

# ***Analysis of Stock Trends impacted by pandemic viruses***

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# Agenda

- Background of SARs and COVID-19
- Hypothesis
- Exploration and Cleaning data
- Deep analysis SARs data
- Summary



# Analysis



## Data Cleaning and Reformatting:

- Sources : SARs Data and Stock Market Data (S&P 500 Index and others)
- How :
  1. Merging data from different sources
  2. Removing unnecessary columns
  3. Grouping data, setting index, rename columns

## Analyse:

- Number of countries are infected
- Total number of people infected, death, recovered
- Stock Market :
  1. Focus on the S&P 500 to represent the stock market performance during SARs
  2. Comparing stock performance before and after SARs

# Timeline - SARs outbreak

## March 2003 (Peak)

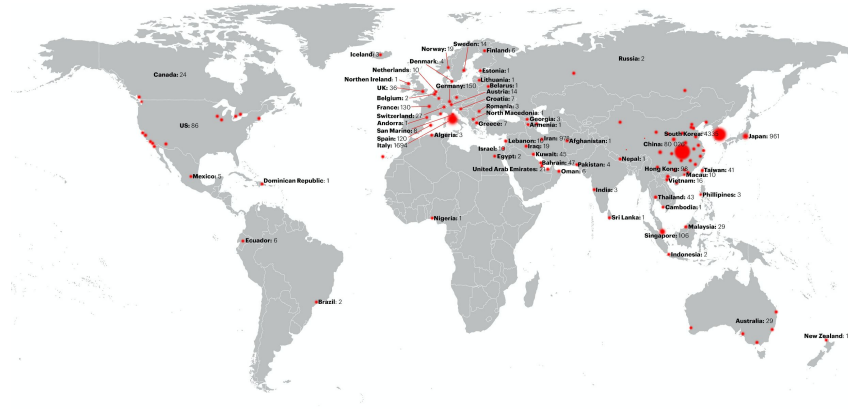
- Mar 12, 2003
- WHO announced global alert
- Mar 28, 2003
- More widespread worldwide

## July 2003

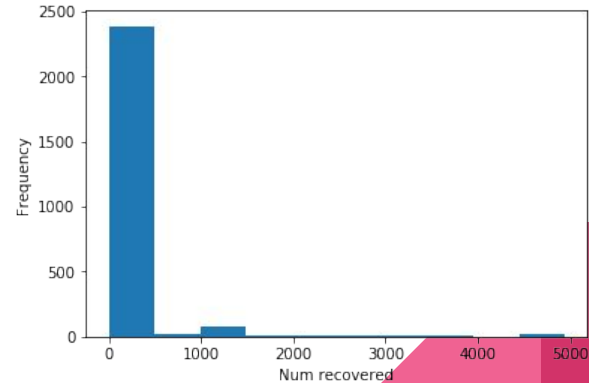
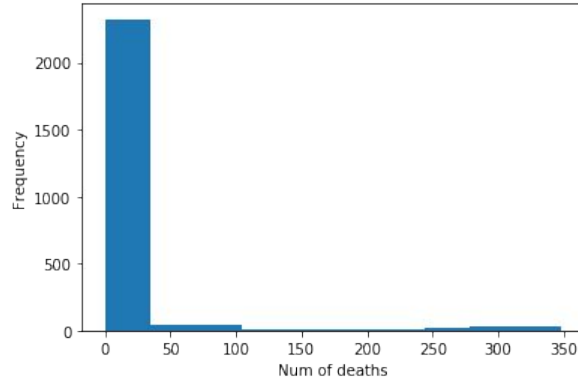
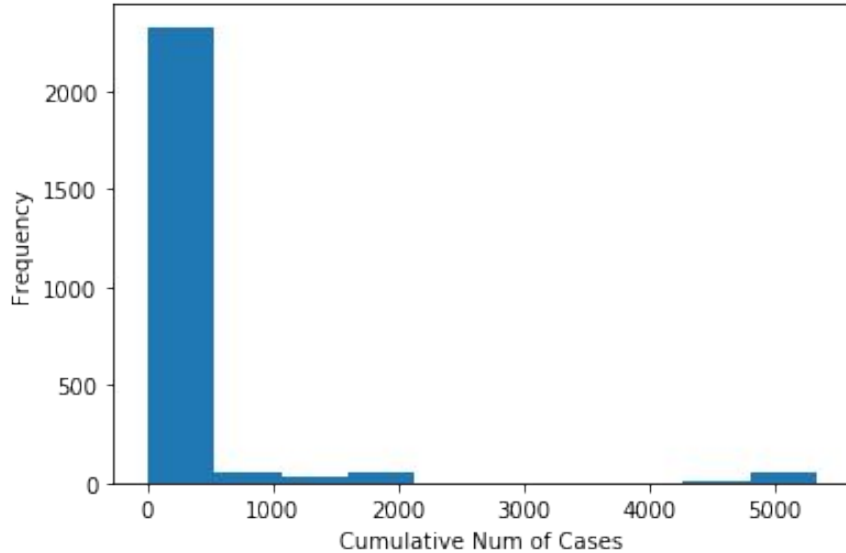
- WHO dismissed global alert on SARs

