OliverWyman

# Stress Testing in a World of Compound Risks and Polycrises

Gregory Hopper, Greg Rattray, Til Schuermann, Ben Power

NYU Stern Volatility Risk Institute Conference on Managing Compound Risks in a Polycrisis World
April 28, 2023

# 2020 INTO 2023

Lessons for risk managers

**On January 31, 2020, as many banks were reviewing and preparing their stress testing, who would have guessed that the year ahead would bring...**

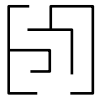
- 100 yr. pandemic that would sweep the globe
- US death toll of >500,000 [and >1 million by mid 2022]
- Global economy would contract for just the second time since WW2
- Public sector support at ~25% of GDP
- All Fed facilities from the financial crisis back open (plus some more)
- Hurricane produced record flooding in Houston … and a winter storm crashed much of the electric grid in Texas
- Wildfires in California: 10.3mm acres, >10,000 structures, >$12 BN damages/cost
- Storming of US Capitol

**And that the following two years…**

- Suez canal blocked for 1 week
- Biggest hedge fund failure since LTCM
- Russia invades Ukraine
- Inflation roars back to levels not seen in 40 years
- 2nd and 3rd largest bank failures in US history

**When it rains, it pours – and seemingly disparate events do tend to co-occur more often than we like**

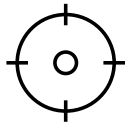
# OVERVIEW OF THE PAPER: KEY GUIDING QUESTIONS



What is different about the world now that challenges existing stress testing practices?

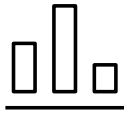
How can we adapt stress testing in response to these changed circumstances?

# FUNDAMENTALLY, RISK MANAGEMENT ENTAILS 4 KEY ELEMENTS



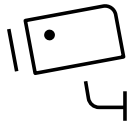
**Identify**

- Risk identification is the bedrock of all risk management: you can't manage what you don't know about
- Risk ID is core to major programs such as strategic planning, stress testing



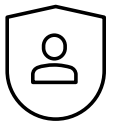
**Measure**

- How big are the risks that have been identified?
- Consider correlations, dependencies, aggregation
- Many risks are difficult to quantify (most nonfinancial risks) – but need still to be assessed and measured



**Monitor**

- Are risks growing or shrinking?
- How are the risks evolving, changing, mutating?
- Counterparties, clients, customers, markets, economy(ies), politics, dark net



**Control**

- People, policies, processes
- Data & IT, tech & ops
- Governance, starting with Board of Directors

**Stress testing is helpful for each element**

# STRESS TESTING IS NOW USED ACROSS THE RANGE OF "DISTRESS"

**Stress scenario severity**

*Relatively lower* *Relatively higher*

## BAU stress testing

- Stress testing in the course of ordinary business
- Portfolios, products, segment, risk factor

## DFAST-style regulatory ST

- Severe stress
- Comprehensive: full on and off B/S, P&L
- Help calibrate capital adequacy

## Recovery planning

- Extreme stress
- Survival only with significant & drastic management action

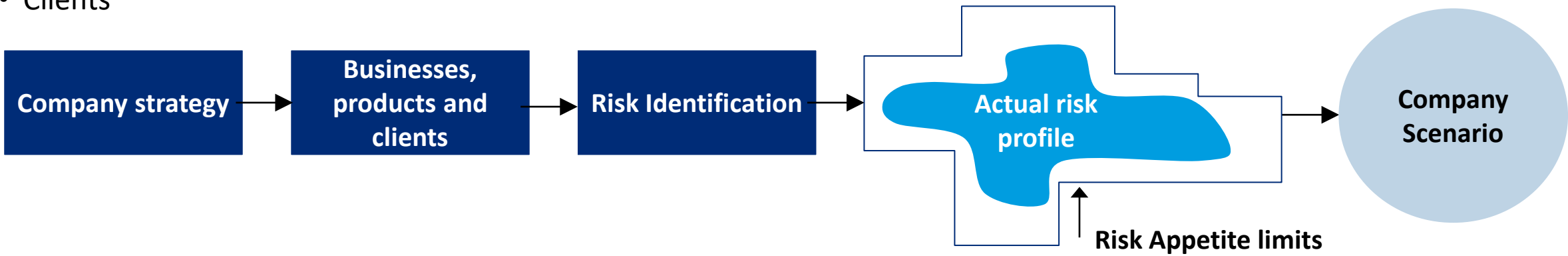
## Resolution planning

- Catastrophic stress to gone concern
- Orderly wind-down

# STRESS SCENARIOS SHOULD BE TAILORED TO EACH INSTITUTION'S UNIQUE RISK PROFILE

**Design of a stress scenario requires a firm understanding of the risks taken**

- Business
- Products
- Clients
- Countries, regions
- Markets




**The scope and severity of the impact of the scenario is a tangible expression of the company's risk appetite**

- Given the risks
- From business activities and portfolio composition
- And the strategic objective that will take on more and new risks

