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

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Motivation

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.

Aims and Objectives

- Which banks are more vulnerable during COVID?
- Checking whether crash risk of firms taking loans from vulnerable bank is high or not compared to non-vulnerable bank.

Data Description

- Stock market data of Nifty50 index and considered all private and public Indian bank is collected from the National Stock Exchange (NSE) and the Bombay Stock Exchange (BSE) through Yahoo Finance API.
- Listed companies/firms stocks data is given by supervisor.
- Number of Bank:
  - 12 Public Bank
  - 17 Private Bank
- Considered time period:
  - 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

Private

	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

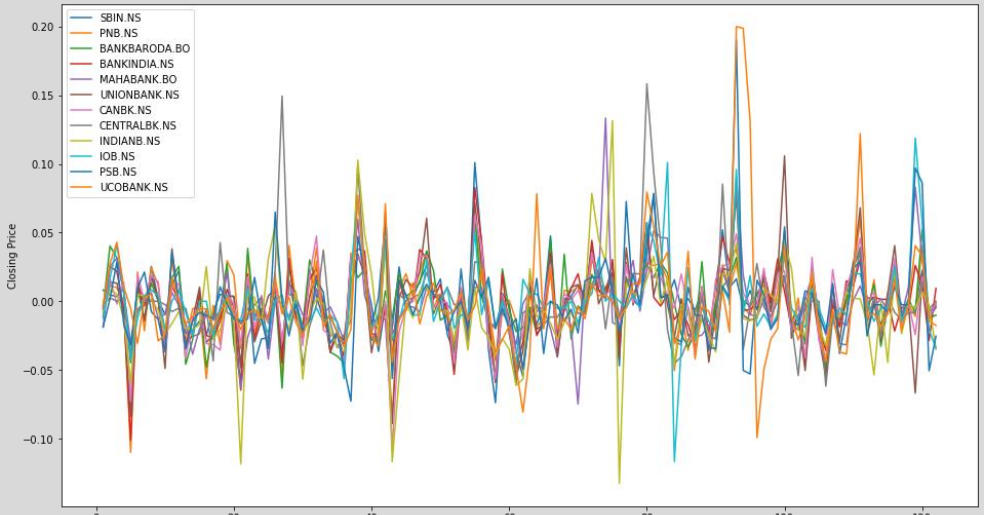
	co_code	company_name	co_stkdate	bse_opening_price	bse_high_price	bse_low_price	bse_closing_price	bse_returns	bse_traded_qty	bse_traded_val	...
0	100044	INDUCTO STEEL LTD.	01-01-2019	14.25	14.25	14.25	14.25	0.98	500.0	0.0	...
1	100044	INDUCTO STEEL LTD.	02-01-2019	13.55	13.55	13.55	13.55	0.95	500.0	0.0	...
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	...