# SARs - Relative Information

- Date Range: 2003/03/17 to 2003/07/11: **75 days**
- Total number of countries: **37**
- Total number of people infected: **8645**
- Which day has the max number of ppl infect: **26-Mar (836)**
- Which day has the least: **19-Apr, beginning of July (0)**
- Ave number of people are infected in the whole period: **87 ppl/day**

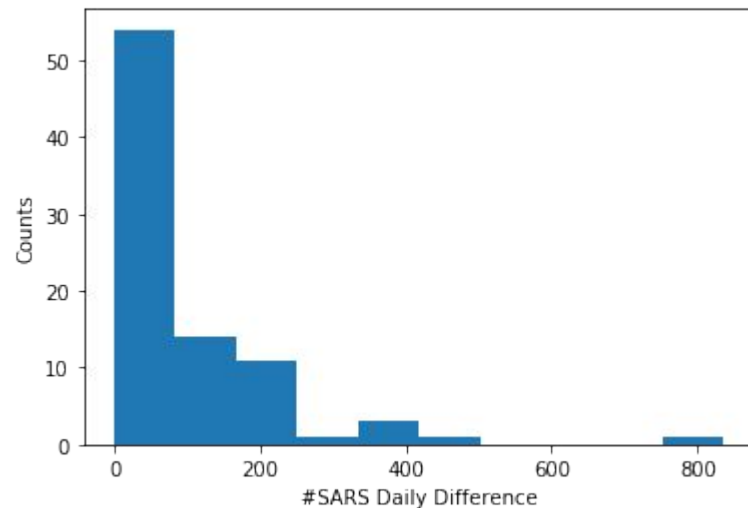


# Analysis of Key Metrics of SARs Cases



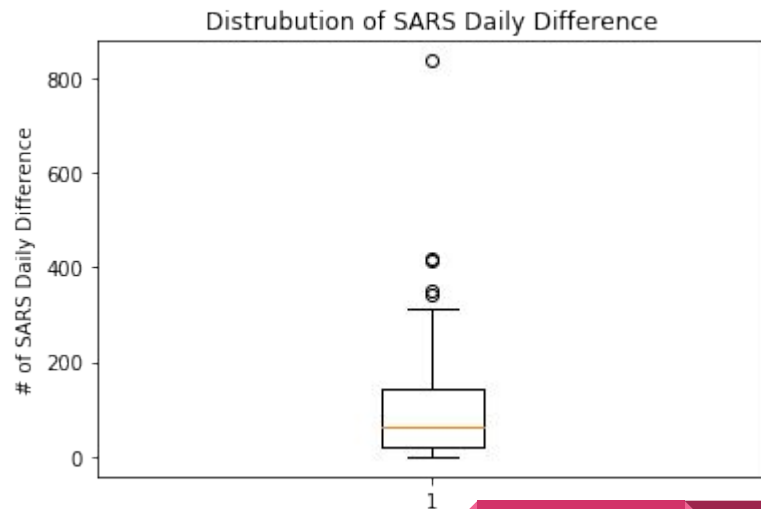
# Deep Analysis SARs Daily Difference

- The **mean** SARs daily difference is 97.62
- The **median** SARs daily difference is 63.0
- The **mode** SARs daily difference is 63.0
- Normal test result  
(**pvalue**=1.0419301191553956e-13)
- The population variance of SARs daily difference is 15247.59944636678
- The population **standard deviation** SARs daily difference is 123.48



