ANALYSIS OF THE IMPACT OF COVID19 OUTBREAK ON THE INDIAN BANKING SYSTEM

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Why this topic?

India, which has a mix of state-owned banks and private sector banks, provides an ideal setting to explore the impact of COVID19 crisis.

In general most of the people's perception during crisis is withdraw money from private sector and deposit into public sector.

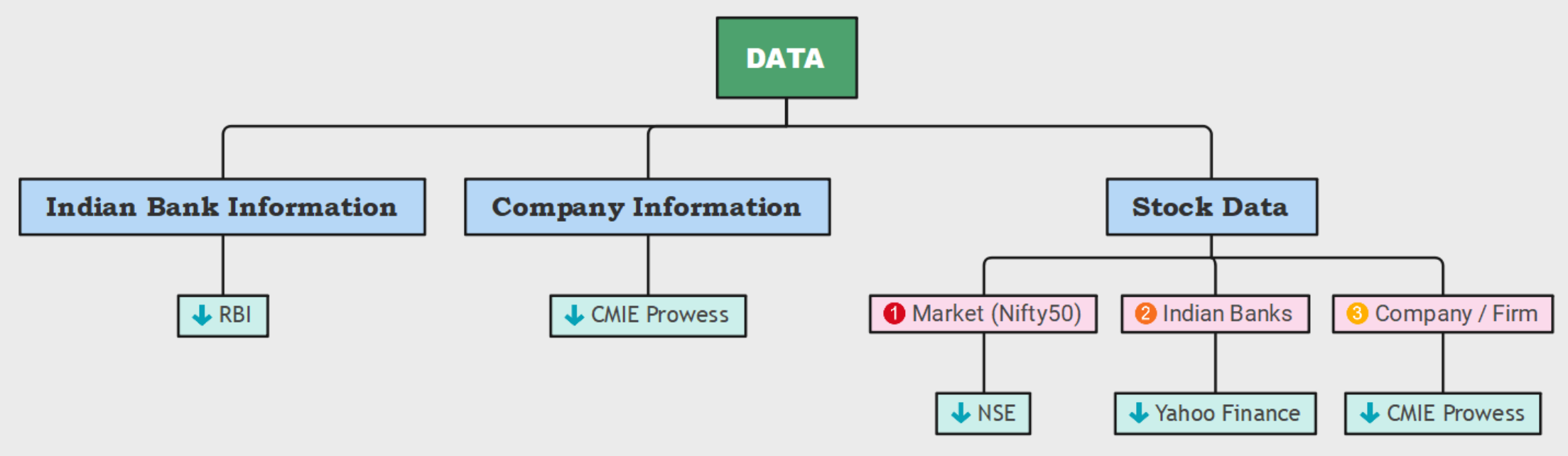
Similarly in any crisis time, peoples started investigating market in detail and managers does not withhold bad news anymore and then stock price drop.

Using crash risk and several fixed effects we are trying to verify the above facts.

Objective

- Checking whether crash risk of firms who took loan(s) from vulnerable bank is high or not compared to non-vulnerable bank during COVID.

Data Description



- Number of Bank:
  - 12 Public Bank
  - 17 Private Bank
- Considered time period:
  - Initial stage of COVID: January 2019 to June 2019
  - Before COVID: July 2019 to December 2019
  - During COVID: January 2020 to June 2020

Snapshot of Data

RBI

	Sr. No	Name of the Bank	Branches	Establishment	Headquarter	Symbol	Type
0	1	Axis Bank	4528	1993	Mumbai, Maharashtra	AXISBANK.NS	Private
1	2	Bandhan Bank	670+	2015	Kolkata, West Bengal	BANDHANBNK.NS	Private
2	3	City Union Bank	700+	1904	Kumbakonam, Tamil Nadu	CUB.NS	Private
3	4	D C B Bank	334	1930	Mumbai, Maharashtra	DCBBANK.NS	Private
4	5	Dhanlaxmi Bank	270+	1927	Thrissur city, Kerala	DHANBANK.NS	Private