**The scenario should probe the vulnerabilities of the company – or, in the case of a regulator, the banking system**

# POLYCRISIS CHANGES THE RISK ENVIRONMENT STRESS TESTS MUST ENCOMPASS (1/2)

**What is a polycrisis?**

**The cascading degeneration of multiple interrelated systems in the face of repeated shocks**

- Overlapping crises in distinct systems (e.g. climate, energy, politics, finance…)
- Spillover effects: crisis in one system increases risk of degeneration in others
- Feedback loops: failure of each system increases stress on others

**The whole effect of these interlocking shocks is greater than the sum of each individual shock**

**Processes which usually stabilize existing systems begin to fracture**

**Heterogeneous shocks “force policy reactions for which there is no obvious historical precedent” (Tooze 2023)**

# POLYCRISIS CHANGES THE RISK ENVIRONMENT STRESS TESTS MUST ENCOMPASS (2/2)

**Implications for stress testing**

**In a world of polycrisis, the risk environment degenerates across multiple dimensions:**

- Greater **number** of threat vectors
- Increased **diversity** of risk types
- Enhanced **severity** of risks (e.g. via feedback effects)

**Risks increase with complexity and interconnectedness**

- Greater interaction → more transmission mechanisms
- Not limited to economic and financial systems; spillover effects increase vulnerability to all types of shocks

**Events which were previously unlikely (“black swans”) may now be more likely and more dangerous (“grey swans – with sharp teeth”)**

# INTERCONNECTEDNESS EXAMPLE: THE GLOBAL VALUE CHAIN

- The pandemic highlighted the sensitivity to the continued well-functioning of the global supply chain
  - Note that global trade as a share of GDP stagnating since the GFC after doubling since the early 1970s
- Global Value Chains: goods or services whose production process crosses at least 2 national borders
  - Kim and Shin (2023): growing complexity of GVCs requires increase in working capital to finance extended production cycles with a greater number of participants
- Inter-relation between monetary policy and GVC
  - Looser global monetary policy reduces friction in production networks
  - Higher interest rates increase marginal costs of production
  - Particularly pronounced for the US dollar: strengthening USD results in a contraction of global manufacturing that is concentrated in emerging markets but spills over to advanced economies
- Interconnectedness creates hidden complexities in the global economy that increase the potential magnitude of disruption to global economic activity (e.g., supply chain shocks, energy shocks, credit crises, FX fluctuations etc.)
- Differential impact of shocks across industries and geographies increases the challenge of modelling outcomes

# INTERCONNECTEDNESS AND MAGNIFIED RISK IN A WORLD OF POLYCRISIS: CYBER

**Example 2: Cyber & other geopolitical risk**

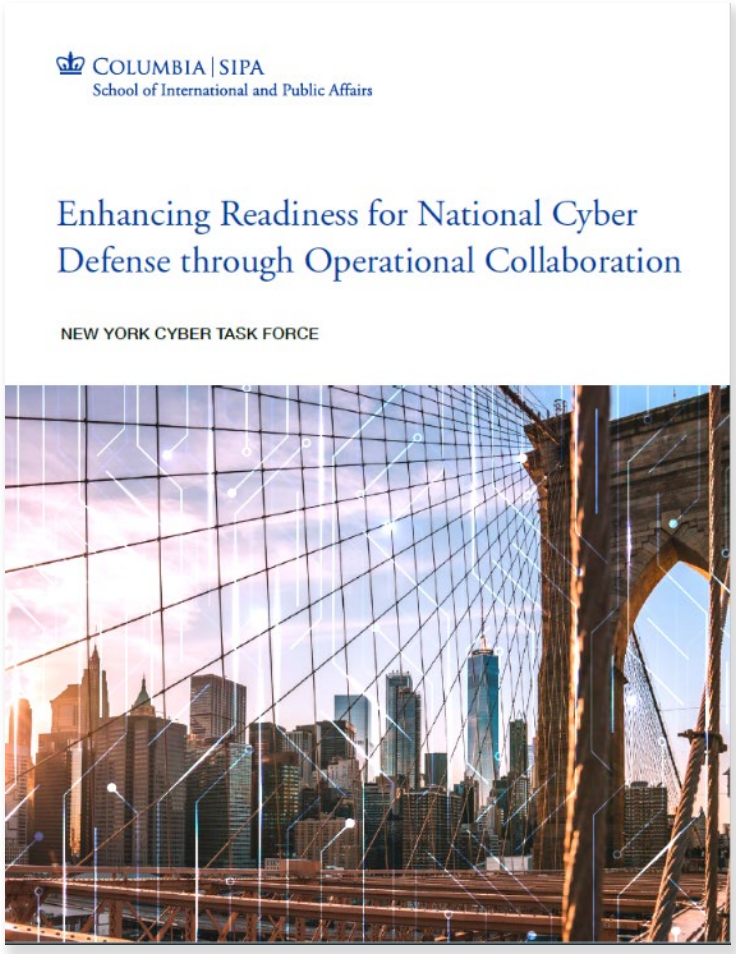
**Risks to banks and other financial institutions arising from beyond the economic and financial system**