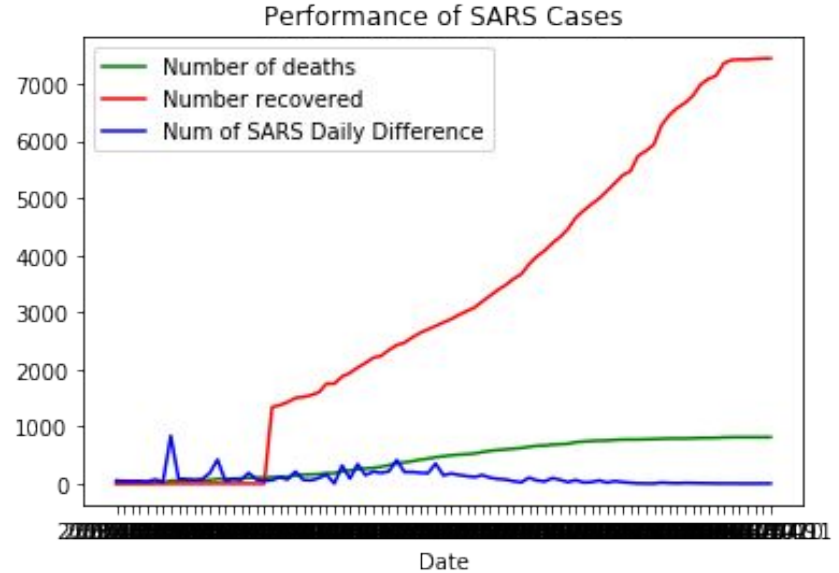
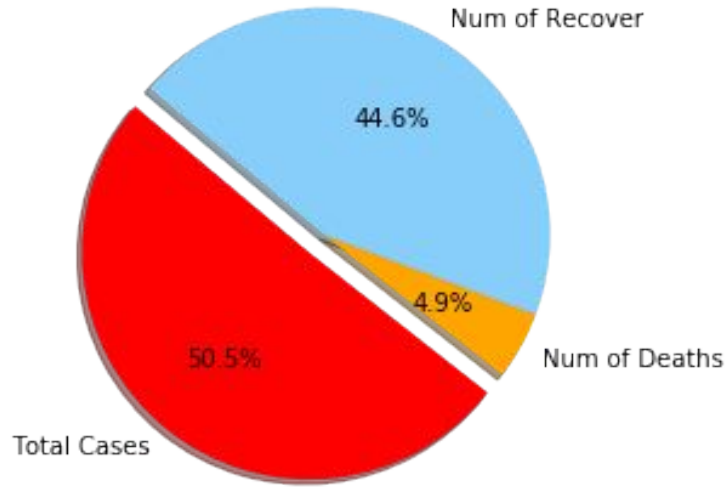
# Outlier of Num of SARs Daily Difference

- The **lower quartile** of SARs daily difference is: 19
- The **upper quartile** of SARs daily difference is: 144
- The **interquartile range** of SARs daily difference is: 125
- The the **median** of SARs daily difference is: 63
- Values above 331.5 could be outliers



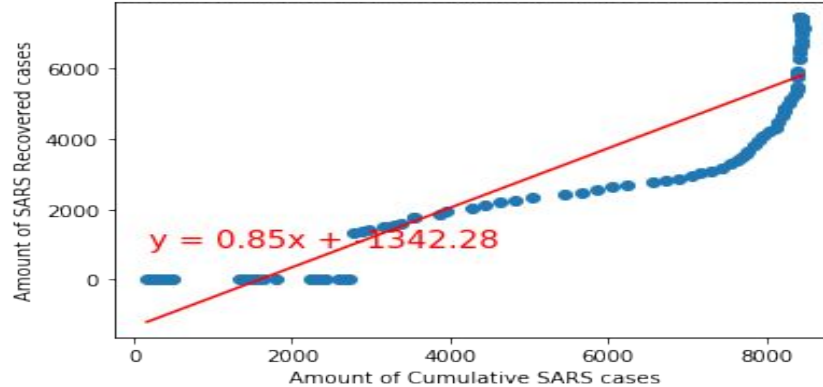


# Distribution and Performance of SARs data

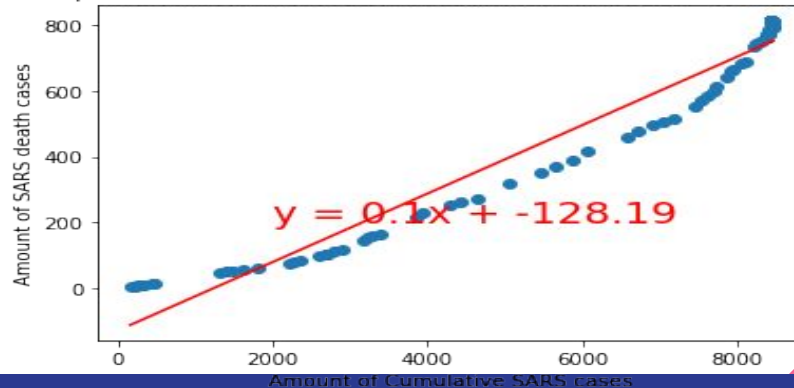


# Linear Regression Analysis of SARs Cases

The Relationship between Cumulative SARS cases number and SARS Recovered cases number

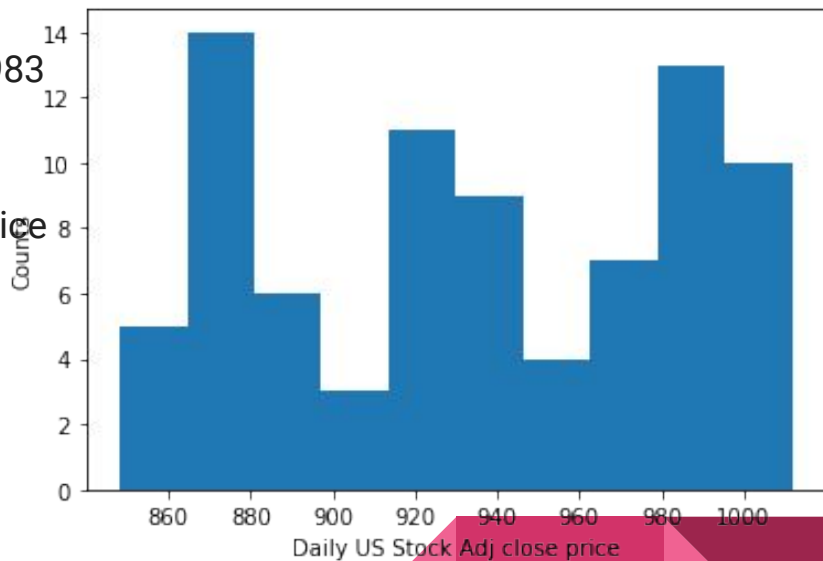


The Relationship between Cumulative SARS cases number and SARS death cases number