Yahoo Finance

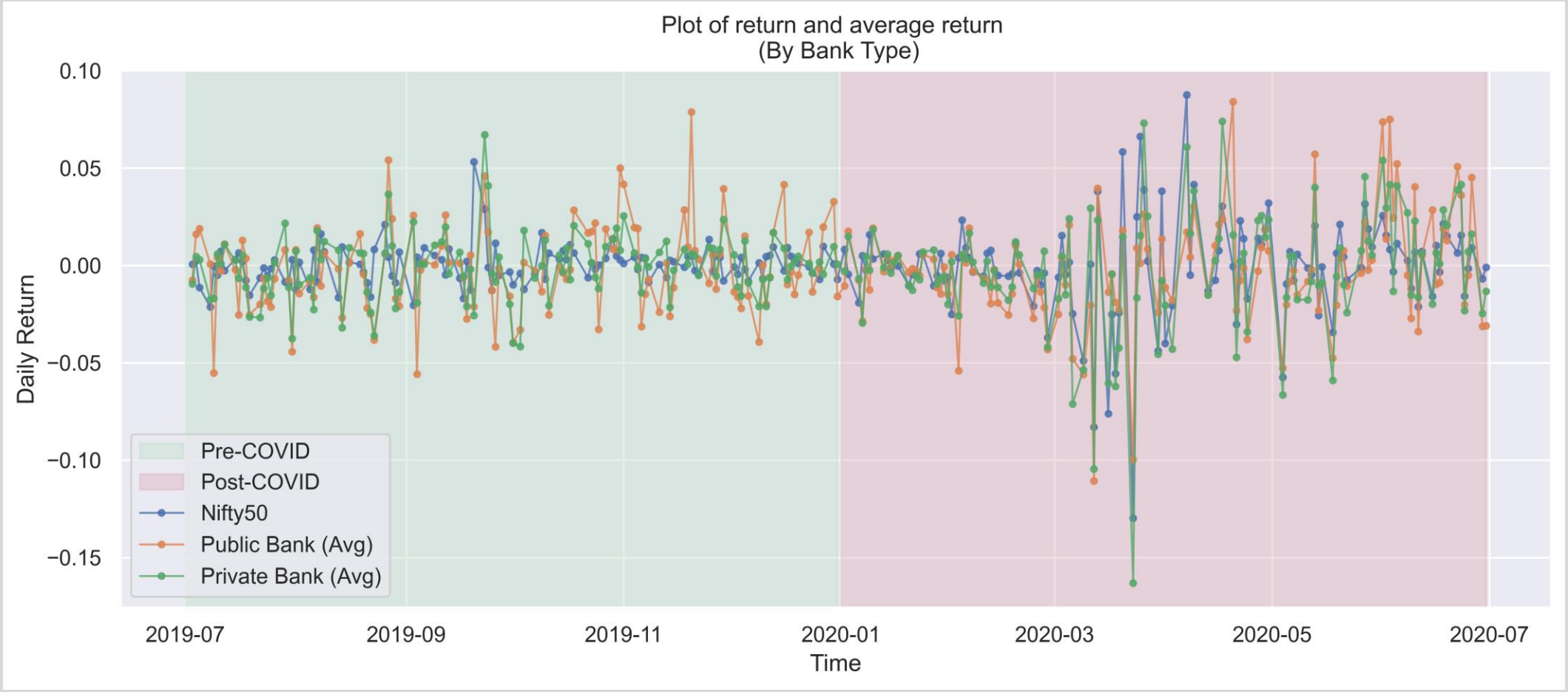
SBIN.NS	PNB.NS	BANKBARODA.BO	BANKINDIA.NS	MAHABANK.BO	UNIONBANK.NS	CANBK.NS	CENTRALBK.NS	INDIANB.NS	IOB.NS
0.014501	0.030912	0.025037	0.011356	0.000775	0.010999	0.032484	0.011142	0.014800	0.004504
-0.016504	-0.024738	-0.034004	-0.007719	-0.003870	-0.007253	-0.031462	0.000000	0.000000	-0.004484
-0.044052	-0.056111	-0.050074	-0.029703	-0.031857	-0.032877	-0.064065	-0.016529	-0.026252	0.045045
-0.001881	0.007329	0.003131	-0.000729	0.000000	-0.004721	0.002892	0.005602	-0.005492	-0.025862
0.004397	-0.016168	-0.008845	-0.010212	-0.016854	-0.014231	-0.001202	-0.011142	-0.014056	-0.017699

