

Event Risk Research

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Event Risk, Options, and Risk Management

Motivation:

Dynamic processes,
Complex systems and
Phase transitions

Lessons learnt and future research

Motivation for Event Risk Research

Era of Dissonance – two scenarios, only one can prevail.

Known date, unknown outcome – elections

Probable date range, unknown outcome – policy shifts

Surprise! (Black swans, unexpected, exceedingly rare, huge impact)

Peering through the lens of Complex systems and phase transitions.

What makes a complex system?

Why does complexity matter?

Searching for Anomalies which might lead to price gaps, non-linear behavior, unexpected transitions, etc.

Examining complexity from the science, to applications in economics and finance, to shaping actual investment strategies.

US Dollars per British Pound

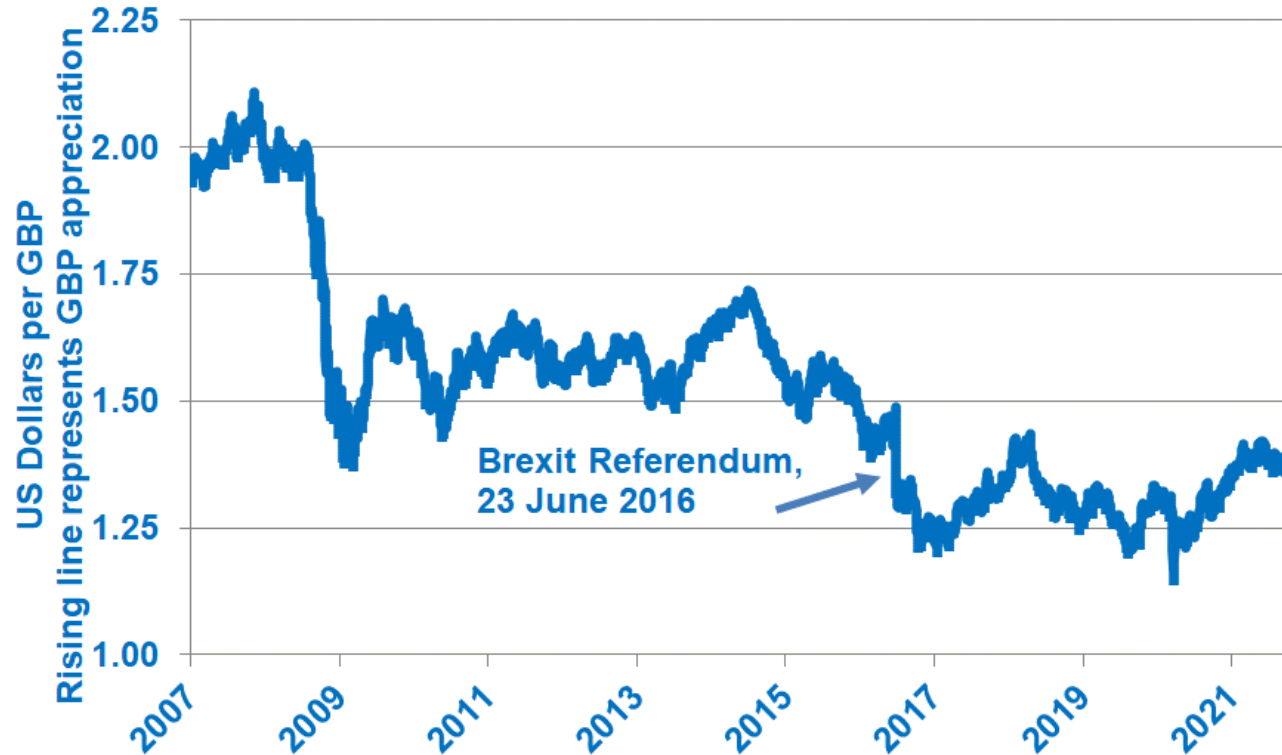
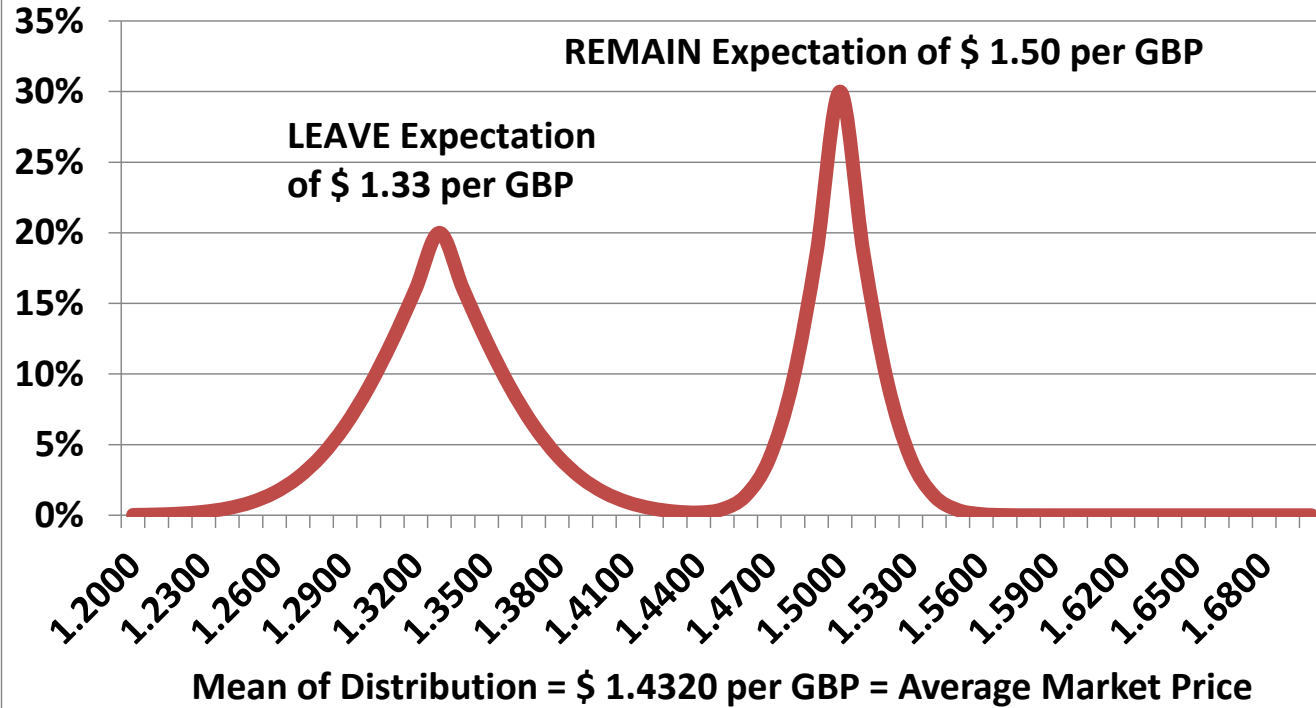


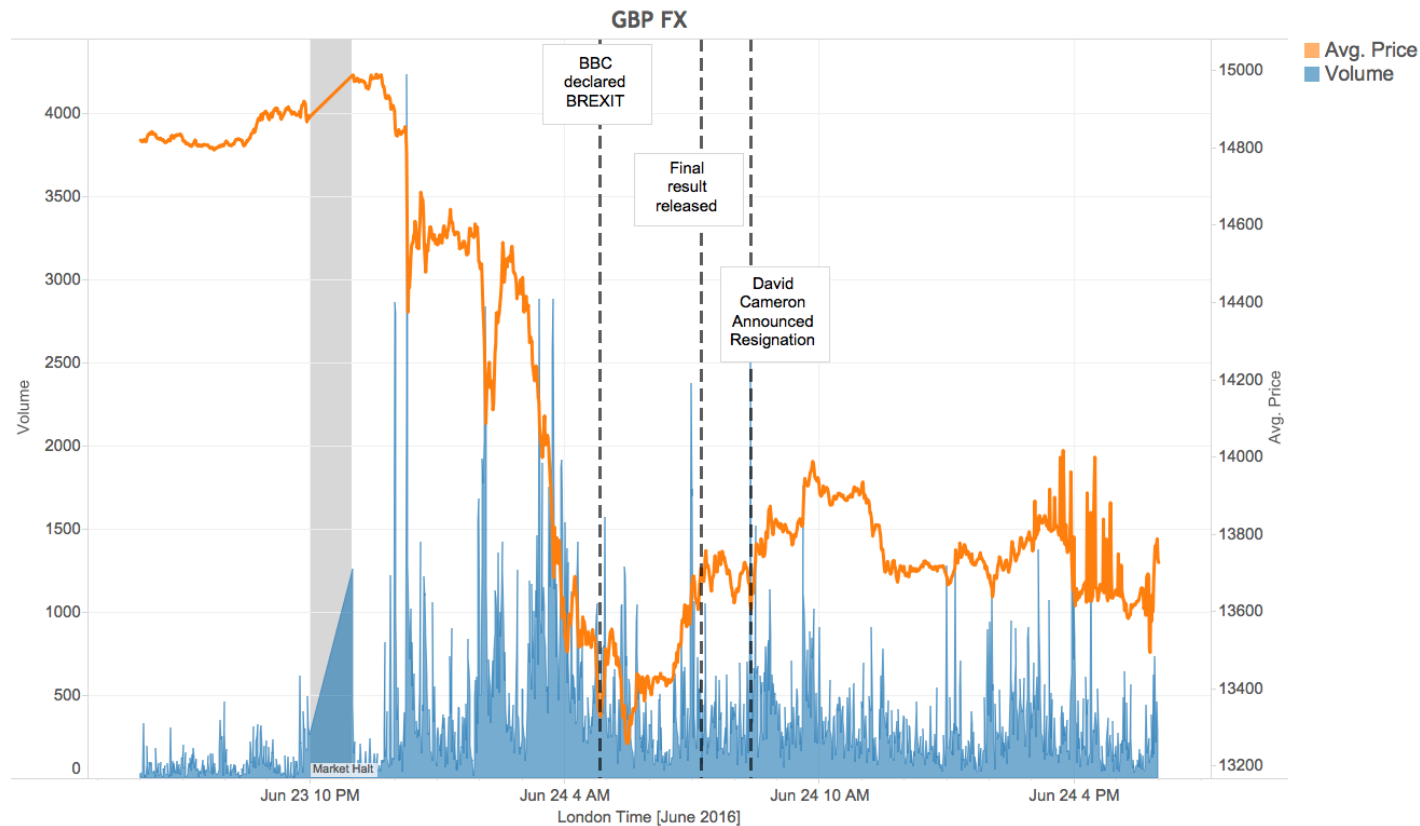
Chart Created by CME Group Economics.
Source: Bloomberg Professional (GBP)