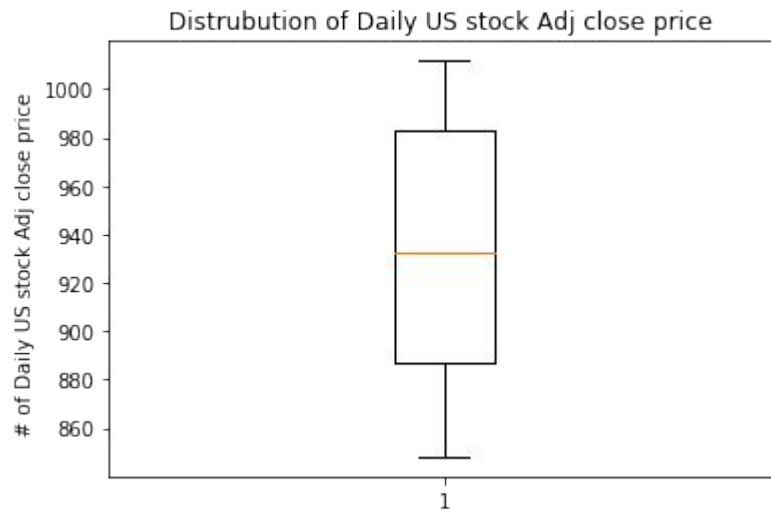
# Deep Daily US Stock Adj Close Price

- The **mean** Daily US Stock Adj close price is 934.3973165609756
- The **median** Daily US Stock Adj close price is 932.544983
- The **mode** Daily US Stock Adj close price is 932.5  
NormaltestResult( pvalue=2.2e-08)
- The population **variance** of Daily US Stock Adj close price is 2360.1
- The population **standard deviation** Daily US Stock Adj close price is 48.6

