	Yes
Adj. R^2	0.001	0.15	0.22	0.003	0.20	0.63
No. Obs.	86038	86038	86038	87798	87798	87798

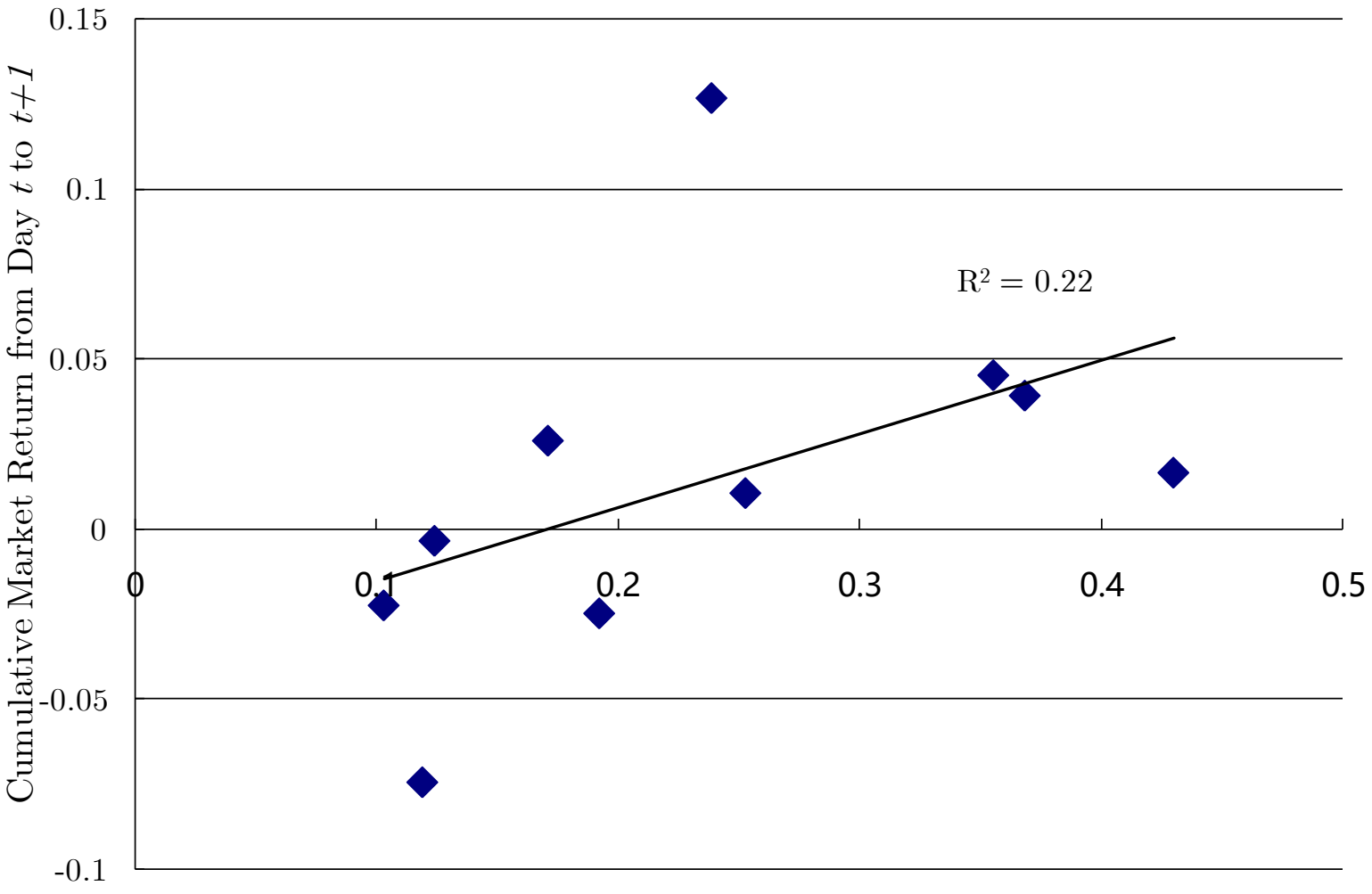
This is entirely due to central stocks having larger downside beta

Government Rescue Effort in July 2015

- Intuitively, central stocks should be purchased!

July 6th to 9th	Purchased by the Government	Not purchased by the Government	T-statistic of difference	Z-statistic of difference
% in *HS300*	34	0		
Mean of *Log MCAP*	24.030	22.511	41.70	
Median of *Log MCAP*	23.914	22.517		35.41
Mean of *CENT*	0.163	0.278	-2.49	
Median of *CENT*	0.023	0.035		-5.23
July 15th to 17th				
% *in HS300*	45	0.2		
Mean of *Log MCAP*	24.291	22.772	31.77	
Median of *Log MCAP*	24.052	22.712		25.91
Mean of *CENT*	0.322	0.344	-0.47	
Median of *CENT*	0.098	0.115		-1.81
July 28th to 31st				
% in *HS300*	23	4.3		
Mean of *Log MCAP*	23.577	22.566	24.29	
Median of *Log MCAP*	23.439	22.528		24.10
Mean of *CENT*	0.322	0.285	1.16	
Median of *CENT*	0.103	0.088		2.66

Centrality of Purchased Stocks and Future Market Return



Panel A. Average Centrality of Stocks Purchased by the Chinese Governemnt

Characteristics of Central Stocks

Dependent Variable = Stock Centrality rank in the Leverage Network								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LEVERAGE	0.033***							0.033***
	(10.87)							(10.68)
DRET		-0.091***						-0.507***
		(-9.58)						(-6.02)
BMRATIO			-0.072					-0.025
			(-1.48)					(-1.30)
MOMENTUM				0.034***				-0.010
				(3.06)				(-0.87)
TURNOVER					4.239***			2.100
					(3.48)			(1.60)
IDVOL						10.969***		6.903***
						(12.77)		(6.98)
MCAP							0.333***	0.111**
							(7.95)	(2.28)
Adj. R^2	0.62	0.60	0.60	0.60	0.60	0.61	0.61	0.61
No. Obs.	173836	173836	173836	173836	173836	173836	173836	173836

Central stocks tend to have higher leverage, idio vol and size

Conclusions

- There is a large theoretical literature on leverage and asset returns
  - little empirical evidence due to lack of data
- Taking advantage of daily account-level leverage data, we find
  - idiosyncratic shocks can cause contagion across assets when they are "linked" through common holdings by margin investors
  - stocks with common ownership by margin investors exhibit excessive return comovement, especially during market downturns
  - stocks central to the leverage network are more vulnerable to negative shocks – should perhaps be targeted in government intervention