The British pound fell 7% against the U.S. dollar the day after the 23 June 2016 referendum, and since then has bounced quite widely, although never getting back to pre-Brexit levels.

Pre-Brexit Vote USD per GBP Expected Probability Distribution

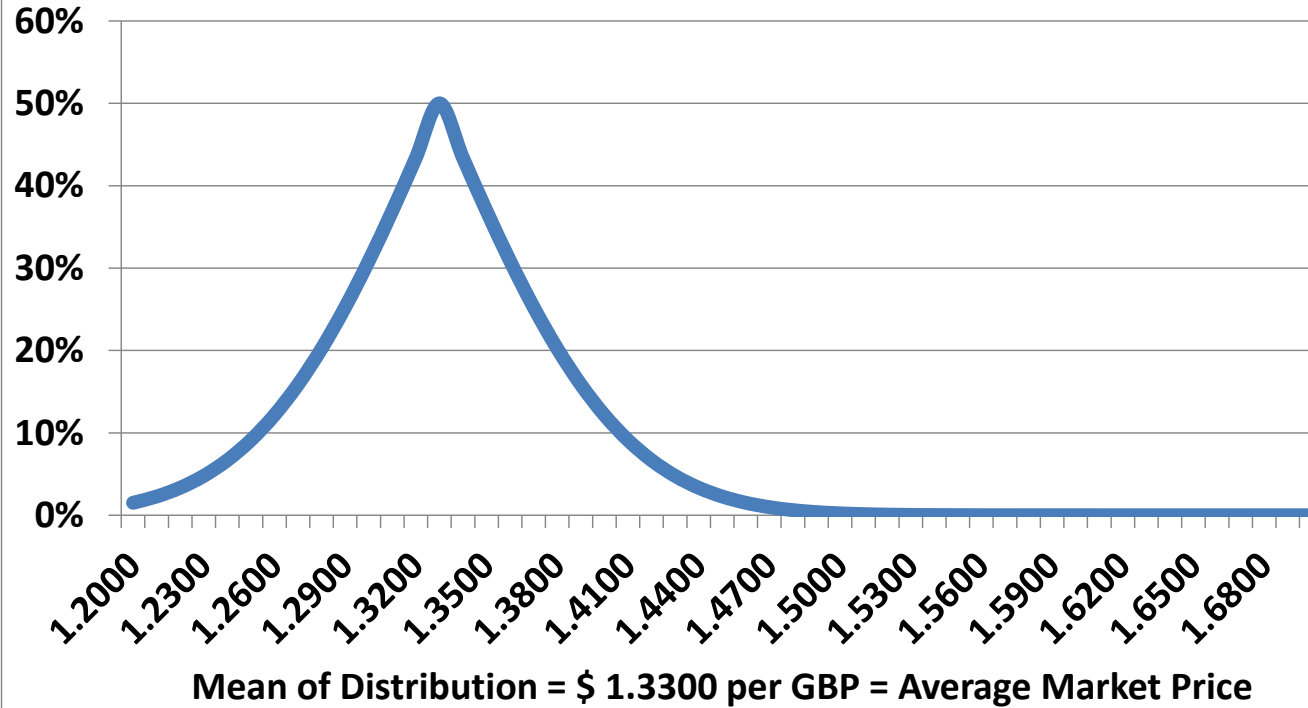


Source: CME Group Economics



Source: **CME Group, Inc.**

Post-Brexit Vote USD per GBP Expected Probability Distribution



Source: CME Group Economics

Date known, Outcome unknown –

**Elections and Referendums
OPEC production decisions,
Corporate earnings surprises**

Probable date range, Outcome unknown –

**Central bank policy shifts,
Corporate actions,
M&A regulatory decisions,**

Implied Federal Funds Rate 2-Year Ahead

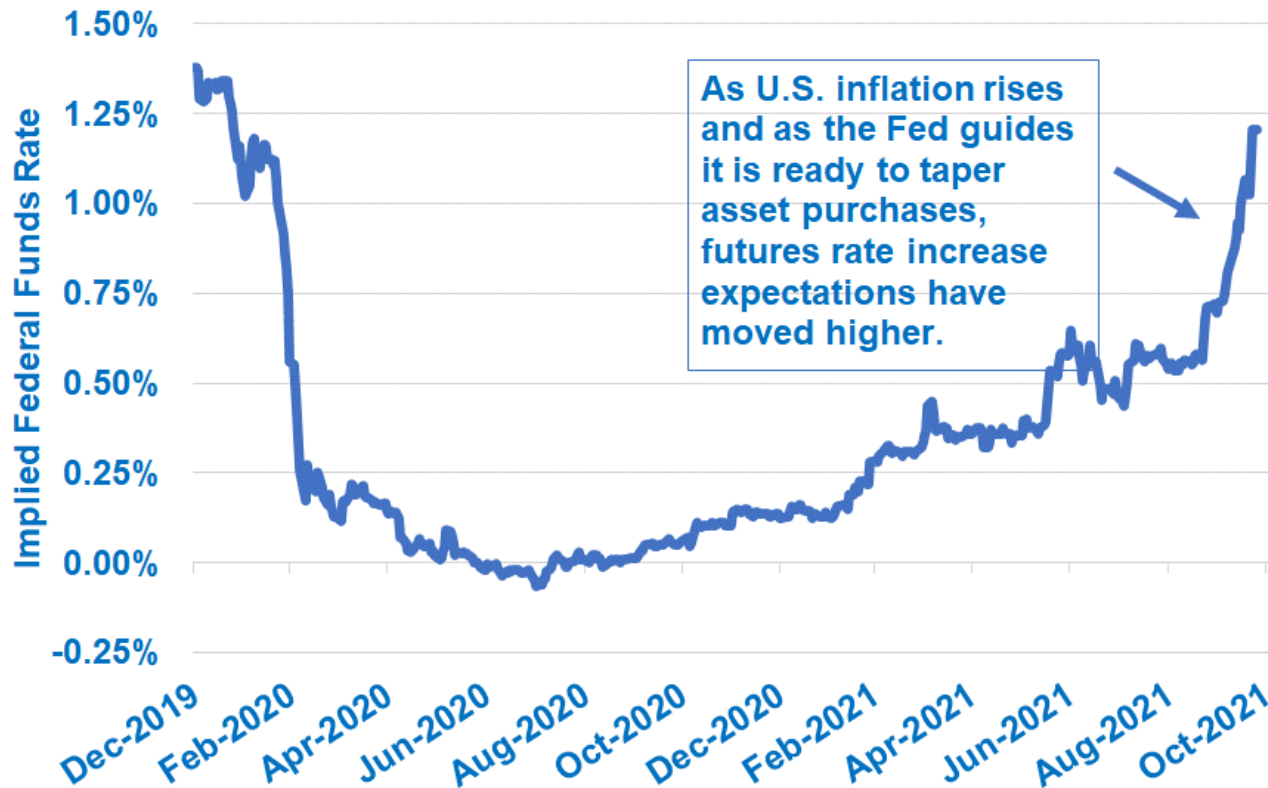


Chart Created by CME Group Economics.
Source: Bloomberg Professional (FF25)

U.S. Interest Rate Expectations have come forward in terms of when the Fed will commence raising rates, and the rate rises may go higher than previously thought.