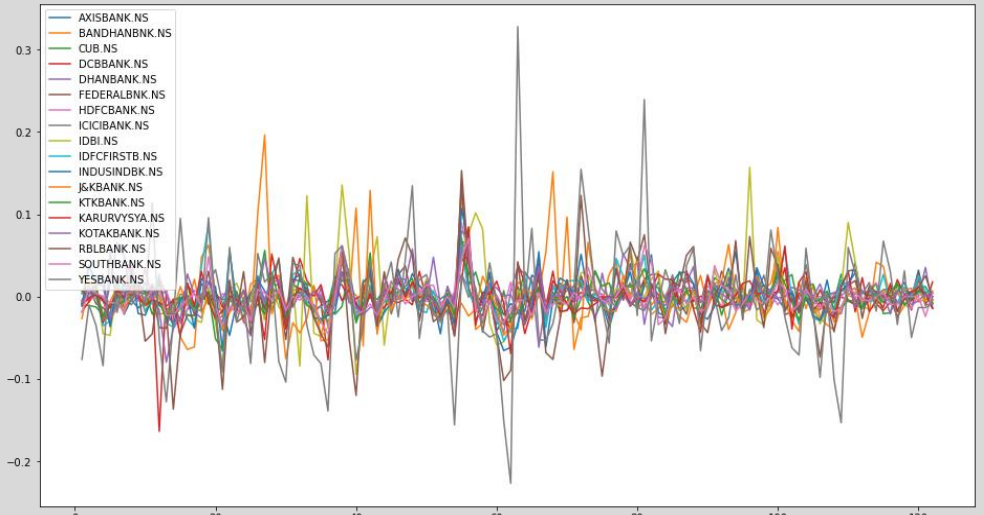
Exploratory Data Analysis

PUBLIC BANK

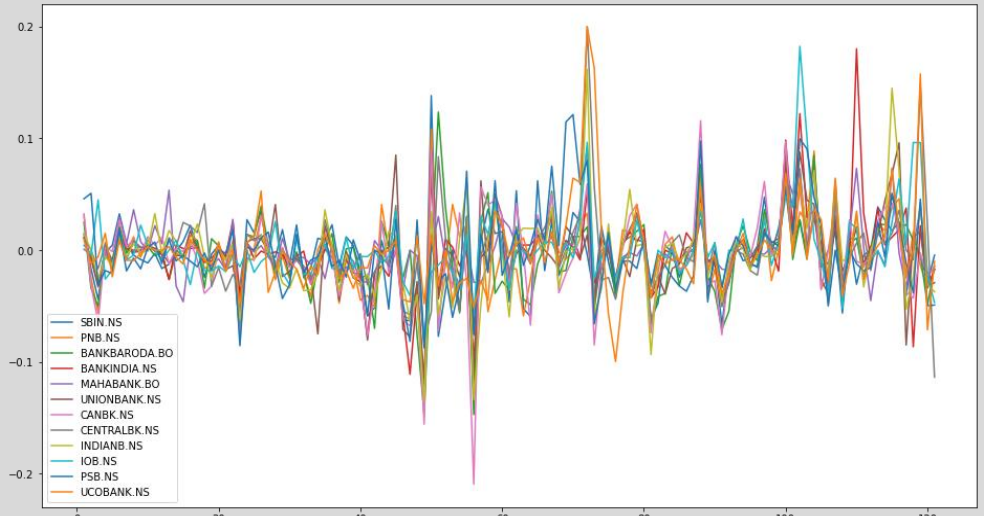
PRIVATE BANK

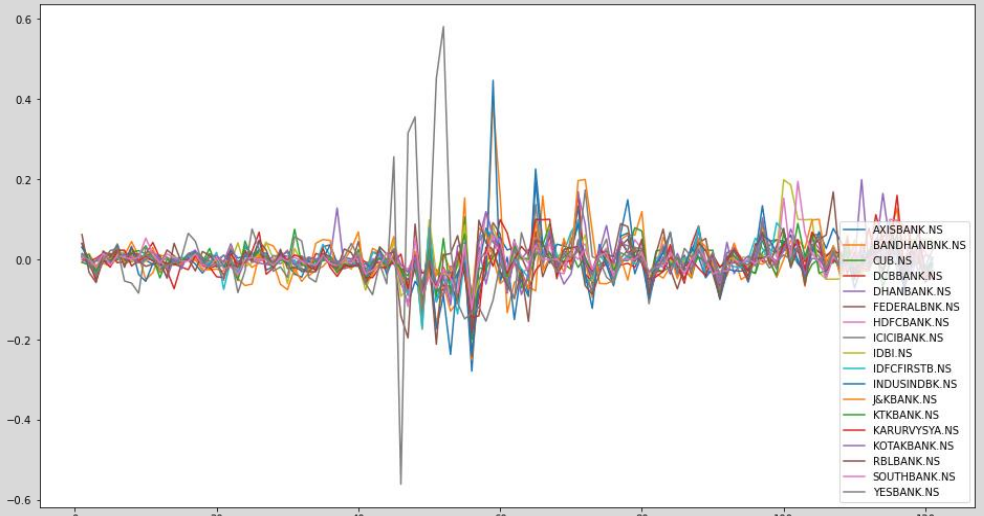
BEFORE



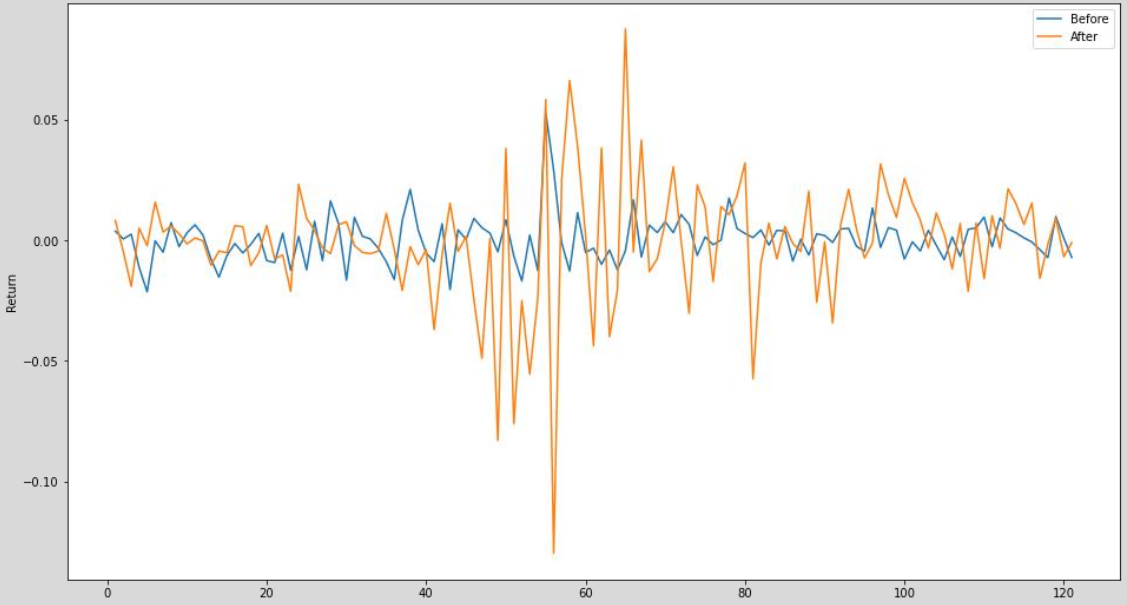


AFTER

