NEW CHALLENGES FOR AI/ML BASED ASSET MANAGEMENT - THE POST COVID ERA

ARVIND RAJAN, BASIS POINT GLOBAL SOLUTIONS

AGENDA

- Historical patterns of medium/long term investment returns and risk are broken -- a challenge for AI/ML based methods
  - Example 1: Massive Monetary and Fiscal Stimulus distort prices
- Return expectations have changed dramatically
  - Example 2: Drop in Fixed Income yields/prospective returns
- Changes in market structure and liquidity
  - Example 3: Anomalous behavior of many assets and impact of Fed liquidity injections
- Changes in statistical relationships and correlations
  - Example 4: Divergences and potential bubbles in equity
- Lessons and takeaways for AI/ML practitioners

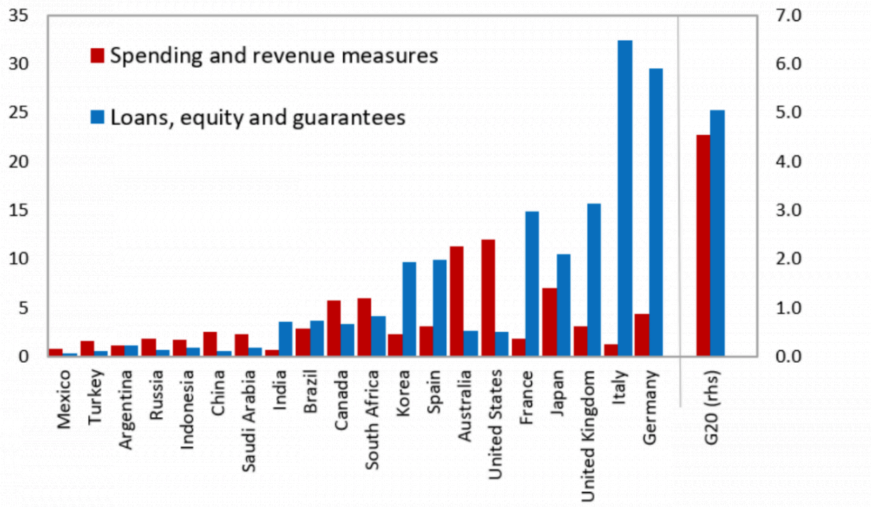
COVID 19 ADDS TO EXISTING AI/ML CHALLENGES

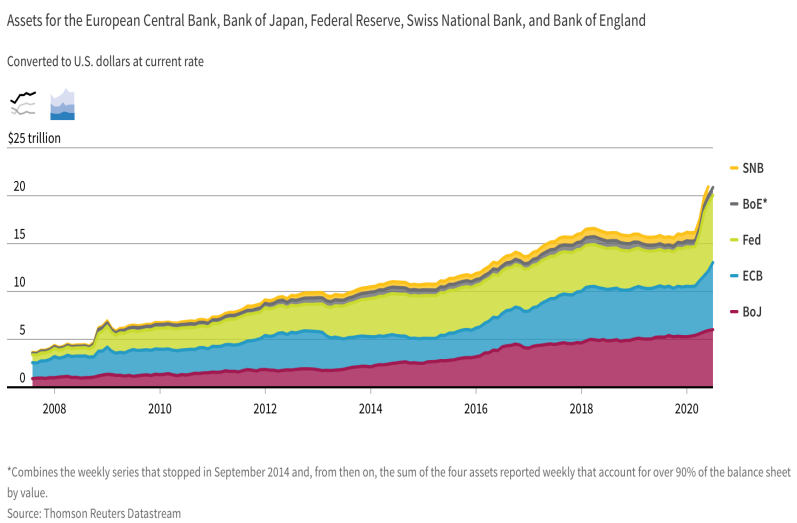
- AI/ML has been more useful operationally than it has for alpha generation
- Predicting financial time series is very difficult
  - Good at spotting nonlinearities and regime shifts, less obviously good at alpha generation
  - Better at higher frequency and short time periods
- AI/ML existing challenges
  - Non-stationarity of data
  - Heightened risk of spurious causality
  - Crowding may attenuate or even reverse the impact of signals
- Covid 19 has exacerbated these and adds new challenges

COVID-19 HAS BROUGHT CHANGES OF UNKNOWN MAGNITUDE AND DURATION

Fiscal: Global, totaling over $9 Trillion, timing unknown, country/asset specific, and subject to change
Monetary: For developed CBs, totaling over $6 Trillion, impact country/asset specific, continually changing
Market Changes: Massive repricing of asset classes and sectors imply changed value and prospective returns
Relative value changes: One-off, driven by stimulus, fundamentals, technical, and price moves

Where are the stimulus relationships that a machine can learn from? Can this new information be successfully incorporated into the inputs?