Surprise!

Black swan, unexpected, exceedingly rare, huge impact, then what?

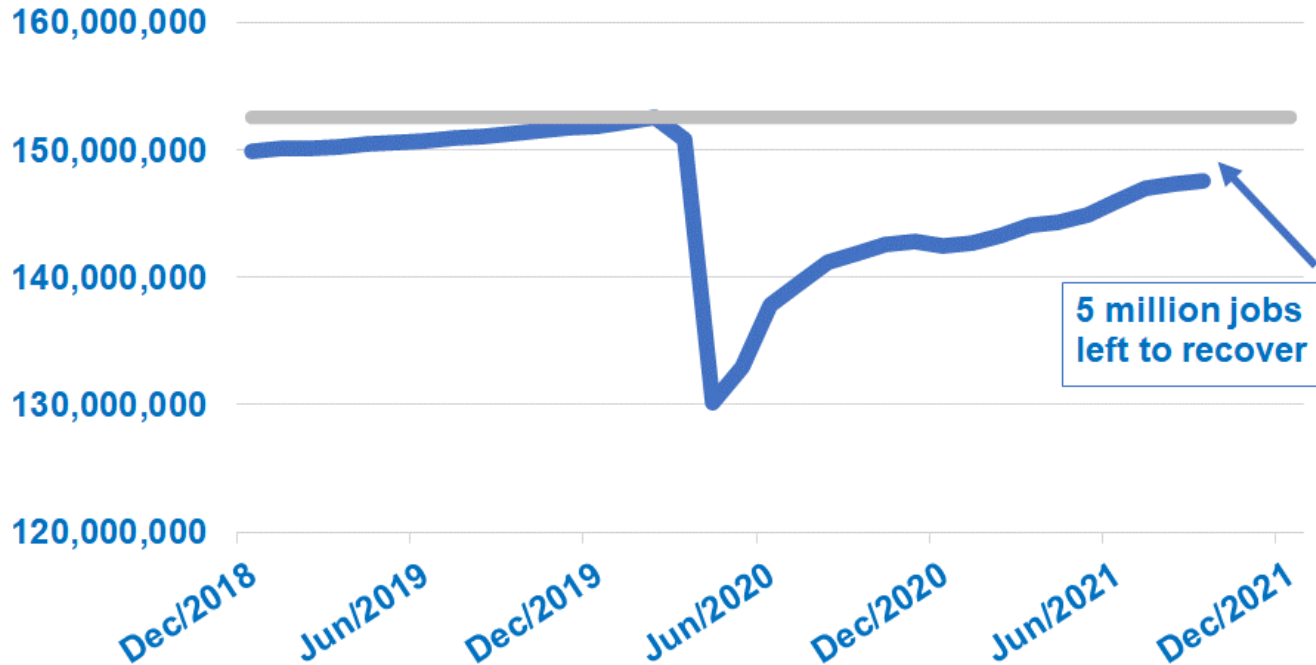
Analyzing the recovery from a shock using a complex system framework



Robinhood stock price fell abruptly as its earnings release disappointed market participants.

Source: Bloomberg Professional (HOOD US <Equity>), 10-day chart.

US Civilian Payroll Employment is Recovering, albeit at a Slower Pace in the Fall of 2021



**Jobs left to
recover =
5 million.**

**The last 20% of
lost U.S. jobs
may take much,
much longer to
recover, than the
first 80%.**

Chart Created by CME Group Economics.

Source: Federal Reserve Bank of St. Louis FRED Database (PAYEMS).

Phase Transitions

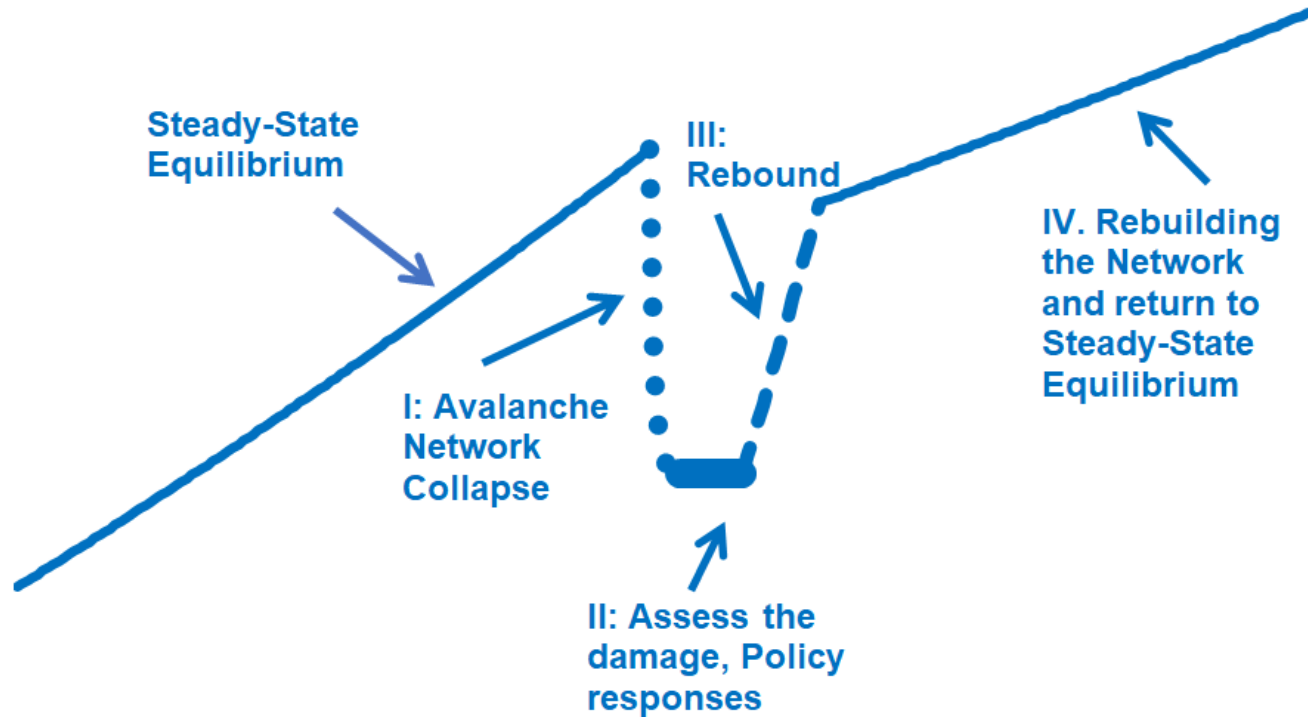


Chart Created by CME Group Economics.

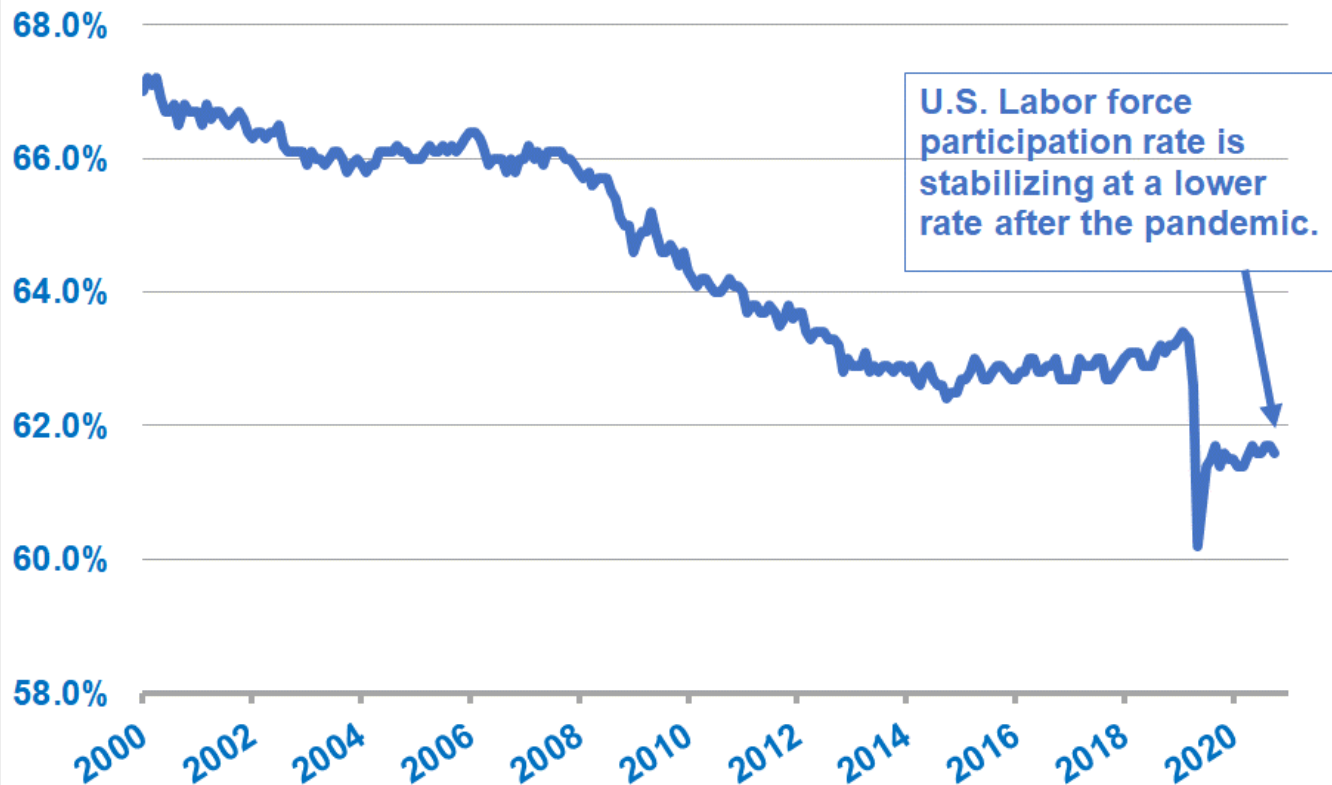
Original Inspiration: Dr. John Rutledge, "Far from Equilibrium".