**One example of geopolitical risk: cyberattack**

- High and increasing dependence on digital systems
- Democratization of cyber capacity → low barriers to entry
  - Large number of states with sophisticated tools
  - Increased disruptive capacity of non-state groups e.g. terrorists

**Scenario-based planning can be used for analyzing a broad range of geopolitical risks**

- E.g. New York Cyber Task Force, *Enhancing Readiness for National Cyber Defense through Operational Collaboration*



# INTERCONNECTEDNESS AND MAGNIFIED RISK IN A WORLD OF POLYCRISIS: CLIMATE

**Example 3: Climate change risk**

**Characterized by "tipping points" and cascading disruption across multiple systems**

- Direct effects (e.g., crop failures, drought, catastrophic storms)
- Cascading effects (e.g. enhanced likelihood of extreme infections diseases)

**Climate risks increasingly incorporated into bank stress testing**

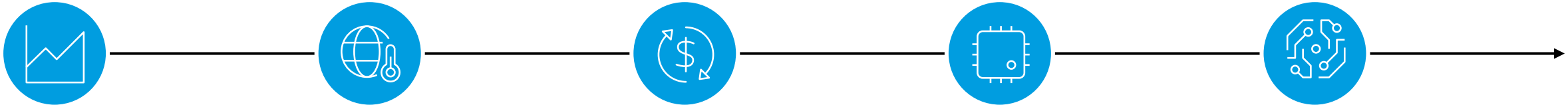
- Physical risks (e.g. storm damage)
- Transition risks (e.g. stranded hydrocarbon assets)

**Built on Integrated Assessment Models (IAMs)**

- Extremely complex: thousands of inputs, interlocking feedback loops
- Highly interdisciplinary: climate science, soil & agriculture, economics, engineering ….
- E.g. MESSAGEix-GLOBIOM, REMIND-MAgPIE

# A PLAUSIBLE POLYSCENARIO: INFLATION, AI, AND AN EAST ASIAN CONFRONTATION (1/2)

Hypothetical – severely adverse but plausible



**Macroeconomic developments**

- Significant disruption as “low for long” monetary policy ends
- Continued inflation as central banks shy away from painful interest rate hikes

**Deglobalization**

- Continued fragmentation into “West” and “BRIC+” coalitions following Russian invasion of Ukraine
- Growing de-dollarization of trade and finance

**Climate change**

- Limited policy adaptation by BRIC+ countries
- Growing dissension within Western countries over transition costs

**Chips are the new oil**

- Intense competition over latest chips technology (concentrated in Taiwan)
- Acceleration of near-shoring / friend-shoring manufacturing capacity

**AI wars**

- Growing importance of large language models (LLM) as a dual-use technology
- Access to chips and LLM technology becomes critical

# A PLAUSIBLE POLYSCENARIO: INFLATION, AI, AND AN EAST ASIAN CONFRONTATION (2/2)

Hypothetical – severely adverse but plausible

**Crisis convergence 2025-27**

1

- Fragmented economic and financial blocs
- Inflation weakens Western resilience and commitment
- Growing information warfare/misinformation

2

- Western technology sanctions countered by Chinese rare earths export ban
- Heightened salience of Taiwan → periodic Chinese “soft blockades”
- Growing provocations from Russia and DPRK (e.g. nuclear tests, cyberattacks)

3

- Crises converge with Chinese demand for “free and fair” chips access
- Escalating cyberattacks on infrastructure of both coalitions

# TAILORING THE POLYSCENARIO TO DIFFERENT ACTORS GENERATES DISTINCT RISK PROFILES

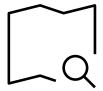
| Type of actor | Features of tailored polyscenario | Key risks |
|---|---|---|
|  **Large Western bank** | • Rapid change in balance sheet as a consequence of higher inflation and economic contraction<br>• Growing challenge to activities in BRIC+ countries<br>• Use of sophisticated LLMs to create new attack vectors on (e.g. impersonation of new or existing customers) | • Counterparty risks from geopolitical fragmentation and higher inflation<br>• Sovereign risk, esp. from BRIC+ countries<br>• Non-financial risks from subversion of existing KYC/AML controls |

Polyscenario analysis is particularly valuable for identifying risks to strategy, sovereign risk, counterparty risk, cyber risk etc.

