NASSCOM Analytics Hackathon 2022

Are the Stock Markets 'Dancing on a Knife's Edge' again?

Background:

Globally, nations remain affected in an unprecedented period of economic turbulence. Since, COVID-19 was officially declared a pandemic in March 2020, almost every country faced economic lockdowns, reduced consumer demand and significant disruption in supply chains. All this was accompanied by significant quantitative easing and soaring stock markets. As 2021 unfolded and the impact of pandemic started to rescind, despite rising Omicron cases, US economy's performance turned out better than most people expected—or even realized. Multiple factors pointed to a sharp recovery in late 2021:

- The unemployment rate was back to the full employment level.
- The labor force participation rate started to pick up.
- Corporate profits soared in most places. Profits in Q3 2021 were 21% above the pre-pandemic level. That's much better than many businesses had reason to expect when the pandemic first hit in March 2020.

For now, emerging Covid variant's potential to severely impact the economy has generally diminished but it could make a comeback. This time though, it would be against the backdrop of severe geopolitical tensions.

Fast forward to Q2-2022, the Ukraine-Russia war has added to an already disrupted supply chains and global inflationary pressures amid rising food and energy prices. The Consumer Price Index (CPI) rose 8.5% for the year ended Mar 2022 – the largest 12 month increase since 1981. The international Monetary Fund predicts that U.S. inflation rate will reach 7.7% this year and 5.3% in the euro zone. In response, the US Federal Reserve raised benchmark interest rates by 0.5 percentage point, the biggest hike in 22 years and the second increase of the year. At the same time, investors are selling securities – pushing bond yields higher and a sharp drop in the equity markets. S&P 500 is down 16.3% from start of the year which includes a, decade high, 5 week stretch of selling.

Further uncertainty is expected as the Russia-Ukraine war prolongs and puts more pressure on oil markets, production of key essential goods and shipping. Inflationary concerns for most of the large economies continue to exist. Additionally, China's zero-tolerance policy on Covid and multiple political strategies hinder their government's 5.5% growth target and add to an already grave job market. The US Federal Reserve is widely expected to continue increasing benchmark rates with the same intensity unless key consumer price indictors point otherwise.

In a largely placid market for most part in the prior years, we are staring at a stretch of considerable volatility in the financial markets. Now more than ever, investors need a good plan to move forward, and what good is the plan without the predictive power of analytics?

Objective:

Help the investors by building a predictive analytics model or providing actionable analytical insights to this problem. Output should be a confidence score on whether stock market will crash in 2022 or not and if it does find an approximate time interval in which this can possibly occur.

Data:

There is no restriction on data that can be used as long as it has *Open Source license* or *freely available* for anyone to use without any conditions. To get participants started we propose the use of following sites. However, solution need not be necessarily based on the material mentioned below.

Time series data sets available:

P/E Ratio: https://www.macrotrends.net/stocks/charts/NDAQ/nasdaq/pe-ratio

EPS Trend: https://www.macrotrends.net/stocks/charts/NDAQ/nasdaq/eps-earnings-per-share-diluted

Debt/Equity Ratio: https://www.macrotrends.net/stocks/charts/DOW/dow/debt-equity-ratio

Debt-Liabilities level: https://fred.stlouisfed.org/series/NCBDBIQ027S#0

Industrial Production: https://fred.stlouisfed.org/series/INDPRO

Real GDP: https://fred.stlouisfed.org/series/A191RL1Q225SBEA

Unemployment Rate: https://fred.stlouisfed.org/series/UNRATE

Consumer Price Index (Inflation): https://fred.stlouisfed.org/series/CPIAUCSL

US Treasury rates: https://fred.stlouisfed.org/series/DGS10

U.S. GDP growth estimate: 4.2 % in 2021, 3.2% in 2022, 2.4% in 2023

Evaluation criteria:

1. Innovation of the Solution (problem formulation, insights generated)
2. Technical soundness of approach/methodology used (e.g. time series forecast, analytical insights, economic theory)
3. Research done (literature survey, comparison with previous crashes and/or any time series based analysis)
4. Use of indicators or financial variables in approach (indicators could be both quantitative and qualitative (e.g. Unemployment rate, Debt to GDP ratio, change in government policies etc.)
5. Additional points for predicting or estimating any related indicators and measures that support the analysis.
6. Indicate the time period in which different phases of bubble (displacement, boom, euphoria, distress and revulsion) occurred or may occur (if analysis shows that *crash*[1] is going to happen).

7. Final result with a metric quantifying the possibility of stock market crash in 2021 or a confidence score indicating the time interval of crash.

Expected outcome:

- An ML model exposed through an API and web based interface to call the API?
    - Input parameters to be passed during invocation?
    - Expected output?
        - Crash probability along with the time frame ?
        - Reasons for crash (Explainability?)
    -

  Any restrictions on technology to be used like Python Gradio/stremlit/Collab etc?

Appendix:

1. *IMPORTANT*: Definition of Crash
   Please clearly define your definition of crash. Temporary crashes could even happen intraday and markets recover within hours but definition of crash should be more persistent with situations where markets recover gradually over days, months or years. Also, define threshold %age drop as crashes.
2. Related reads:
    - https://fortune.com/2022/05/09/housing-bubble-watch-housing-markets-are-beginning-to-look-like-they-did-in-2007/
    - https://www.businessinsider.com/stock-market-crash-hawkish-fed-inflation-rate-hikes-forecast-pento-2022-5?IR=T
    - https://internationalbanker.com/brokerage/is-a-stock-market-crash-around-the-corner/
    - https://www.investopedia.com/articles/stocks/10/5-steps-of-a-bubble.asp