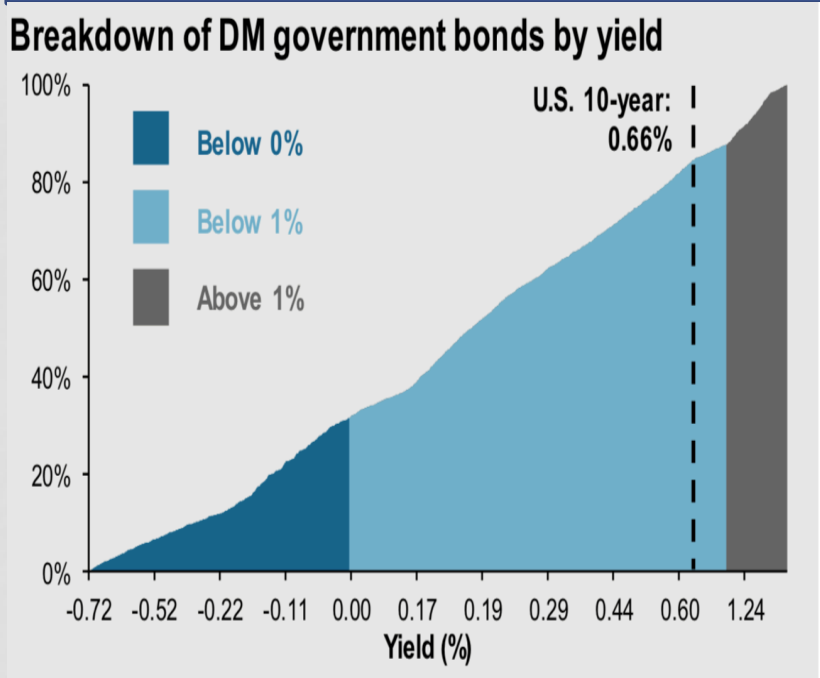


Source: IMF Blog

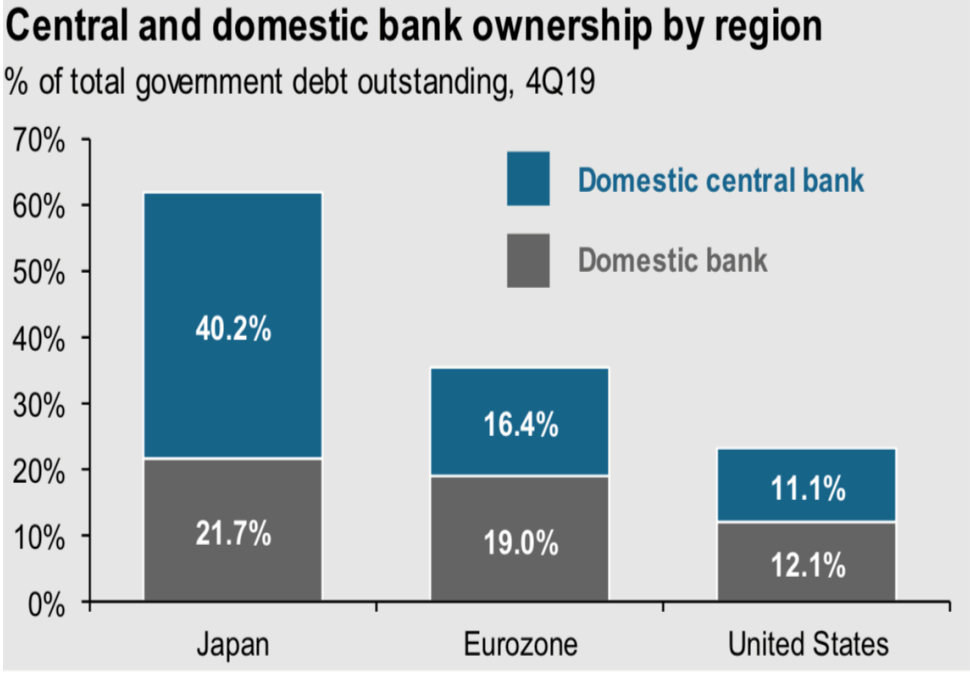
GOVERNMENT BONDS UNDER 1% AND HEAVILY OWNED BY CENTRAL BANKS

Europe and Japan each have over $5T in negative yielding bonds , US is converging to 0
Key benefits eroded: safety and liquidity, income, and deflation and growth hedge
Higher risks: exposed to issuance and inflation, but many institutions are forced to match liabilities
Regulations and governmental entities play a huge role in ownership patterns

Are these facts known to our AI/ML models? Can they be incorporated, or should they be ignored?