Academic paper: "From phase transitions to Modern Monetary Theory: A framework for analyzing the pandemic of 2020", *Review of Financial Economics*, 9/2020.

We have found using the physics of phase transitions as a very useful framework for analyzing the Pandemic.

Review of Financial Economics. "From phase transitions to Modern Monetary Theory: A framework for analyzing the pandemic of 2020", Fall 2020.

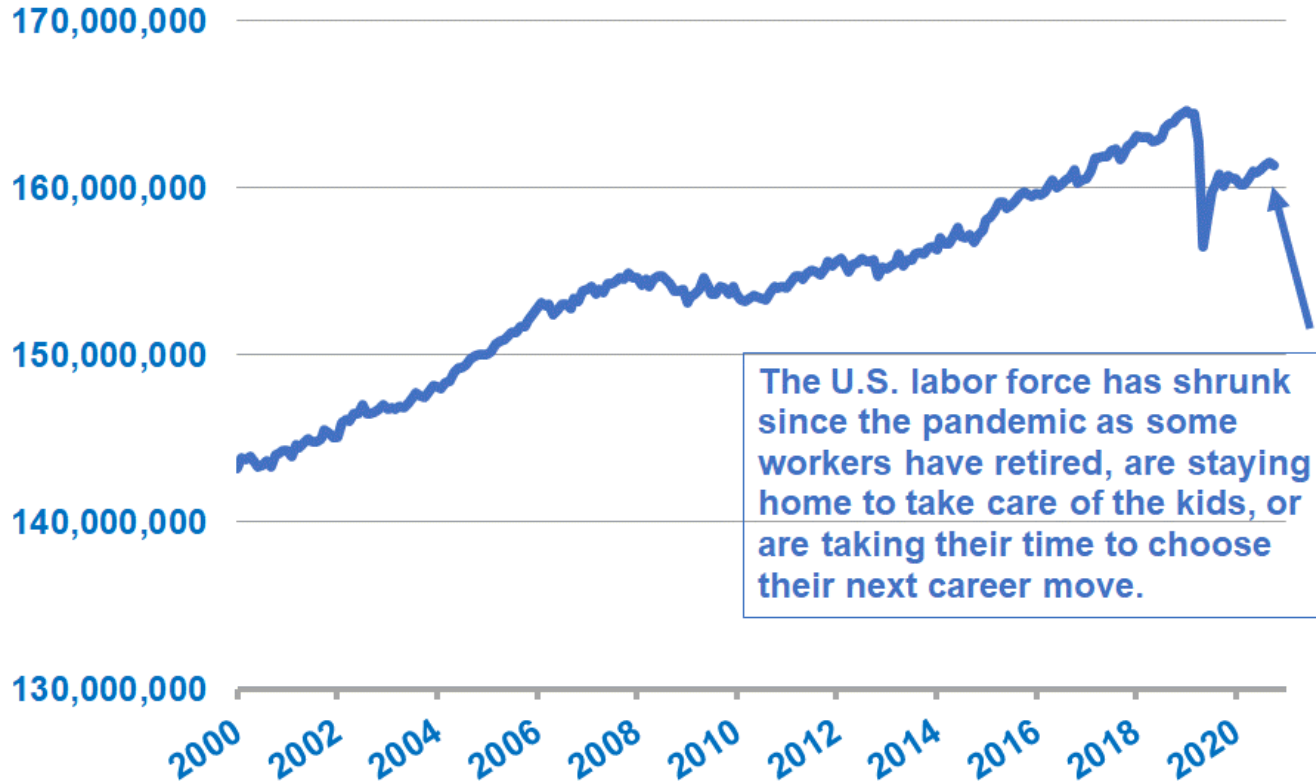
U.S. Labor Force Participation Rate



Labor force participation rate is lower.

Chart Created by CME Group Economics.
Source: St. Louis Federal Reserve FRED Database (JTSQUR).

U.S. Labor Force



The U.S. labor force has shrunk since the pandemic as some workers have retired, are staying home to take care of the kids, or are taking their time to choose their next career move.

Labor force is lower.

Chart Created by CME Group Economics.
Source: St. Louis Federal Reserve FRED Database (CLF160V).

U.S. Job Quits Rate

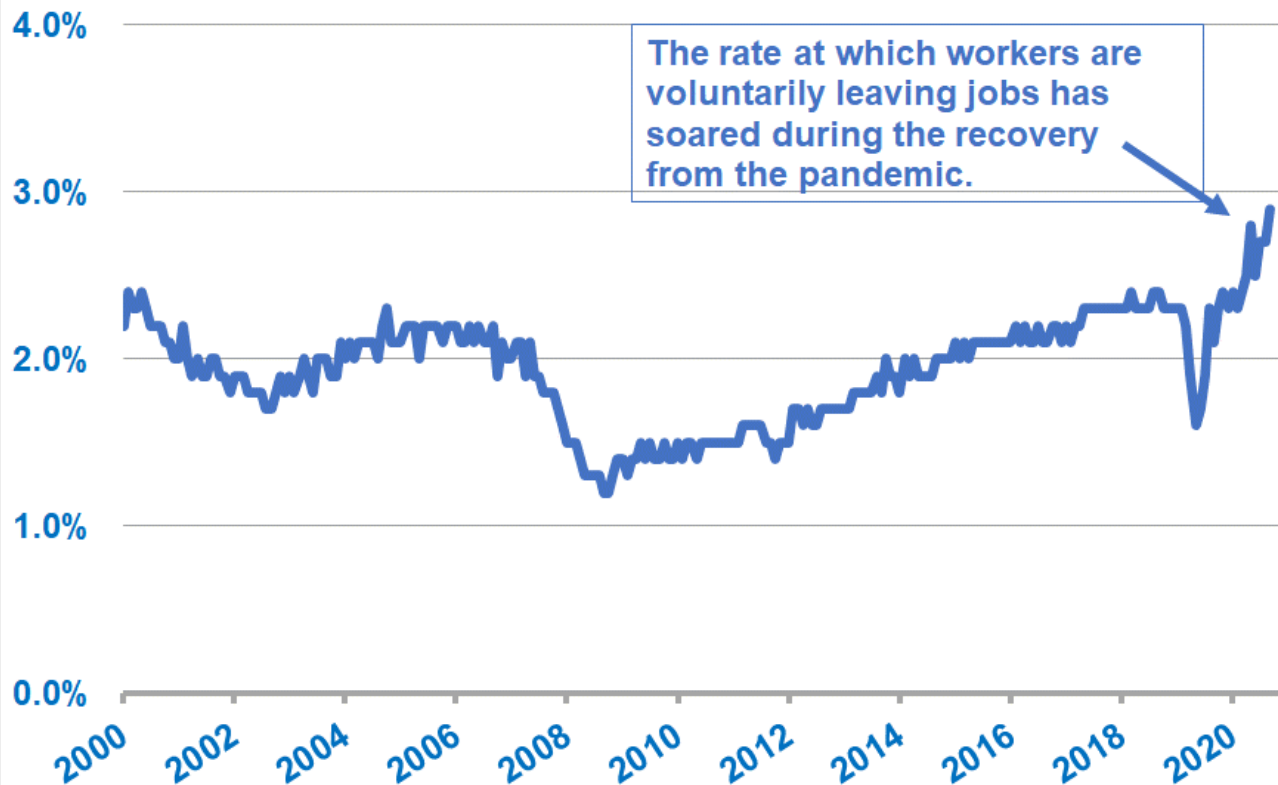
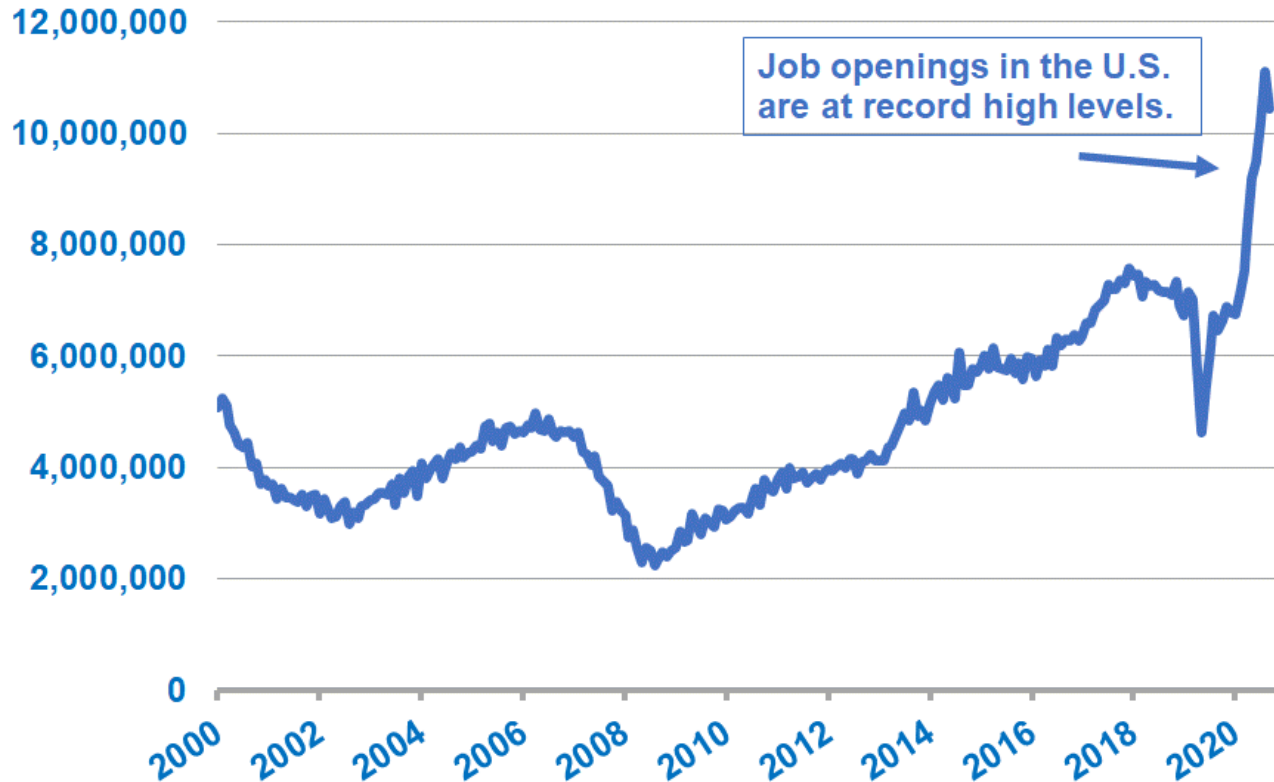