# TAILORING THE POLYSCENARIO TO DIFFERENT ACTORS GENERATES DISTINCT RISK PROFILES

| Type of actor | Features of tailored polyscenario | Key risks |
|---|---|---|
|  **Large Western bank** | • Rapid change in balance sheet as a consequence of higher inflation and economic contraction<br>• Growing challenge to activities in BRIC+ countries<br>• Use of sophisticated LLMs to create new attack vectors on (e.g. impersonation of new or existing customers) | • Counterparty risks from geopolitical fragmentation and higher inflation<br>• Sovereign risk, esp. from BRIC+ countries<br>• Non-financial risks from subversion of existing KYC/AML controls |
|  **Western automaker** | • Continued dependence on trailing-edge chips; increased dependence on leading-edge chips as automated driving advances<br>• Sharp shift to EVs, driven by regulation and consumers | • Supply risk to critical semis components (e.g., rare earths)<br>• Supply risk to semis, with limited potential diversification beyond East Asia<br>• Supply chain risk (e.g., port closures) |
|  **Hydrocarbon producer** | • Key extraction markets align with BRIC+ bloc (e.g., Guyana, Argentina, Mexico, Iraq, Colombia)<br>• Bifurcation of markets for hydrocarbon production and sale into blocs (with higher prices in Western bloc)<br>• Civil and political pressure for alternative assets | • Supply risk to assets in BRIC+ bloc<br>• Stranded asset risk as West phases out hydrocarbons<br>• Profit and reputational risks from high Western oil prices (e.g., windfall taxes) |

# WHAT IS DIFFERENT FOR THE STRESS TESTER NOW?



**Broader risk spectrum**

- Surprises may come from unexpected places
- Seemingly low-salience risks may spillover/compound to create unexpected problems
- Wider aperture required to identify all risks relevant to different business lines

**Heightened risk magnitude**

- Impact of known risks may increase (e.g. climate change)
- Interconnectedness enhances potential for cascading, compounding risks
- Feedback loops can enhance effects of known risks beyond current estimates

**Multiple threat scenarios**

- Number of high-impact potential threat scenarios is increasing
- Corresponding increase in number of scenarios which stress tests should encompass
- Not all plausible scenarios can be contained in a single model

**Pace of stress test iterations**

- Likelihood of different stress scenarios may change rapidly as risks evolve
- Stress tests should therefore be designed for rapid iteration and adaptability
- Flexible models with shorter run times enable probing of newer threats as they emerge

**Importance of interdisciplinarity**

- "Siloing" of expertise limits ability to build robust that consider interconnected risks
- Interdisciplinary expertise required to properly model complex risks
- A cross-functional "stress test design committee" may help bring together in-house resources

# QUALIFICATIONS, ASSUMPTIONS, AND LIMITING CONDITIONS

This report is for the exclusive use of the Oliver Wyman client named herein. This report is not intended for general circulation or publication, nor is it to be reproduced, quoted, or distributed for any purpose without the prior written permission of Oliver Wyman. There are no third-party beneficiaries with respect to this report, and Oliver Wyman does not accept any liability to any third party.

Information furnished by others, upon which all or portions of this report are based, is believed to be reliable but has not been independently verified, unless otherwise expressly indicated. Public information and industry and statistical data are from sources we deem to be reliable; however, we make no representation as to the accuracy or completeness of such information. The findings contained in this report may contain predictions based on current data and historical trends. Any such predictions are subject to inherent risks and uncertainties. Oliver Wyman accepts no responsibility for actual results or future events.

The opinions expressed in this report are valid only for the purpose stated herein and as of the date of this report. No obligation is assumed to revise this report to reflect changes, events, or conditions, which occur subsequent to the date hereof.

All decisions in connection with the implementation or use of advice or recommendations contained in this report are the sole responsibility of the client. This report does not represent investment advice nor does it provide an opinion regarding the fairness of any transaction to any and all parties. In addition, this report does not represent legal, medical, accounting, safety, or other specialized advice. For any such advice, Oliver Wyman recommends seeking and obtaining advice from a qualified professional.