Source: JP Morgan



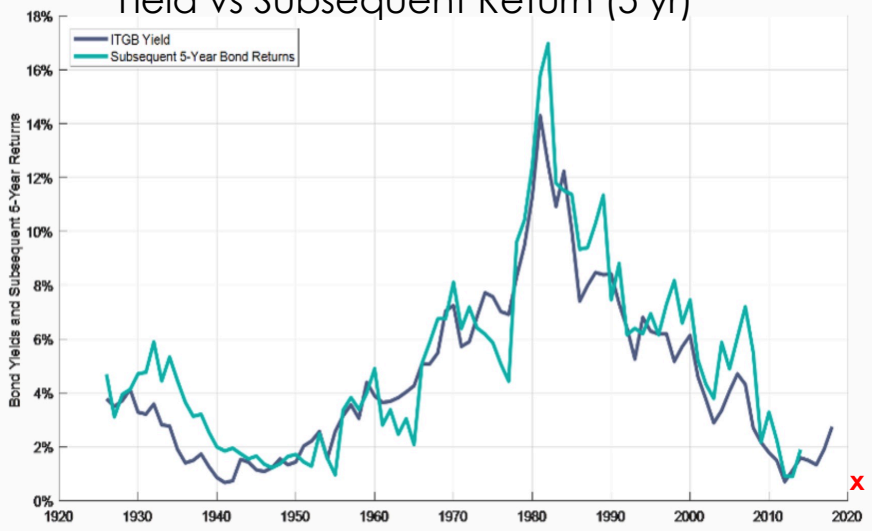
Source: JP Morgan

LOW AND VOLATILE FIXED INCOME RETURN ASSUMPTIONS NEED TO BE BUILT IN

- The yield to maturity is an excellent point estimate of a bond's annualized return at maturity
- The Covid-19 crisis has killed prospects for returns of $100 Trillion bonds around the world
- Structural linkages between yields, inflation, and returns need to be built in
- Traditional correlations may fail when yields change sign from positive to negative

Boundary conditions may apply- but little experience after you cross the boundary

Yield vs Subsequent Return (5 yr)



Source: Wade Pfau, Forbes, Mar 24. 2020

Sector	Yield (7/15/20)	Est. Info Ratio
US Short Tsy	0.15%	0.3
US 10 Yr Tsy	0.64%	0.1
US 30 Yr Tsy	1.33%	0.07
IG Corporate	2.2%	0.3
Japan 10 Yr	0.0%	0.0
German 10 Yr	-0.45%	---
India 10y	5.8%	0.3

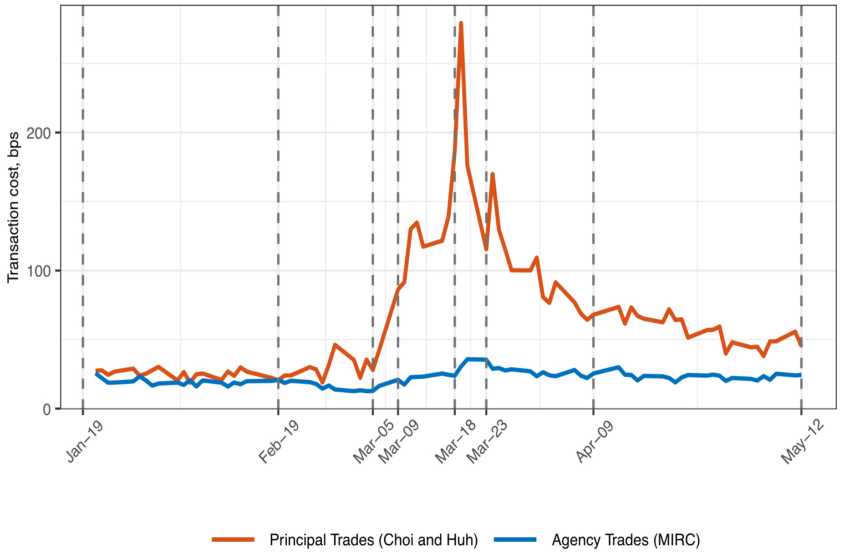
Source: Bloomberg, Author's calculations