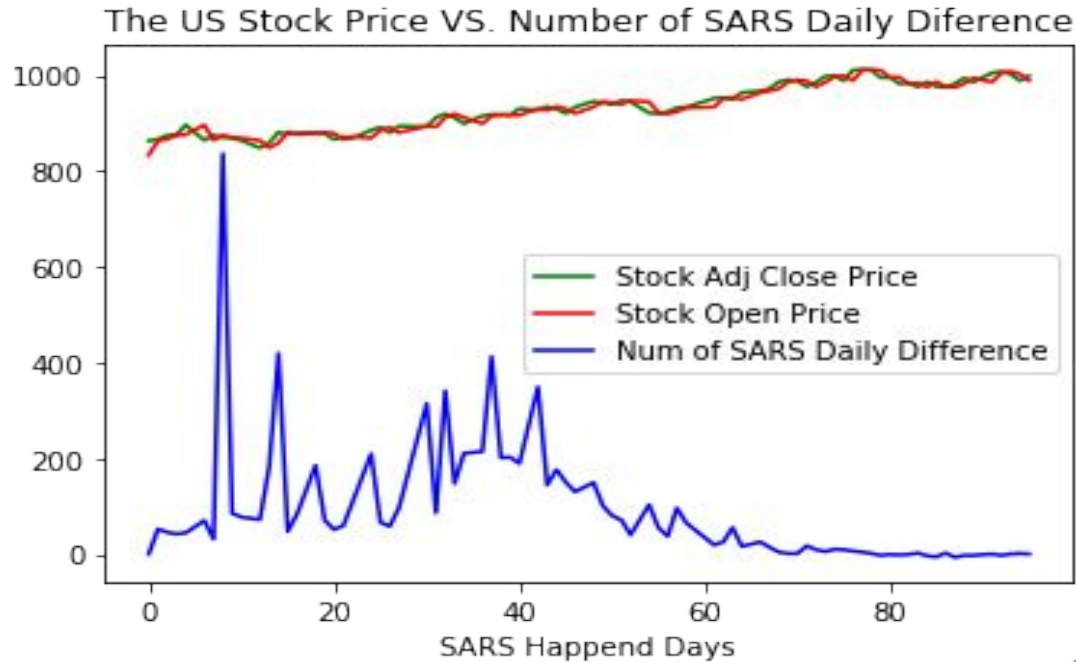


# Outlier of Daily US Stock Adj Close Price

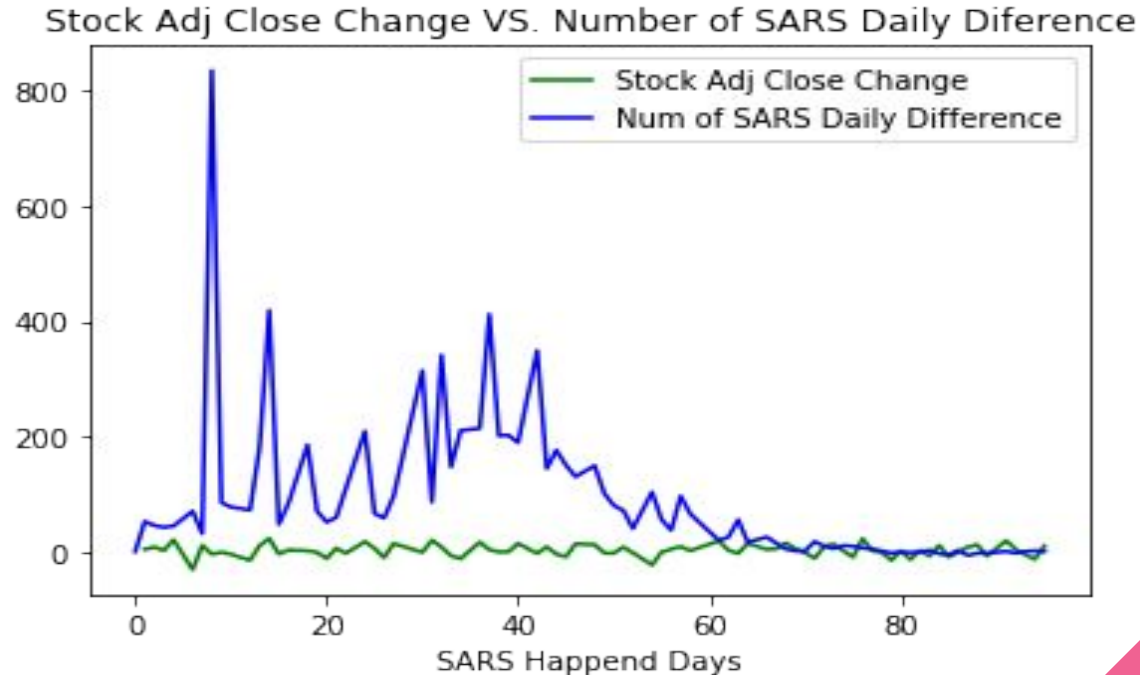
- The **lower quartile** of Daily US stock Adj close price is: 886.6
- The **upper quartile** of Daily US stock Adj close price is: 983.2
- The **interquartile range** of Daily US stock Adj close price is: 96.5
- The **median** of Daily US stock Adj close price is: 932.5
- Values below 741.8 could be outliers
- Values above 1128.0 could be outliers