Chart Created by CME Group Economics.
Source: St. Louis Federal Reserve FRED Database (JTSQUR).

Voluntary quit rate is elevated.

During the pandemic workers had time to re-assess their work-life balance, ponder alternative careers, think about retirement, etc.

U.S. Job Openings



Job openings in the U.S. are at record high levels.

Job openings are also elevated.

The economy is re-opening and workers are quitting. The labor market is very active.

Chart Created by CME Group Economics.
Source: St. Louis Federal Reserve FRED Database (JTSJOL).

U.S. Consumer Price Inflation Scenarios (Year over Year Percentage Change)

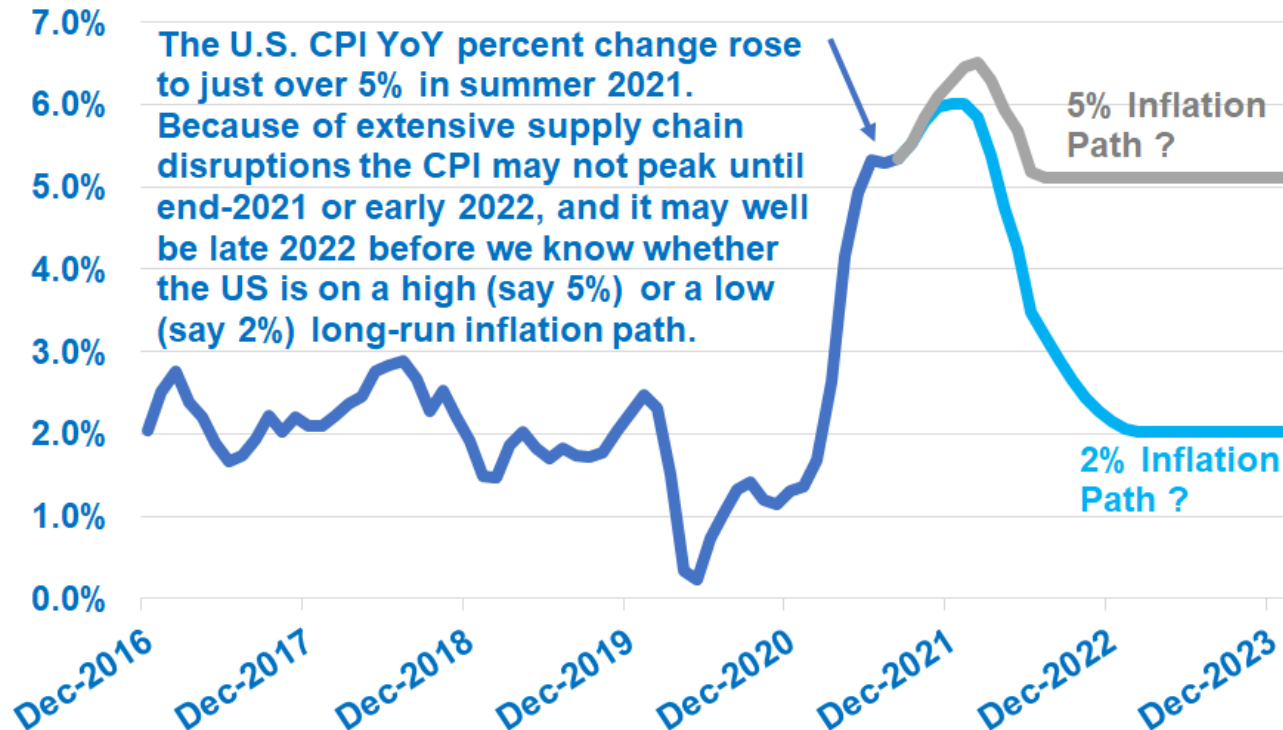


Chart Created by CME Group Economics.

Source: St. Louis Federal Reserve Bank FRED Database (CPIAUCSL).

Supply chain disruptions have been severe and led to sharp increases in the U.S. inflation rate. We may not know until late 2022 as to whether this is temporary or more persistent.