SHIFTS IN LIQUIDITY AND MARKET STRUCTURE + REGULATORY RESPONSE HARD TO INCORPORATE

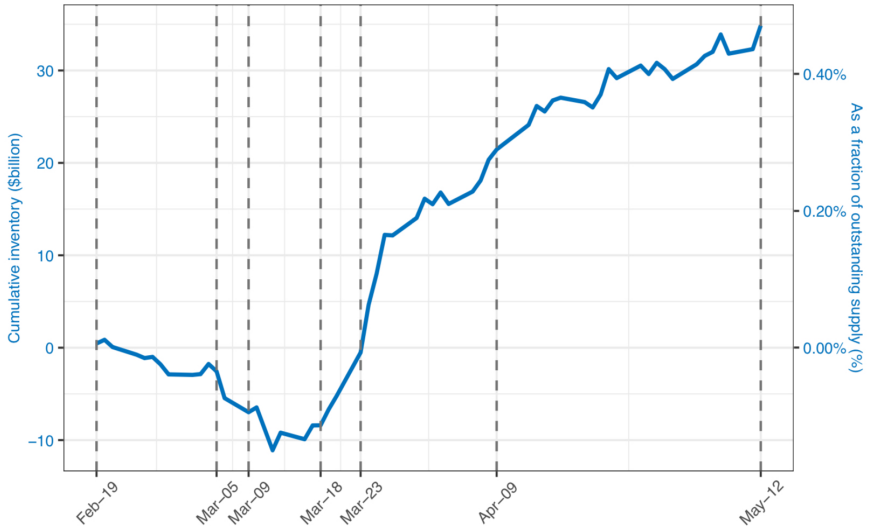
- Corporate, sovereign and structured bonds all lost liquidity in March 2020
- Market makers became extremely risk averse – widening bid-offers and refusing to buy bonds
- The stricter regulatory environment post-GFC may have played a role in dealer risk aversion
- Sovereign and structured credit bonds also became very illiquid
- The Fed managed to avert a liquidity crisis by stepping in with QE and liquidity provision

Neither the structural changes in liquidity and market structure nor the interventions by regulators and central banks are easy to build into historically driven models

Bid offer spreads for principal trades soared



Dealer inventories shrank amidst outflows



Source: Kargar et.al. Corporate Bond Liquidity During the Covid-19 crisis, NBER Working Paper No. 27355, June 2020

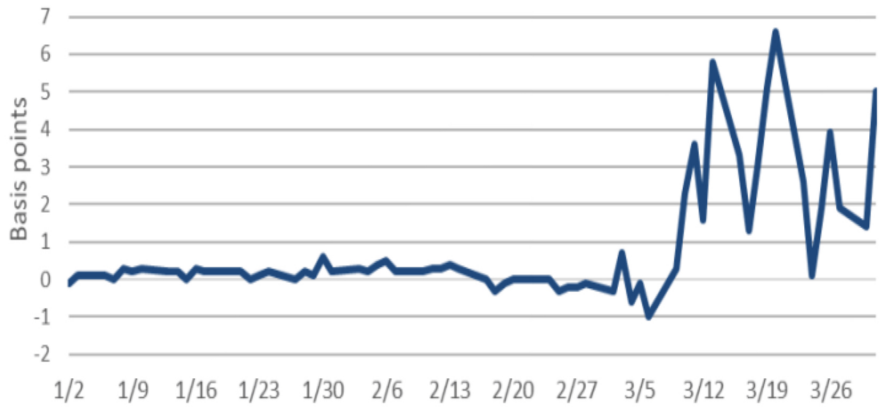
MODELLING CHALLENGE: LIQUIDITY PROVISION BY POWERFUL AGENTS

- US Treasuries went through a period of illiquidity in March 2020
  - On-the run vs Off–the-run treasury spreads widened
  - The prices of futures and underlying deliverable treasuries diverged
  - Bond prices were extremely volatile, especially at the long end
  - Abrupt reversal as the market stabilized when the Fed acted

Many risk premia are mean reversion driven –hence are short liquidity, which is now often affected by powerful individual human agency – not the market. Hard to model statistically!