CMIE Prowess

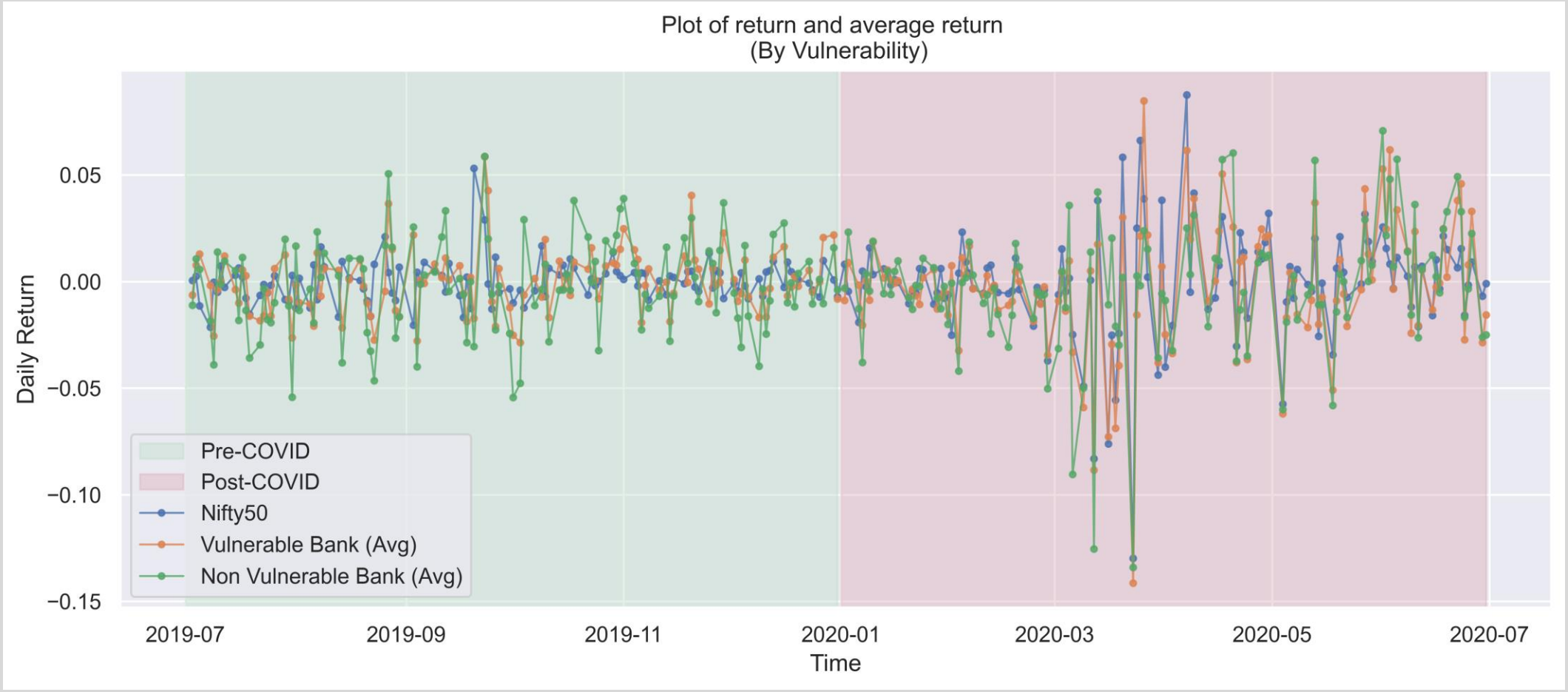
	banker_name	co_code	company_name	bnkhist_date
0	AXIS BANK LTD.	183396	3P LAND HOLDINGS LTD.	31-03-2020
1	AXIS BANK LTD.	218767	52 WEEKS ENTERTAINMENT LTD.	31-03-2020
2	AXIS BANK LTD.	73119	63 MOONS TECHNOLOGIES LTD.	31-03-2020
3	AXIS BANK LTD.	21420	A B B INDIA LTD.	31-12-2019
4	AXIS BANK LTD.	568730	A K M LACE & EMBROTEX LTD.	31-03-2020