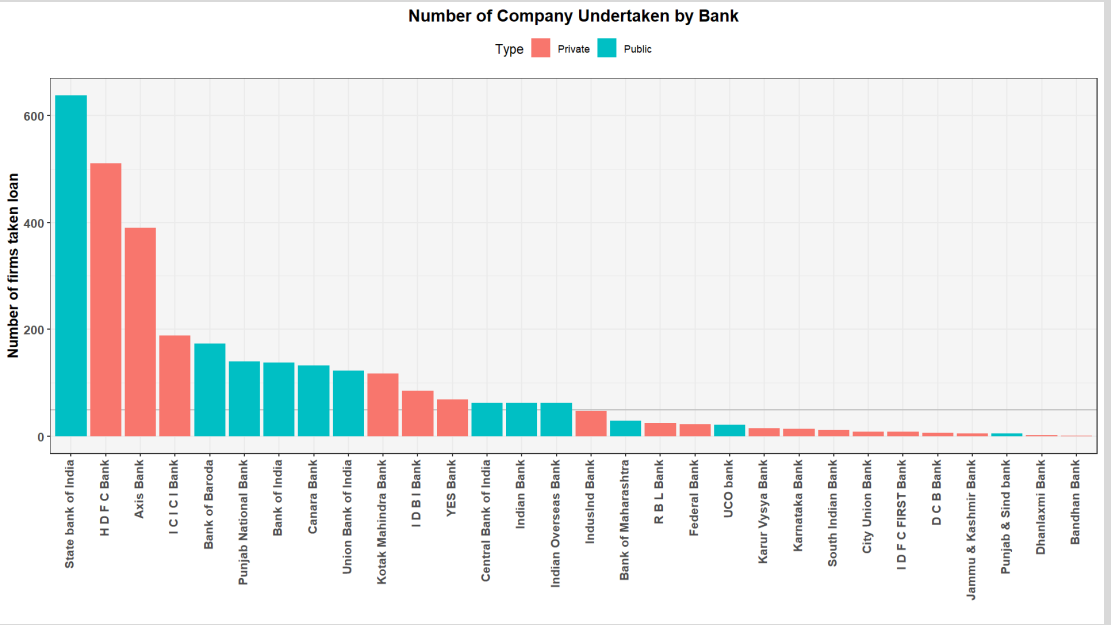




Exploratory Data Analysis



Market return before and after COVID19



Number of firms taken loan from public and private banks

Methodology-I

- Calculating Beta and Marginal Expected Shortfall
  - **Beta**: Risk-reward measure.