Spread between off-the-run and on-the-run bonds spiked

30-Years Treasury Bonds

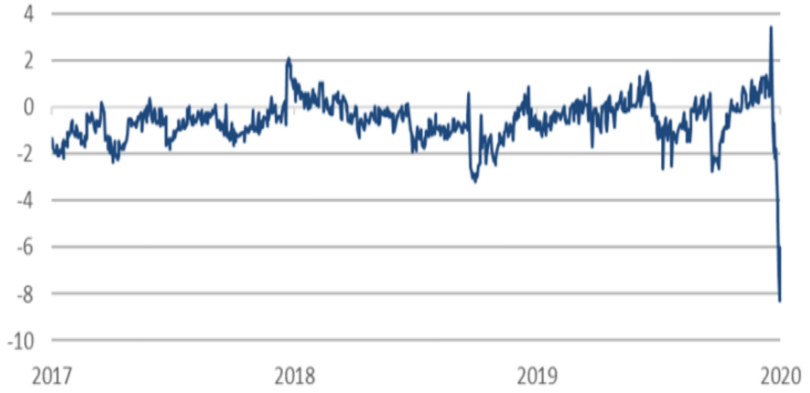


Source: Haver

Hutchins Center on Fiscal & Monetary Poli at BROOKINGS

Prices of Treasury futures and underlying securities become unmoored

Units are in 1/32 of a point



Source: Bloomberg

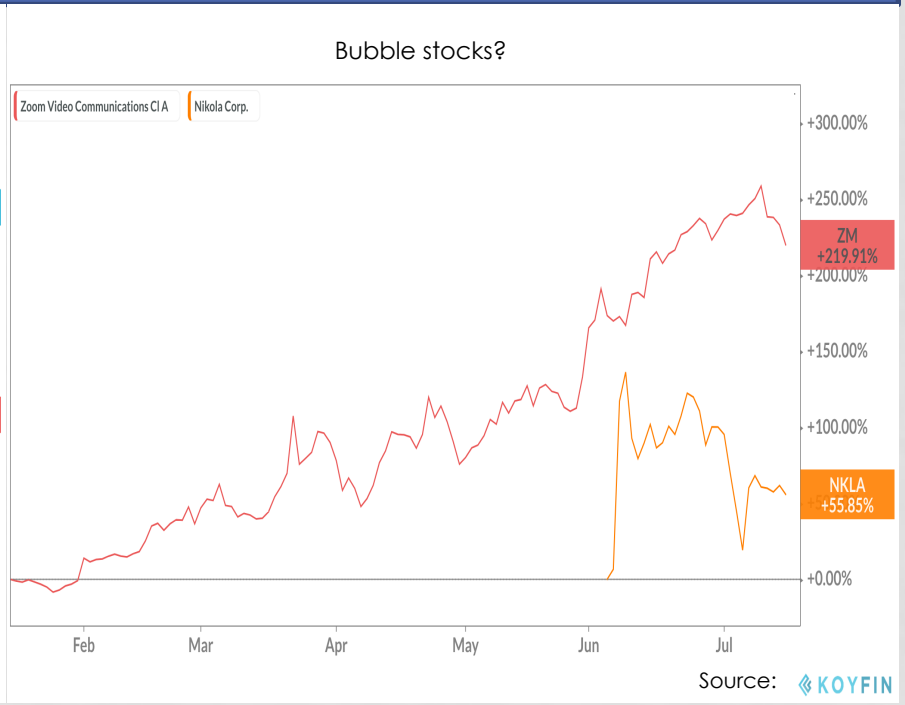
Hutchins Center on Fiscal & Monetary Policy at BROOKINGS

A CONFUSING DIGITAL SHIFT: COVID19 SUPERIMPOSED ON PRIOR PATTERNS

Covid-19 has created a two-speed world – a virtual economy that is soaring vs. a physical economy that is stagnant or slow