	co_code	company_name	co_stkdate	bse_opening_price	bse_high_price	bse_low_price	bse_closing_price	bse_returns	bse_traded_qty	bse_traded_val	...
0	100044	INDUCTO STEEL LTD.	01-01-2019	14.25	14.25	14.25	14.25	0.98	500.0	0.0	...
1	100044	INDUCTO STEEL LTD.	02-01-2019	13.55	13.55	13.55	13.55	0.95	500.0	0.0	...
2	100044	INDUCTO STEEL LTD.	03-01-2019	13.05	13.10	13.05	13.10	0.97	996.0	0.0	...
3	100044	INDUCTO STEEL LTD.	14-01-2019	12.50	12.50	12.50	12.50	0.95	100.0	0.0	...
4	100044	INDUCTO STEEL LTD.	17-01-2019	11.88	12.50	11.88	12.50	1.00	125.0	0.0	...

Exploratory Data Analysis



Exploratory Data Analysis



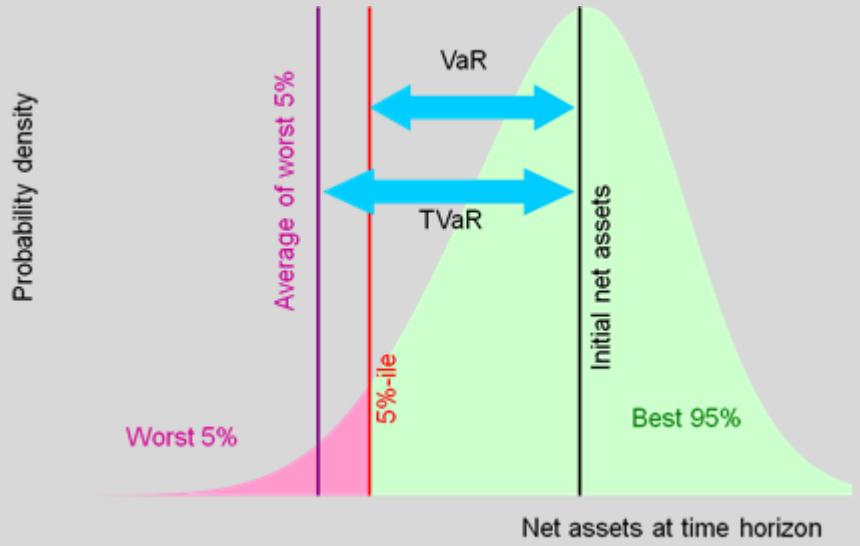
Methodology-I

- Calculating Marginal Expected Shortfall
  - **MES**: Measure of expected equity loss.

$$MES_{i,t} = E_t(r_{i,t+1} | r_{m,t+1} < q_{\alpha,t}(r_{t+1}) = c)$$

Where c is a constant defined as tail risk in the market

- Threshold to measure vulnerability: 5%



(Credit: http://www.nematrian.com/TailValueAtRisk)

Methodology-II

Firm specific daily return

Expanded market model regression

$$r_{j,r} = \alpha_j + \gamma_{1,j} r_{m,\tau-2} + \gamma_{2,j} r_{m,\tau-1} + \gamma_{3,j} r_{m,\tau} + \gamma_{4,j} r_{m,\tau+1} + \gamma_{5,j} r_{m,\tau+2} + \epsilon_{j,\tau}$$

Where,

- $r_{j,\tau}$ be the return of jth firm in τ^{th} day
- $r_{m,\tau}$ be the return of market (Nifty50) in τ^{th} day
- $\epsilon_{j,\tau}$ be the error term of jth firm in τ^{th} day

The **firm specific daily return** for the j in day τ is calculated as the natural logarithm of one plus the residual return.

$$w_{j,\tau} = \ln(1 + \epsilon_{j,\tau})$$

Methodology-III

1. NSKEW

This measure captures the asymmetry of the return distribution of the firm. Negative (positive) values for the skewness indicate data that are skewed to the left (right). NSKEW is calculated by taking the negative of the third moment of firm specific daily returns for each year and normalising it by the standard deviation firm-specific daily returns raised to the third power. This measure is multiplied by -1 So, that a higher value corresponds to greater crash risk.

$$NSKEW_{j,\tau} = -\frac{n(n-1)^{\frac{3}{2}}\sum_{\tau} w_{j,\tau}^{3}}{(n-1)(n-2)\left(\sum_{\tau} w_{j,\tau}^{3}\right)^{\frac{3}{2}}}$$

