# British Stock Market Volatility: Before and After the 1929 NYSE Stock Market Crash

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## Introduction

- Cortes and Weidenmeier (2019, Review of Financial Studies) have recently tried to explain the 'puzzle' of stock volatility in the United States during the Great Depression, arguing that financial leverage and building permits explain much of the volatility on the NYSE during this time.
- The volatility of stock prices can be viewed as an ex-post way to measure investor uncertainty, indicating that investors were unsure about prospects, so prices rose and fell frequently. A purer, ex-ante, measure of uncertainty would be the VIX, which is derived from the implied volatility of options. Unfortunately, as options were not widely quoted in the United States during this period it has not been possible to calculate such a measure.
- However, in the United Kingdom, option prices are available for a range of companies throughout the period from 1922 to 1939 in the Financial Times.

## Research Questions

- Does the implied volatility indicate that greater volatility does come when there was an NYSE stock market crash in 1929?
- How does implied volatility change in major sectors (oil, rubber, railway, and newspaper) of the British stock market when there was an NYSE stock market crash in 1929?

## Methods

### Data

- Stock and option data from 1926 to 1929 are collected from Financial Times which is available in the Gales News Vault database. There are three option prices listed in Financial Times. (2 months, 3 months, 4 months later than the publish date)

### Measures

- Implied volatility is calculated using Black Scholes Merton Option Pricing Formula. The calculation is achieved using the Python modules Mibian and Pandas.

$$C(S,t) = N(d_1)S - N(d_2)Ke^{-rT}$$

$$d_1 = \frac{ln\left(\frac{S}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$$

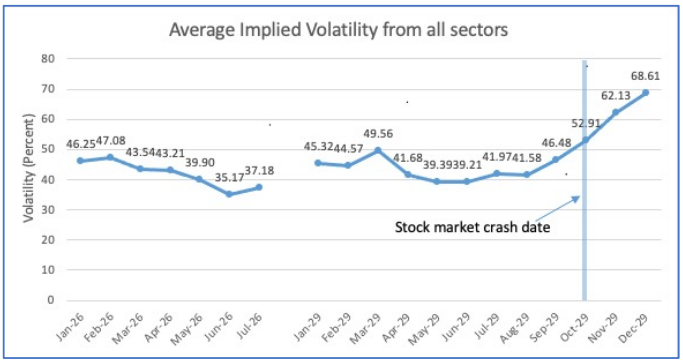
$$d_2 = d_1 - \sigma\sqrt{T}$$

| | |
|---|---|
| $C(S,t)$ | (call option price) |
| $N()$ | (cumulative distribution function) |
| $T = (T_1 - t)$ | (time left til maturity (in years)) |
| $S$ | (stock price) |
| $K$ | (strike price) |
| $r$ | (risk free rate) |
| $\sigma$ | (volatility) |

## Results

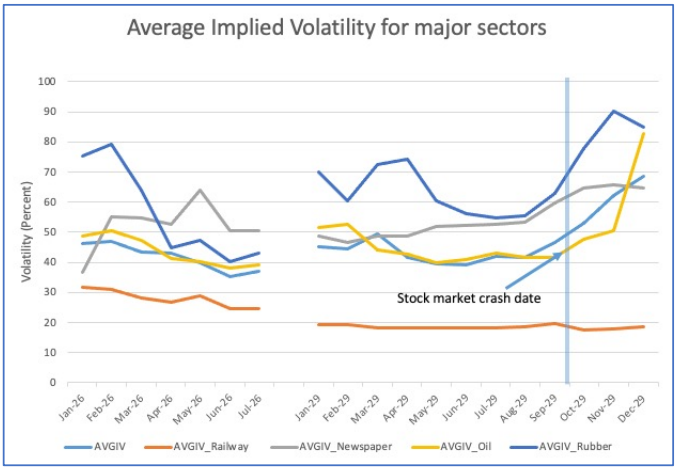
### Fig1: Volatility across all sectors

- Across all sectors, the implied volatility increases from 41.58% to 68.61% after, the stock market crash comes.
- The overall implied volatility remains stable from 1926 to 1929 before the depression.




### Fig2: Volatility in major sectors

- For the oil, newspaper, and rubber sectors of the stock market, there is a drastic increase in implied volatility right before and after the stock market crash.
- For the railway sector, the implied volatility seems to remain stable before and after the stock market crash.




## Discussion

- There was a greater overall volatility when the stock market crash came in 1929. However, more data is needed to see implied volatility after 1929. Currently, there are only 2 observations after the 1929 Great Depression given the time constraint. The planned data frame is 5 years before and 5 years after the stock market crash which presents a better picture of the implied volatility trend.
- Future work can focus on US stock options traded in London during this timeframe and compare the implied volatility rate between British ones and US ones. In addition, since there are also stock market data available in Financial Times during this timeframe, it will also be interesting to analyze the British stock price fluctuation and see if the trend of stock price fluctuations agrees with the implied volatility rate trend here.

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