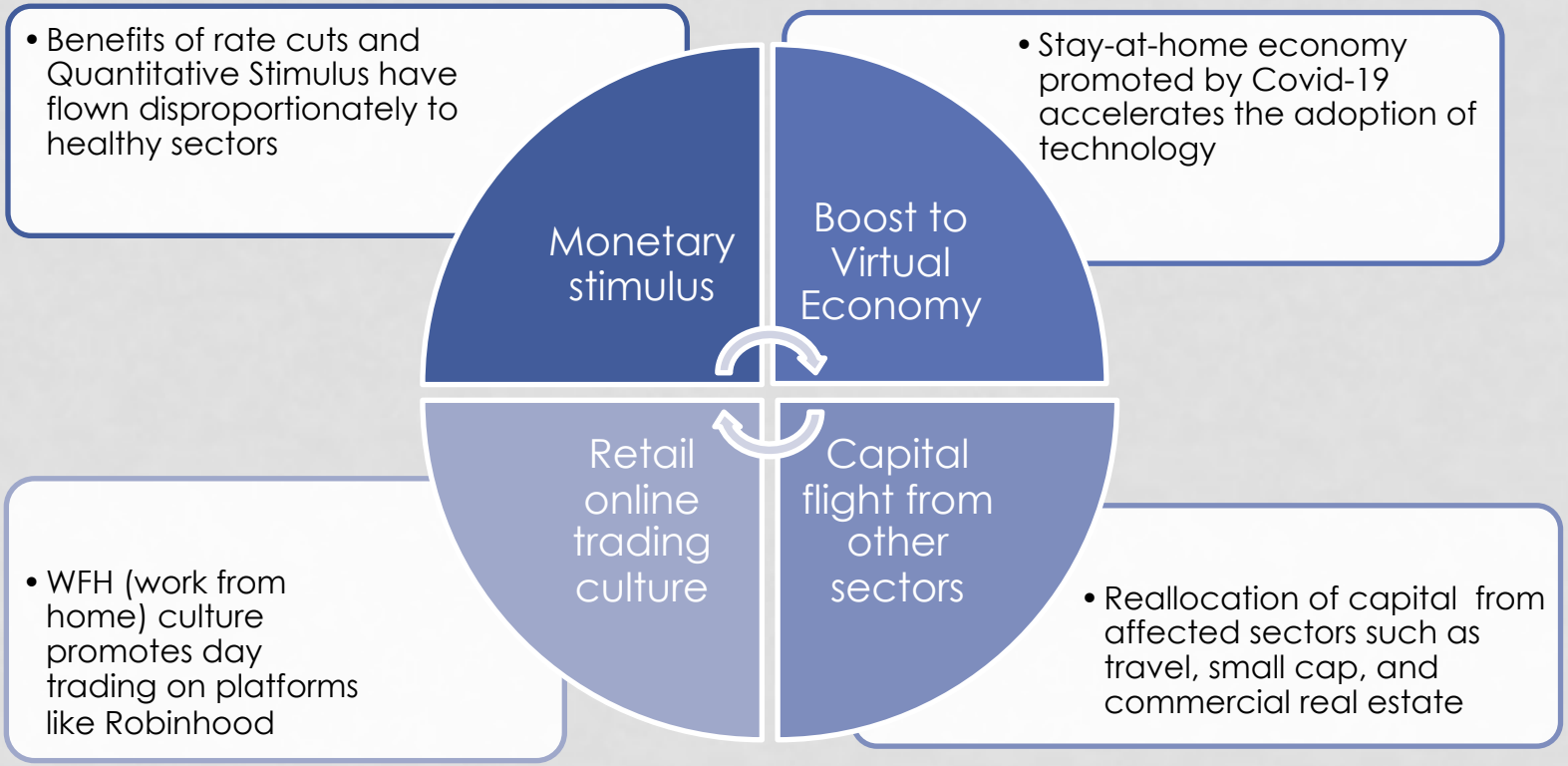
- The segments that are accelerating are not high employment sectors
- US large cap stocks, led by the tech giants, are ahead of Europe and other markets
- A bubble in Technology Growth stocks? If so this was underway pre-Covid

How permanent is the effect? Can machine learning predict when the trend reverses?



FOUR WAYS THE VIRUS MAY BE BLOWING A TECH BUBBLE: A MODELING NIGHTMARE

A technology growth stock bubble was already underway,
The virus has exacerbated not pricked the bubble.
Will this reverse with a recovery and vaccine?



TAKEAWAYS FOR AI/ML PRACTITIONERS

- AI/ML faces formidable challenges in the alpha generation space to begin with
- By introducing several digital shifts, Covid 19 has introduced sharp discontinuities into the data set
- We are in a sparsely populated new regime
- Time series forecasting is even more suspect than during normal times, particularly for low frequency alpha
- Large agents such as central banks have changed the rules
- Lots of new data streams, but which ones are important?
- How can our exogenous knowledge of structure and structural changes be incorporated without introducing new mistakes?

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