Baltic Dry Shipping Cost Indices

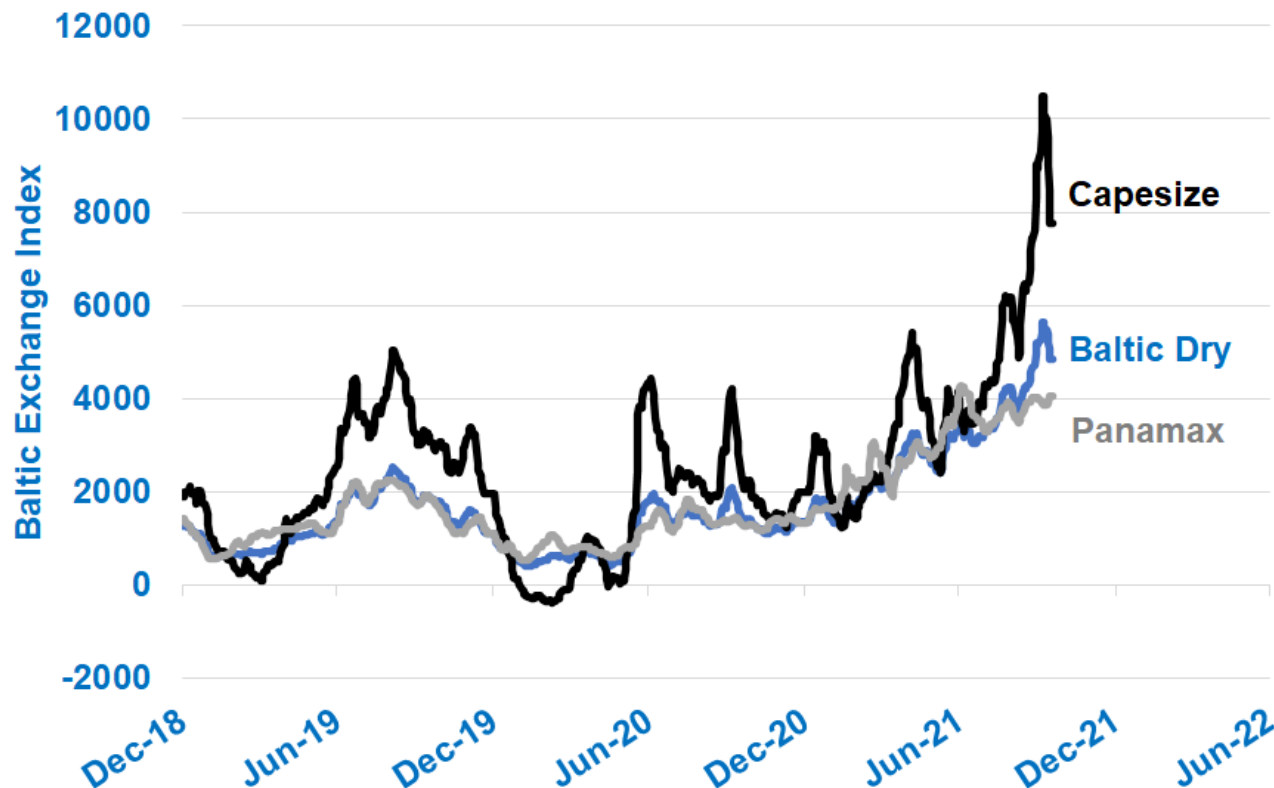
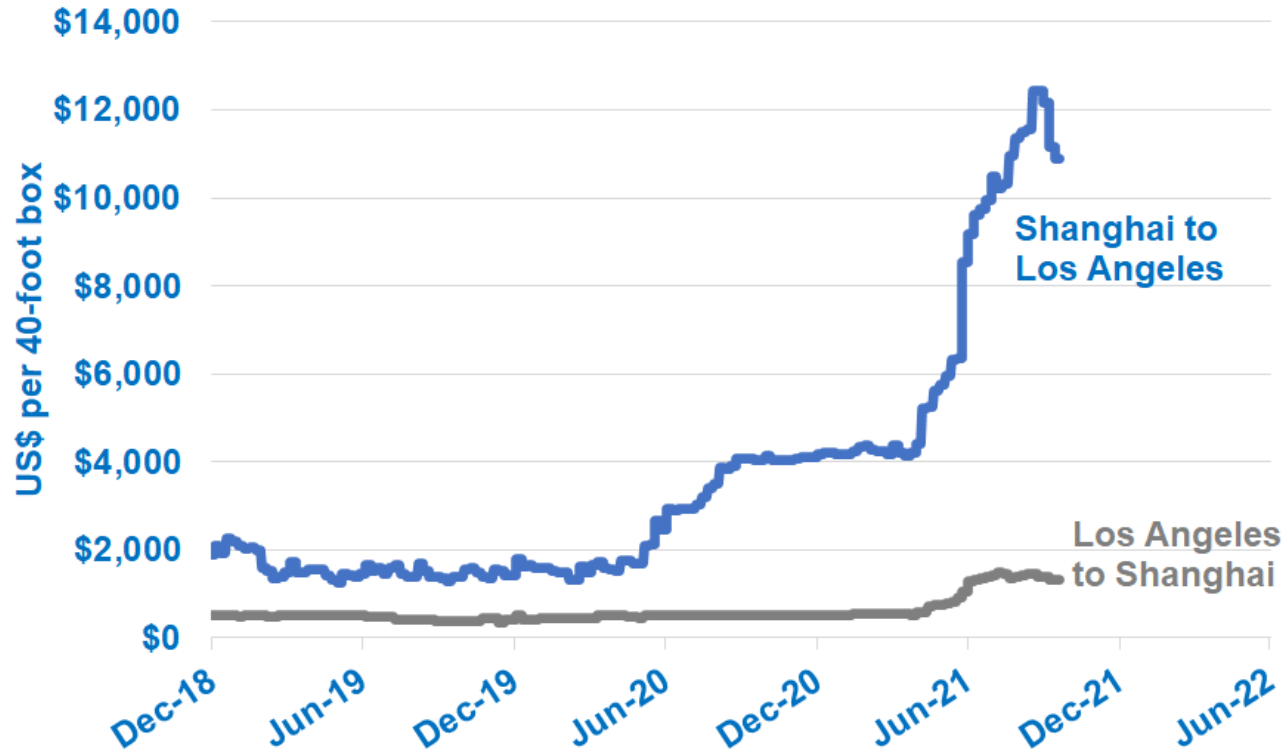


Chart Created by CME Group Economics.
Source: Bloomberg Professional (BDIY, BPIY, BCI14).

One example of supply chain disruptions is the rising costs of shipping.

World Container Route Indices



One example of supply chain disruptions is the rising costs of shipping.

Chart Created by CME Group Economics.

Source: Bloomberg Professional (World Container Indexes assessed by Drewry Reports, WCIDSHLA, WCIDLASH).

Example: Knock-on Effects

Computer chip shortage

Less automobile production

Soaring used car prices

Higher consumer price inflation

Is it complicated or complex?

Some very complicated engineering accomplishments (i.e., space tourism, driverless vehicles) can still have highly accurate predictability.

Complex systems involve many feedback loops and usually are highly sensitive to initial conditions.

Complex systems, especially when under-going a state change, are highly resistant to reliable predictability.

Dynamic Analysis: Why Bayes?



Form an expectation of the direction and magnitude of the future price move and make a probabilistic risk assessment.

Receive new information.

Revise expectations of both the price move and the risks.

Adjust one's behavior (portfolio) accordingly.

Economics Gone Astray

Inappropriate use of mathematics

Reliance on overly heroic assumptions

Failure to appreciate behavioral dynamics and complex systems

Emphasis on linear extrapolations and bell-shaped probability distributions in a decidedly non-linear, non-normal world.

Explorations into market liquidity during an event risk episode

Brexit Referendum 2016, US 2016 Elections

Outcome Discovery Period (price gap, elevated trading activity, higher bid/ask spreads than typical)

Followed by portfolio rebalancing (price stabilizes at new level, yet trading volumes remain elevated, bid/ask spreads more typical)

Article: “Describing the dynamic nature of transactions costs during political event risk episodes”, by Putnam, McDannel, Ayikara, and Peyyalamitta, in *High Frequency*, October 2017.

Market Sentiment Meter (MSM)

Building hypothetical risk-return probability distributions that are not biased towards single-mode solutions and distribution independent

Put-Call options volumes disparities

Unusual high-Low intraday price activity

Implied volatility versus recent historical volatility comparisons

Implied volatility from different options maturities

Mixture distribution of a naïve Normal with an enhanced Normal derived from internal market metrics

Backward process – Built system – Then studying its usefulness

CME Market Sentiment Meter States

<https://www.cmegroup.com/tools-information/market-sentiment-meter.html>

Market Sentiments

The Market Sentiment Meter focuses on four risk profiles common in the futures markets. Below are the illustrative charts that match the sentiment states.