# The US Stock Price VS. Number of SARs Daily Difference

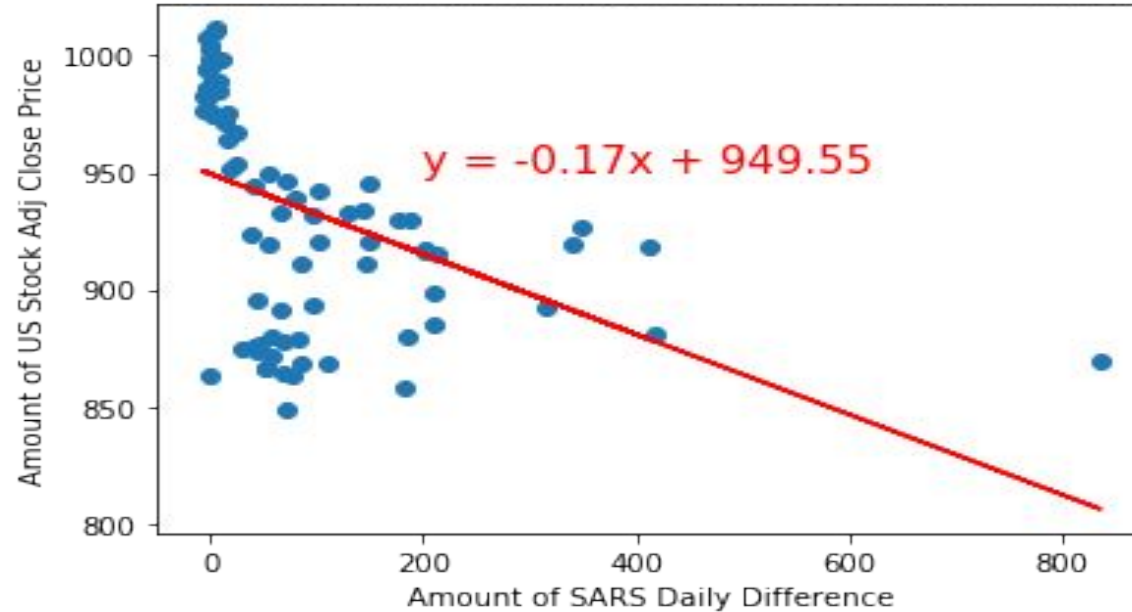


# Stock Adj Close Change VS. Number of SARs Daily Difference

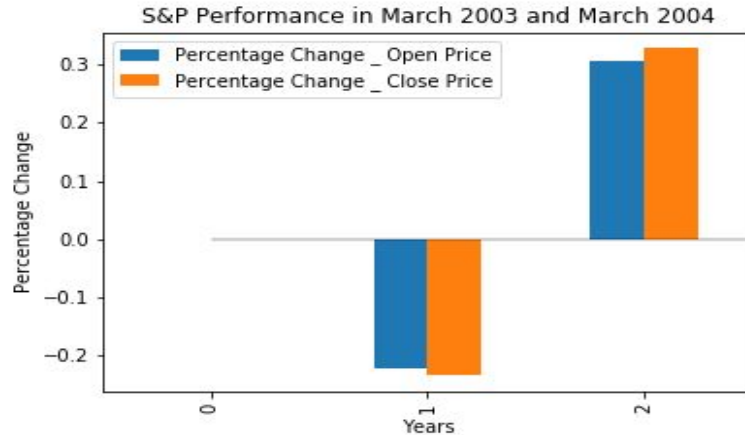


# The Relationship between SARs Daily Difference and US Stock Adj Close Price

The Relationship between SARS Daily Difference and US Stock Adj Close Price



# Percentage Changes - SARs Reached Peak and A Year After



## March 2003 (Peak):

- Open and Close Price:
- Drops 22.2% and 23.36% compares to the March 2002

## March 2004 :

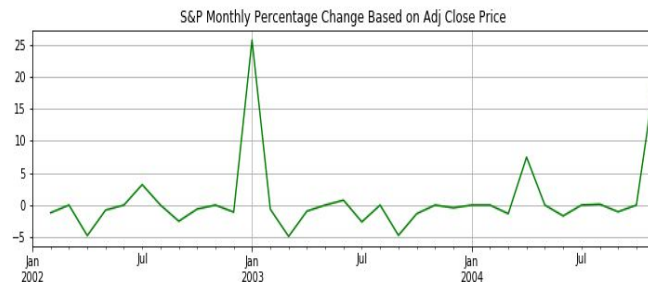
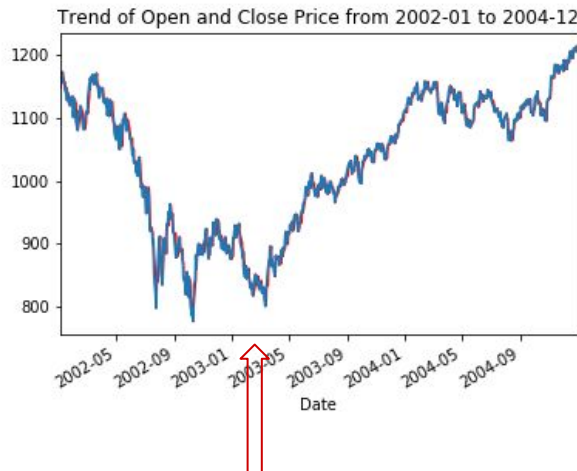
- Recovered
- About 10 percent above March 2002

Comparison	Open Price	Close Price	Percentage Change _ Open Price	Percentage Change _ Close Price
0 March 2002	1109.890015	1106.729980	nan%	nan%
1 March 2003	863.500000	848.179993	-22.20%	-23.36%
2 March 2004	1127.000000	1126.209961	30.52%	32.78%