Where,

- n be the number of available days
- $w_{j,\tau}$ be the firm specific daily return of jth firm in τ^{th} day

2. DUVOL

This is the down to top volatility measure of the crash likelihood. A higher value of the DUVOL indicated greater crash risk. DUVOL does not involve third moments and hence is less likely to be overly influenced by extreme daily returns.

$$DUVOL_{j,\tau} = -log\left(\frac{(n_u-1)^{\frac{3}{2}}\sum_{Down} w_{j,\tau}^{2}}{(n_d-1)\sum_{Up} w_{j,\tau}^{2}}\right)$$

Model

DID Panel data regression

$$Crash\ Risk = \alpha + FE + \beta_1 MES_{firm} + \beta_2 Post + \beta_3 Post * MES_{firm} + \epsilon$$

Where,

- α be the intercept
- Fixed effects (FE)
  1) Bank
  2) Industry
  3) Bank*Industry
- MES_{firm} be the marginal expected shortfall
- $Post$ is a dummy variable, indicate the time
- $Post * MES_{firm}$ be the interaction effect
- β_1 ,β_2 ,β_3 are unknown coefficient
- ϵ be the error component

Result I

NSKEW (Without Controls)

- ✓ How much crash risk change?
  - On average, during the crisis time crash risk is less than before. But it is not significant.
- ✓ Does the time difference in crash risk differ based on the MES measure?
  - The interaction is significant.
  - Crash risk gap is not same for every level of MES.
  - Reduction in the crash risk for those firms that took loan from the vulnerable banks.

Table 1: Result for NSKEW measure (Without controls)

	Dependent variable:						
	NSKEW: Crash Risk Measure						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MES		1.939*	3.722			9.472*	
	(0.000)	(1.095)	(3.922)	(0.000)	(0.000)	(4.887)	(0.000)
Post	-0.047	-0.046	-0.044	-0.045	-0.044	-0.044	-0.044
	(0.039)	(0.059)	(0.046)	(0.033)	(0.026)	(0.027)	(0.026)
MES:Post	-8.529***	-8.591***	-8.605***	-8.590***	-8.651***	-8.673***	-8.677***
	(0.734)	(1.048)	(1.096)	(0.864)	(1.067)	(1.044)	(1.047)
Observations	4,203	4,203	4,203	4,203	4,203	4,203	4,203
R2	0.009	0.042	0.125	0.048	0.137	0.145	0.150
Note:						*p<0.1; **p<0.05; ***p<0.01	

Bank-FE	Y	N	N	Y	Y	N	Y
Industry-FE	N	Y	N	Y	N	Y	Y
Bank * Industry-FE	N	N	Y	N	Y	Y	Y
Controls	N	N	N	N	N	N	N

Result II

NSKEW (With Controls)

- ✓ How much crash risk change?
  - On average, after the crisis time crash risk is less than before. But it is not significant.
- ✓ Does the time difference in crash risk differ based on the MES measure?
  - The interaction is significant.
  - Crash risk gap is not same for every level of MES.
  - Reduction in the crash risk for those firms that took loan from the vulnerable banks.

Table 2: Result for NSKEW measure (With controls)

	Dependent variable:						
	NSKEW: Crash Risk Measure						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MES		2.260**	4.735			11.141**	
	(0.000)	(0.977)	(3.757)	(0.000)	(0.000)	(4.777)	(0.000)
Post	-0.047	-0.046	-0.044	-0.045	-0.044	-0.043	-0.043
	(0.037)	(0.066)	(0.044)	(0.032)	(0.026)	(0.027)	(0.027)
ROA	0.002	0.004	0.003	0.004	0.003	0.003	0.003
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Leverage	0.0001	-0.00002	0.0001	-0.00004	0.0002	0.0002	0.0002
	(0.0002)	(0.0002)	(0.001)	(0.0002)	(0.001)	(0.001)	(0.001)
NSKEW (t-1)	0.092***	0.081***	0.071***	0.083***	0.067***	0.072***	0.070***
	(0.013)	(0.024)	(0.015)	(0.012)	(0.012)	(0.014)	(0.013)
MES:Post	-8.535***	-8.601***	-8.628***	-8.599***	-8.673***	-8.698***	-8.704***
	(0.759)	(1.034)	(1.113)	(0.880)	(1.086)	(1.061)	(1.067)
Observations	4,203	4,203	4,203	4,203	4,203	4,203	4,203
R2	0.019	0.051	0.130	0.057	0.142	0.150	0.155
Note:						*p<0.1; **p<0.05; ***p<0.01	