COMPLACENT



Rare
Low level of market anxiety

BALANCED



Common
Normal level of market anxiety

ANXIOUS



Rare
High level of market anxiety

CONFLICTED



Extremely Rare
Price gap anxiety

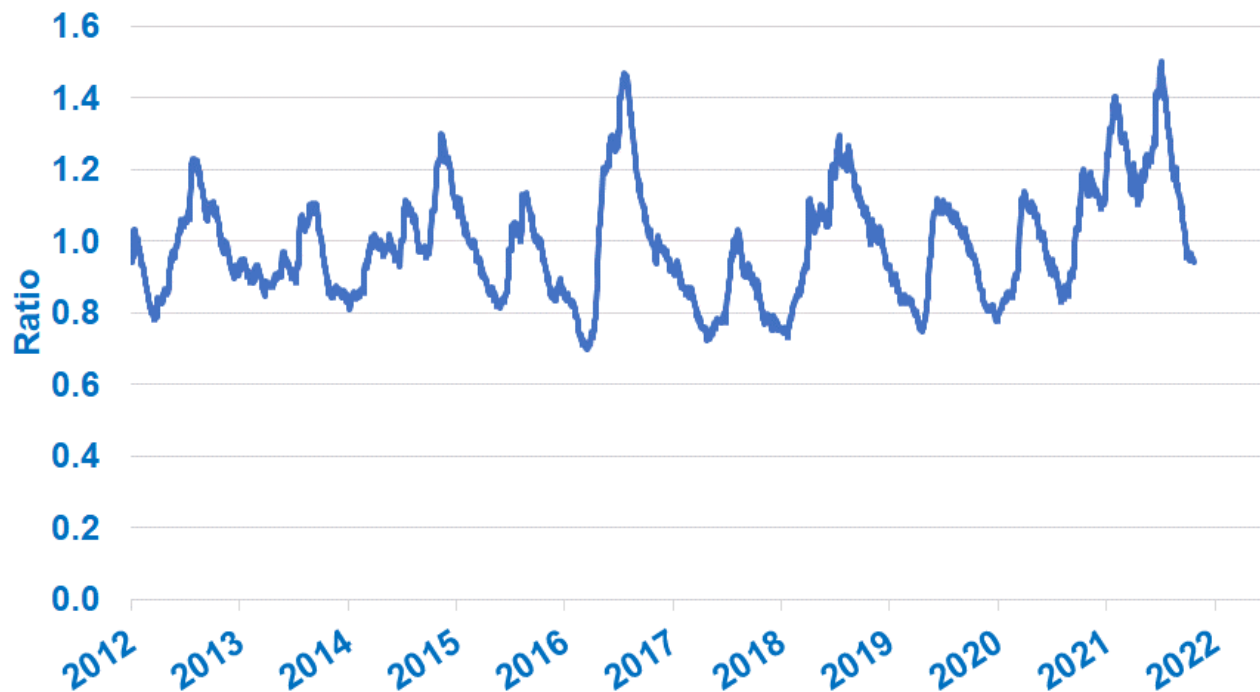
Put/Call Options Volume - Soybeans: Ratio Puts to Calls Volume Short-Term



**Put-Call Volume
chart**

Chart Created by CME Group Economics.
Source: CME DataMine, Market Sentiment Meter powered by 1QBit (SPZ).

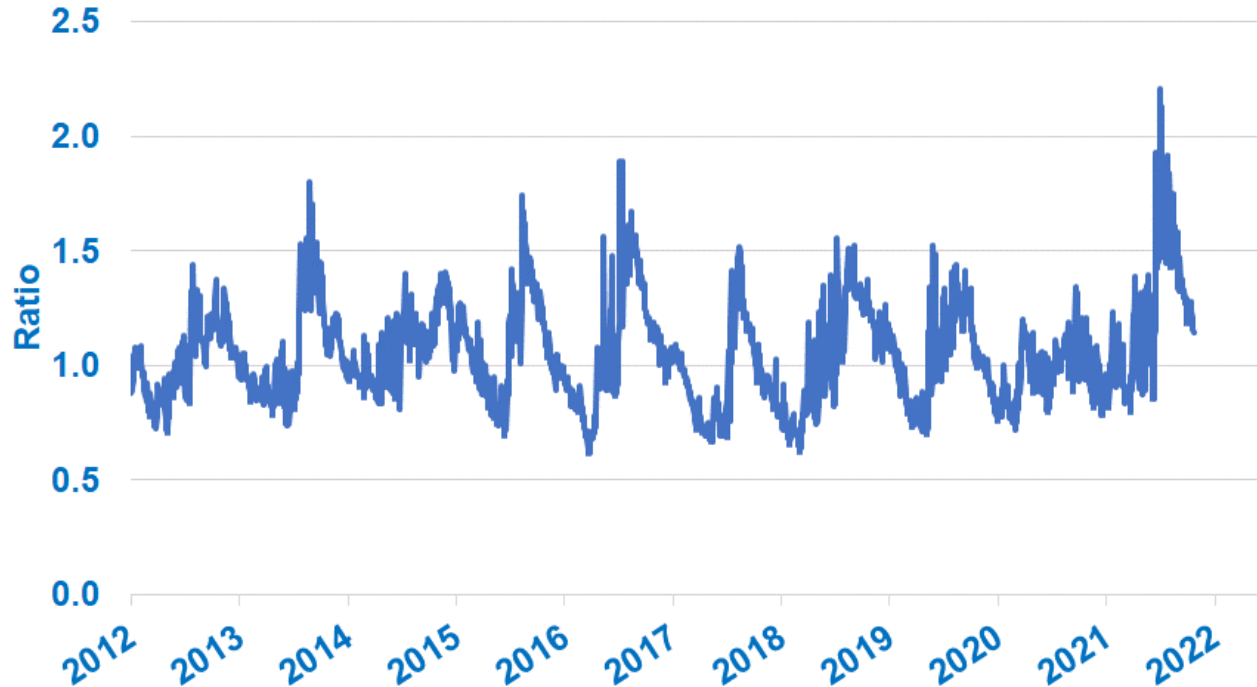
Intraday High/Low - Soybeans: Ratio Short-Term High/Low Spread to Long-Term



Intraday Trading Chart

Chart Created by CME Group Economics.
Source: CME DataMine, Market Sentiment Meter powered by 1QBit (SPZ).

Volatility - Soybeans: Ratio Short-Term Historical Standard Deviation to Current Implied Volatility



**Implied volatility
versus recent
historical
volatility**

Chart Created by CME Group Economics.
Source: CME DataMine, Market Sentiment Meter powered by 1QBit (SPZ).