# Would SARs a big impact on stock market?

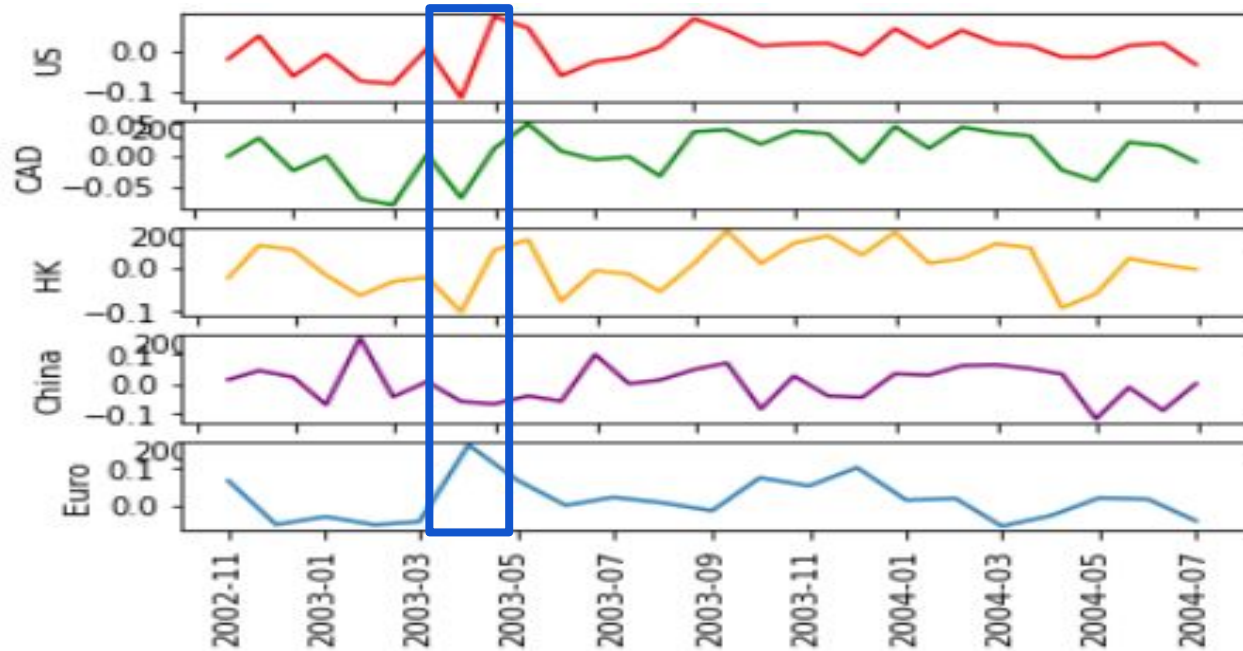
2002-2004 Stock Perf		During SARs
count	755.000000	167.000000
mean	1029.696226	912.087904
std	109.098383	57.272345
min	776.760010	800.729980
25%	926.404999	867.375000
50%	1058.410034	909.929993
75%	1122.614990	969.279999
max	1213.550049	1011.659973



Close Price : **During SARs vs 2002 Jan to Dec 2004**

- **Mean & Min** price During SARs, not reached at the lowest number
- **Lowest point: End of 2002**, not on March 2003 when SARs reached peak
- **Monthly Percentage Change graph: Largest percentage changed on Jan 2003**, not on March 2003