Bank-FE	Y	N	N	Y	Y	N	Y
Industry-FE	N	Y	N	Y	N	Y	Y
Bank * Industry-FE	N	N	Y	N	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y

Result III

DUVOL (Without Controls)

- ✓ How much crash risk change?
  - On average, after the crisis time crash risk is more than before. But it is not significant.
- ✓ Does the time difference in crash risk differ based on the MES measure?
  - The interaction is significant.
  - Crash risk gap is not same for every level of MES.
  - Reduction in the crash risk for those firms that took loan from the vulnerable banks.

Table 3: Result for DUVOL measure (Without controls)

	Dependent variable:						
	DUVOL: Crash Risk Measure						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MES		-1.165	-3.366			-2.396	
	(0.000)	(0.910)	(2.095)	(0.000)	(0.000)	(2.373)	(0.000)
Post	0.002	0.002	0.004	0.003	0.005	0.005	0.005
	(0.007)	(0.009)	(0.010)	(0.007)	(0.009)	(0.007)	(0.009)
MES:Post	-3.175***	-3.227***	-3.230***	-3.222***	-3.229***	-3.256***	-3.240***
	(0.00004)	(0.364)	(0.889)	(0.00004)	(0.0001)	(0.819)	(0.0001)
Observations	4,203	4,203	4,203	4,203	4,203	4,203	4,203
R2	0.013	0.036	0.134	0.046	0.143	0.148	0.152
Note:							*p<0.1; **p<0.05; ***p<0.01

Bank-FE	Y	N	N	Y	Y	N	Y
Industry-FE	N	Y	N	Y	N	Y	Y
Bank * Industry-FE	N	N	Y	N	Y	Y	Y
Controls	N	N	N	N	N	N	N

Result IV

DUVOL (With Controls)

- ✓ How much crash risk change?
  - On average, after the crisis time crash risk is more than before. But it is not significant.
- ✓ Does the time difference in crash risk differ based on the MES measure?
  - The interaction is significant.
  - Crash risk gap is not same for every level of MES.
  - Reduction in the crash risk for those firms that took loan from the vulnerable banks.

Table 4: Result for DUVOL measure (With controls)

	Dependent variable:						
	DUVOL: Crash Risk Measure						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MES		-0.875	-2.455			-1.076	
	(0.000)	(0.967)	(1.841)	(0.000)	(0.000)	(2.375)	(0.000)
Post	0.002	0.003	0.004	0.003	0.005	0.005	0.005
	(0.007)	(0.009)	(0.011)	(0.007)	(0.009)	(0.008)	(0.009)
ROA	0.001	0.002	0.001	0.002	0.001	0.001	0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	0.001*	0.001*	0.001	0.001	0.001	0.001	0.001
	(0.0004)	(0.0004)	(0.0004)	(0.001)	(0.0004)	(0.0004)	(0.0004)
DUVOL (t-1)	0.110***	0.098***	0.092***	0.096***	0.087***	0.090***	0.089***
	(0.023)	(0.020)	(0.025)	(0.022)	(0.023)	(0.025)	(0.025)
MES:Post	-3.180***	-3.231***	-3.248***	-3.228***	-3.245***	-3.275***	-3.260***
	(0.0001)	(0.290)	(0.851)	(0.0001)	(0.0001)	(0.794)	(0.0001)
Observations	4,203	4,203	4,203	4,203	4,203	4,203	4,203
R2	0.025	0.046	0.140	0.055	0.149	0.154	0.158
Note:							*p<0.1; **p<0.05; ***p<0.01

Bank-FE	Y	N	N	Y	Y	N	Y
Industry-FE	N	Y	N	Y	N	Y	Y
Bank * Industry-FE	N	N	Y	N	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y

Conclusion

- There could be many reason for this,
  - Tightening monitoring/scrutinizing
  - More regularities

- Because of COVID19, COVID shock brought many regularities changes to bring more transparency and monitoring in the economy. Because of this (plausible reason) crash risk got reduce for those firms that took loan from vulnerable bank.

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Thank You