Momentum - Soybeans: Short-Term and Long-Term Return Trends

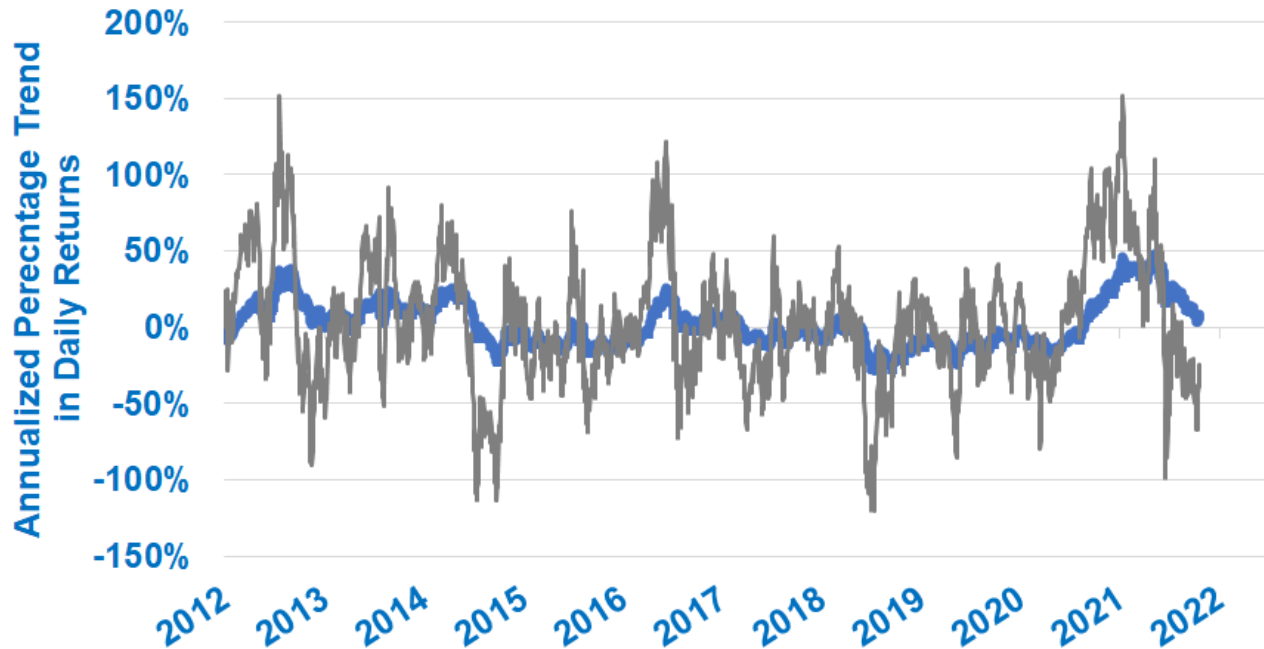


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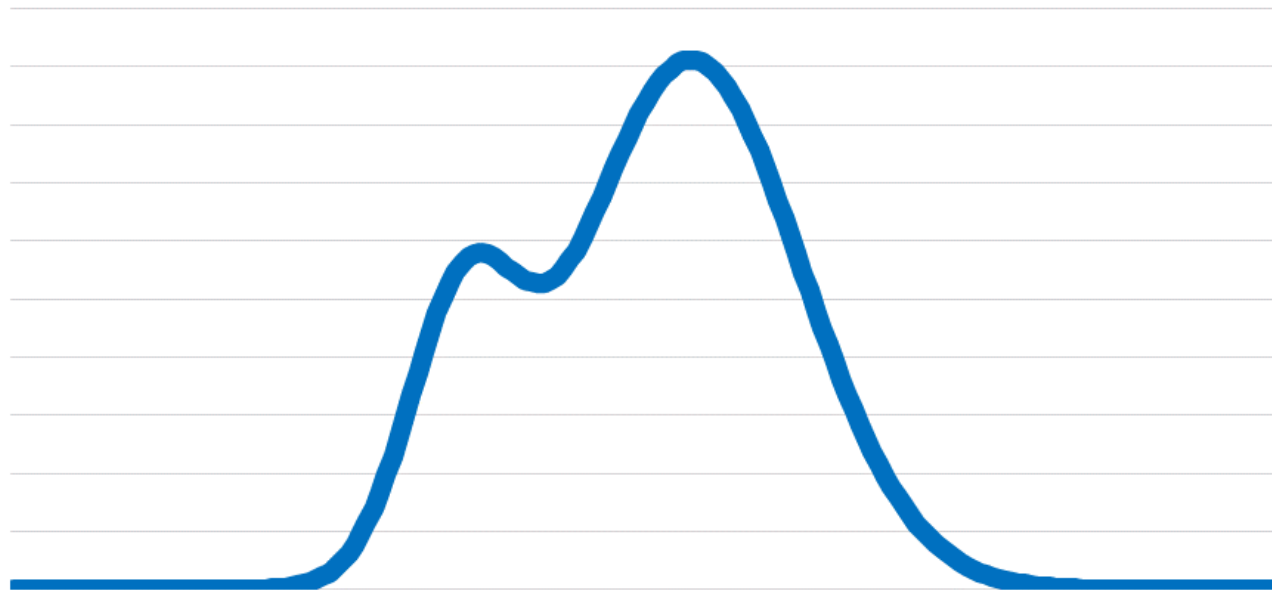
— Long-Term Smoothed Return Momentum Annualized
— Short-Term Smoothed Return Momentum Annualized

Momentum

Soybeans: October 25, 2021

Market Sentiment Meter

Hypothetical Risk-Return Probability Distribution



**Current
“Conflicted”
Markets: Corn
and Soybeans**

Chart Created by CME Group Economics.
Source: CME DataMine, Market Sentiment Meter powered by 1QBit (spz)

Conflicted Sentiment - Soybeans

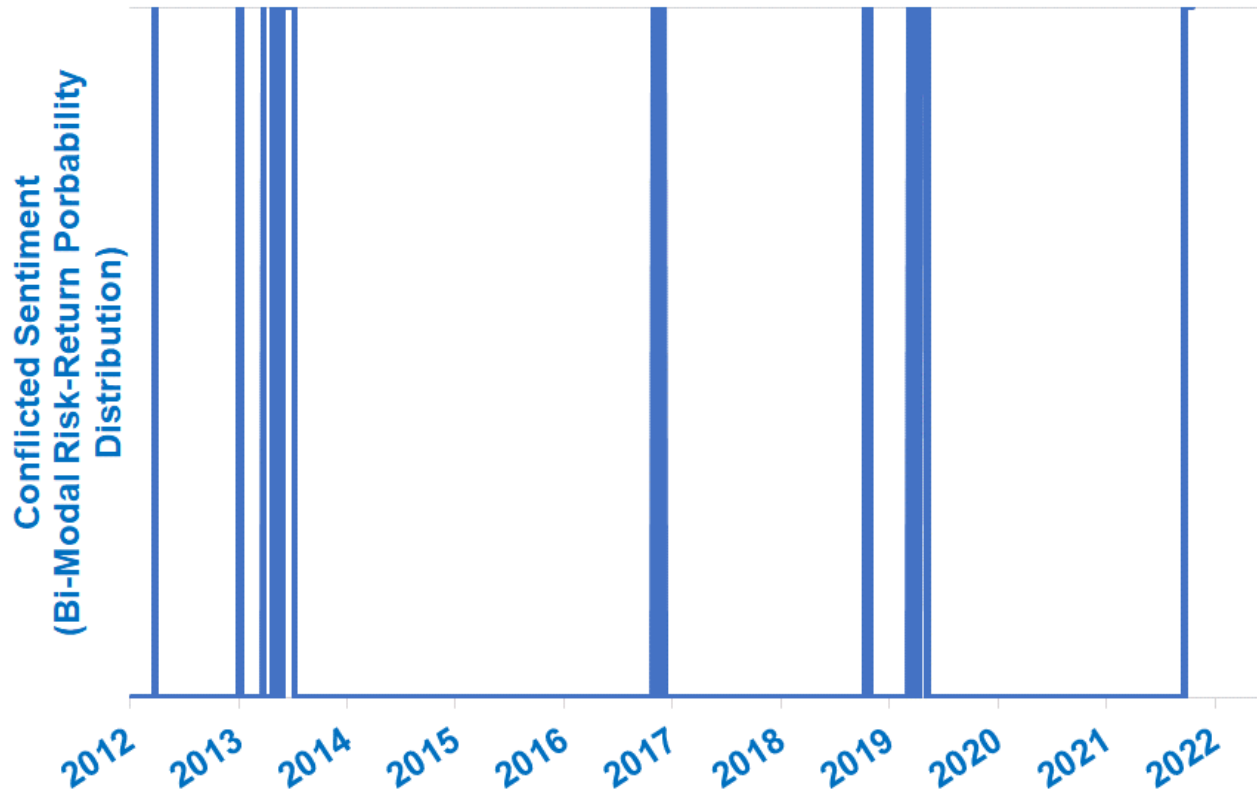
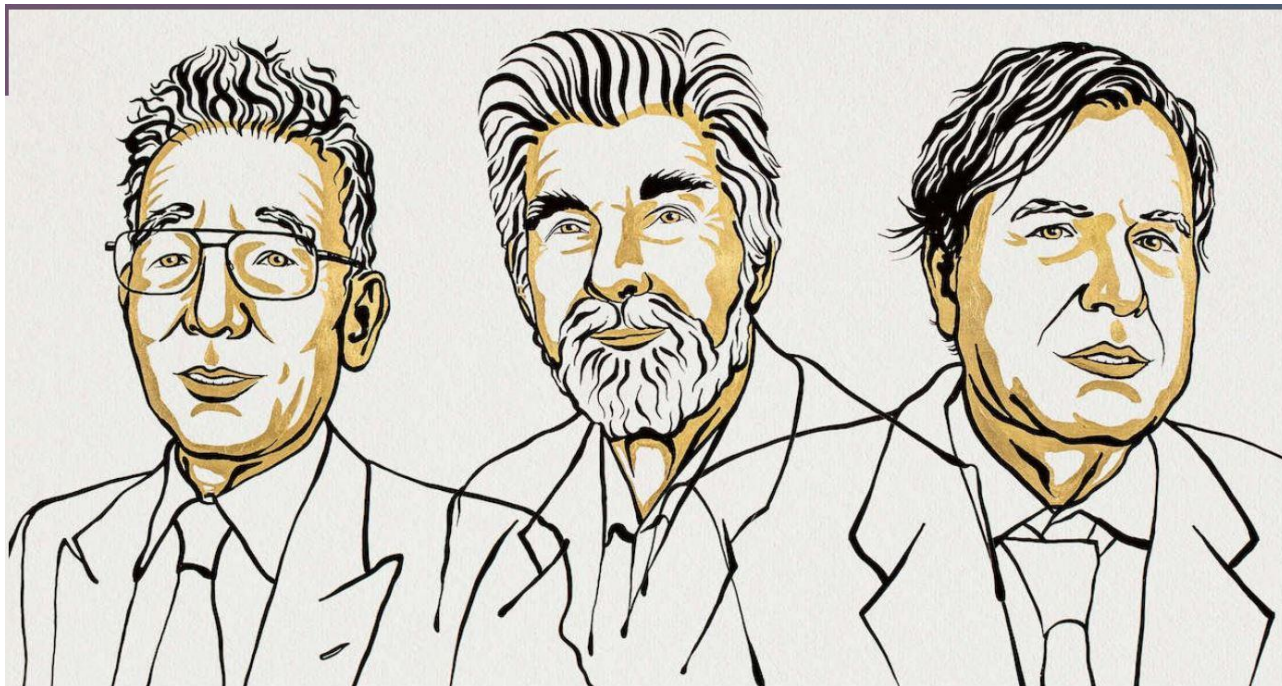


Chart Created by CME Group Economics.
Source: CME DataMine, Market Sentiment Meter powered by 1QBit (SPZ).

**“Conflicted”
Markets for
Soybeans are
episodic.**



Syukuro Manabe, Klaus Hasselmann and Giorgio Parisi (Illustration: Niklas Elmehed for Nobel Prize Outreach©)

The Nobel Prize in Physics was awarded to Syukuro Manabe, Klaus Hasselmann, and Giorgio Parisi "for groundbreaking contributions to our understanding of complex systems."

Peering through the lens of Complex systems and phase transitions.

What makes a complex system?

Why does complexity matter?

**Searching for Anomalies which might lead to
price gaps, non-linear behavior,
unexpected transitions, etc.**

**Examining complexity from the science,
to applications in economics and finance,
to shaping actual investment strategies.**

Thank you.