# More Indexes: Percentage Change on Monthly Closing Price



**US:** S&P 500

**CAD:** S&P/TSX

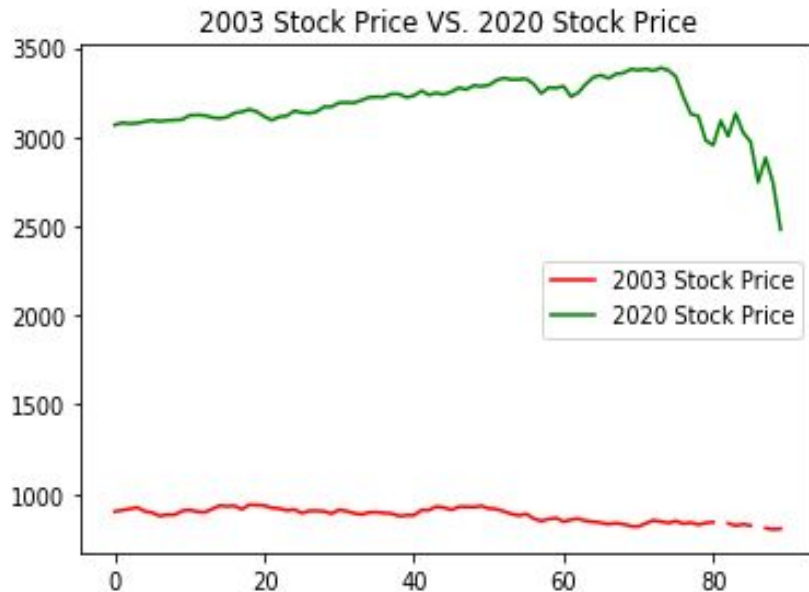
**HK:** Heng Seng Index

**China:** Shenzhen Index - did not impact as much as US, CAD, HK China

**Euro:** Euro Stoxx 50

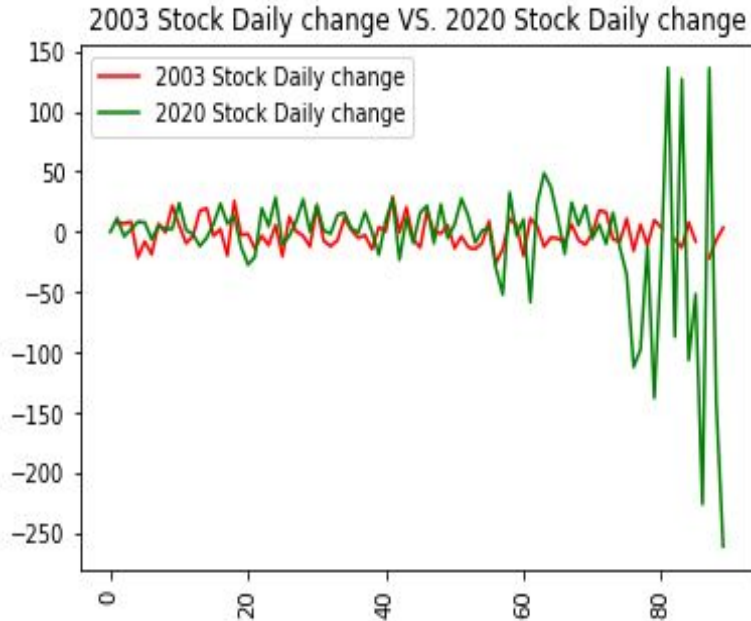
- Increased

# 2003 Stock Market vs 2020 Stock Market



- The 2020 stock market crash began on February 20. The S&P 500 finished down nearly 12% by March 16, its worst day since 1987
- The drop was caused by unbridled global fears about the spread of the coronavirus
- In 2003, the stock market were still at a lower level following the tech bubble and not coming off a decade-long bull market
- The SARs outbreak was not the only main reason. Another major international factor as the U.S. invaded Iraq in March also impacted the stock

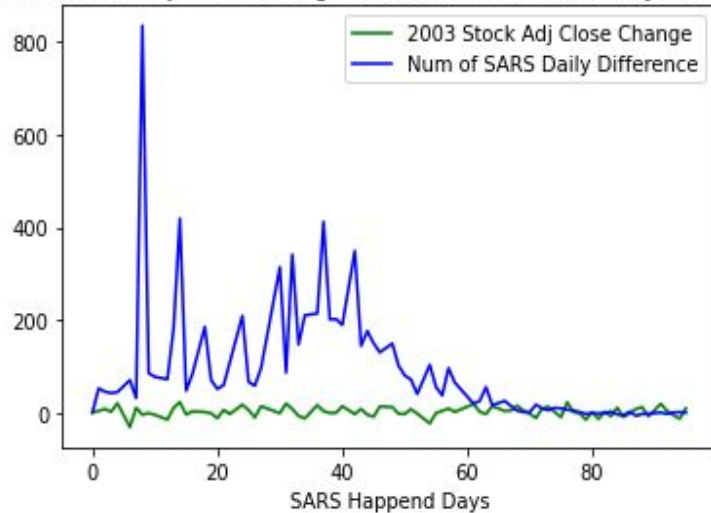
# 2003 Stock Market vs 2020 Stock Market



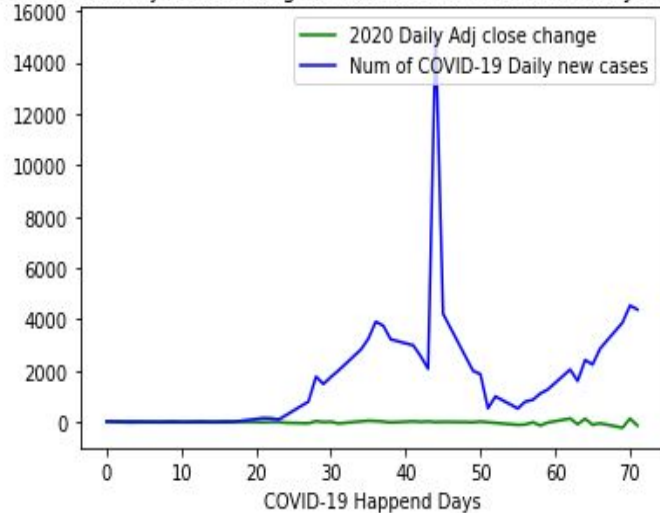
- The SARs outbreak contributed to a slump in US markets in early 2003, but stocks recovered once the outbreak was contained
- The S&P 500 dropped roughly 10% from the start of the year until mid-March, but finished up more than 26% for the 2003 whole year
- Black Monday, March 09, 2020 **-7%** drop
- Black Thursday, March 12, 2020, **-9%** drop
- March 16, 2020, a new record **-12%** drop

# Markets 'powered through' SARs, but the coronavirus outbreak is different

2003 Stock Adj Close Change VS. Number of SARS Daily Difference



2020 Stock Adj Close Change VS. Number of COVID-19 Daily Difference



# Conclusion-SARs

1. The Market's reactions to Coronavirus is not the same as SARs
2. SARs: US stock market was not impacted much by the outbreak of disease
3. SARs showed impact on S&P but it was not significance in the 3 years trend

## Main Reasons:

- Outbreak mainly shown up in Asia
- Much less contagious and high recovery rate
- No big impact on industry
- Other international factor as the U.S. invaded Iraq



# Conclusion-COVID-19

COVID-19: stock market went down dramatically as outbreak increased

- Much higher number of outbreak shown up globally (SARs: 8k vs COVID-19 208k)
- COVID-19 is spreading more quickly
- Social/internet panic and hype because more contagious, lower mortality rate
- A number of suppliers over the world shut down during the outbreak



Thank you!