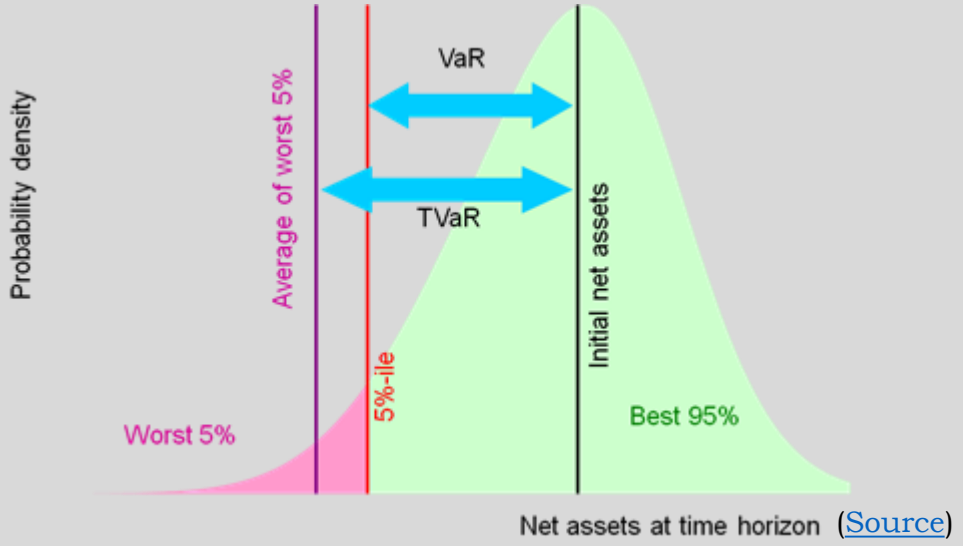
$$y = \alpha + \beta x$$

During time period, y is the Nifty50 daily return and x is individual bank's daily return

  - **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



(Source)

- Making a threshold to measure vulnerability

Methodology-II

Crash risk

The stock price crash risk measures are estimated from the firm-specific daily returns. Following Hutton et al. (2009), we calculate the firm-specific stock returns as follows:

$$R_{it} = \alpha_i + \beta_{1,i} r_{m,t-1} + \beta_{2,i} r_{i,t-1} + \beta_{3,i} r_{m,t} + \beta_{4,i} r_{i,t} + \beta_{5,i} r_{m,t+1} + \beta_{1,i} r_{i,t+1} + \varepsilon_{i,t}$$

Where R_{it} is the stock return for firm i in day t. R_{mt} is the return of the market index at day t.

The firm-specific return is estimated by taking the natural logarithm of one plus residual, which we get from the equation mentioned above:

$$W_{it} = log(1 + \varepsilon_{i,t})$$

Methodology-III

NCSKEW

NCSKEW is the inverse of the third moment, which is divided by the standard deviation of firm-specific returns, which is raised to the third power (Kim et al., 2011b). We can estimate NCSKEW as:

$$NCSKEW_{it} = -\frac{n(n-1)^{3/2}\,\Sigma W^{3}{}_{i,t}}{(n-1)(n-2)(\Sigma W^{2}{}_{i,t})^{3/2}}$$

Where $W_{i,t}$ is the firm-specific return is estimated by taking the natural logarithm of one plus residual. n is the number of daily observations.

Methodology-III

DUVOL

We consider down to up volatility (DUVOL) as our second stock price crash risk proxy. It is estimated by taking the natural logarithm of the standard deviation of the daily firm-specific return that is $W_{i,t}$ when it is lower than its mean over the standard deviation of the daily firm-specific return that is $W_{i,t}$ when it is higher than its mean (Callen and Fang, 2015). We can estimate DUVOL as:

$$DUVOL_{it} = Log\left\{\frac{(n_u - 1)\Sigma_{DOWN}W^2{}_{i,t}}{(n_d - 1)\Sigma_{UP}W^2{}_{i,t}}\right\}$$

Where $W_{i,t}$ is the firm-specific return is estimated by taking the natural logarithm of one plus residual. n_u is the number of daily observations when the daily firm-specific return that is $W_{i,t}$ when it is lower than its mean. n_d is the number of daily observations when the daily firm-specific return that is $W_{i,t}$ when it is higher than its mean.

Model

Bank-level analysis

$$y_j = \alpha + \beta * MES_j + \phi * Private_j + \gamma * MES_j * Private_j + \epsilon_j$$

Difference in difference regression

$$y = \alpha + \beta_1 Private + \beta_2 MES_{bank} + \beta_3 Private * MES_{bank} + \epsilon$$

Panel data regression

$$CrashRisk = \alpha + some\ fixed\ effects + \beta_1 MES_{firm} + \beta_2 Post + \beta_3 Post * MES_{firm} + \epsilon$$

Thank You