



CLIMATE CHANGE: HOW BEHAVIOURAL CHANGES & ECONOMIC CONSEQUENCES MAY IMPACT OP RISK

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INTRODUCTION

*"...banks and supervisors have predominantly focused on assessing credit risk, as they advance in applying methods to translate climate-related exposures into categories of financial risk [this] has contrasted **with...a very limited focus on...operational risk**". ¹*

*"Publicly available information regarding **climate-related operational risks is scarcer than for other risk types**, and therefore the whole risk category would benefit from more data and research."* ²

Basel Committee

The focus of this presentation is the:

1. Behavioural changes arising from Climate Change.
2. Economic consequences of Climate Change.
3. Impacts on Operational Risk capital models and lags in the settlement of losses.

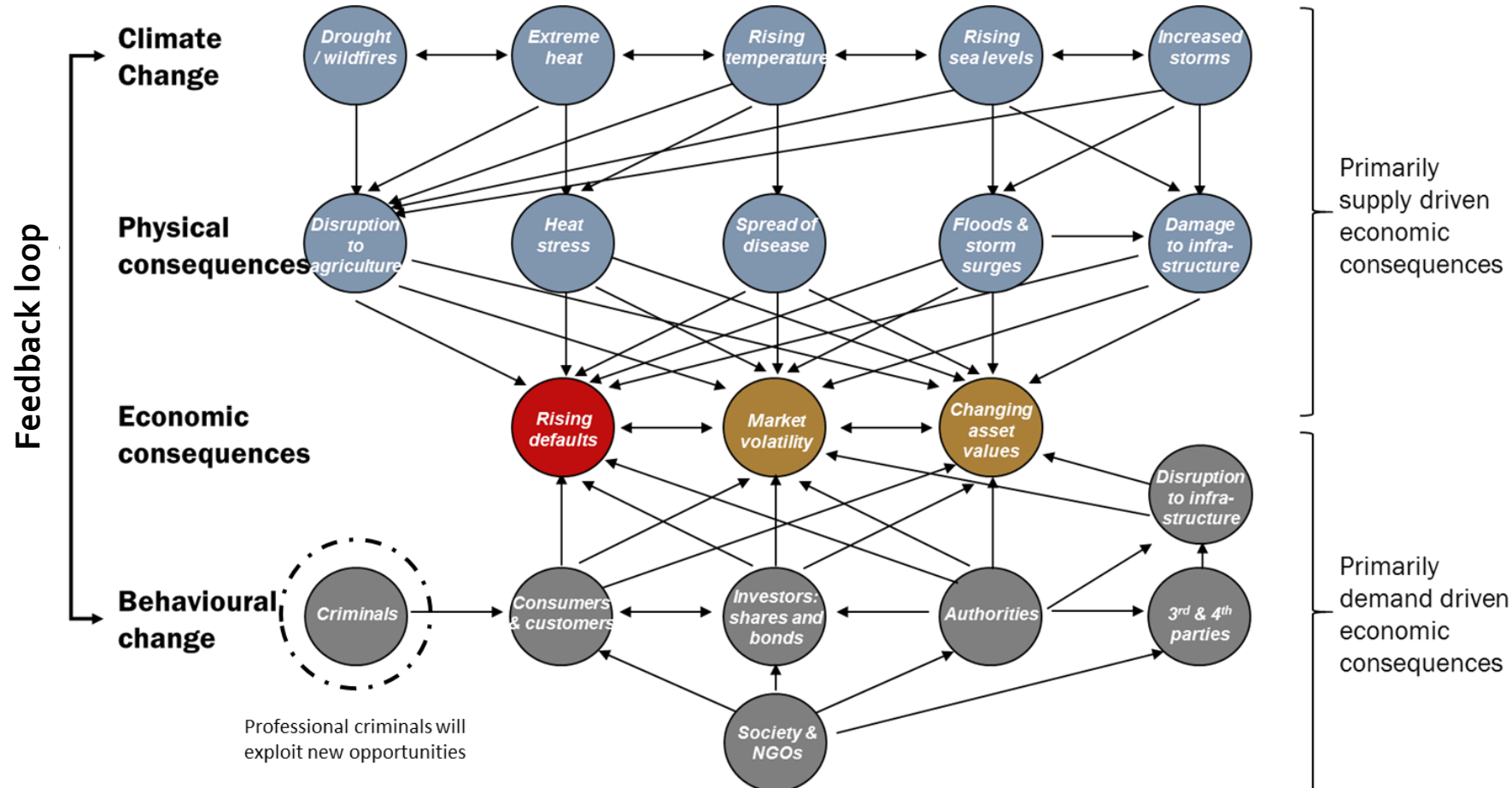
The contents of this presentation are my own views rather than those of ICBC Standard Bank.

1. Basel Committee on Banking Supervision "Climate-related financial risks – measurement methodologies" April 2021

2. Basel Committee on Banking Supervision "Climate-related risk drivers and their transmission channels" April 2021

CONSEQUENCES OF CLIMATE CHANGE: PHYSICAL, BEHAVIOURAL AND ECONOMIC CHANGES

Climate Change results in physical consequences and behavioural change, that can both lead to economic consequences through disruption of either supply or demand, respectively, and which collectively may drive Op Risk losses in the future.



Due to the current scarcity of data, predictions have to be made by drawing parallels with past crises, e.g. the:

- COVID-19 pandemic; and
- Global Financial Crisis;

as well as:

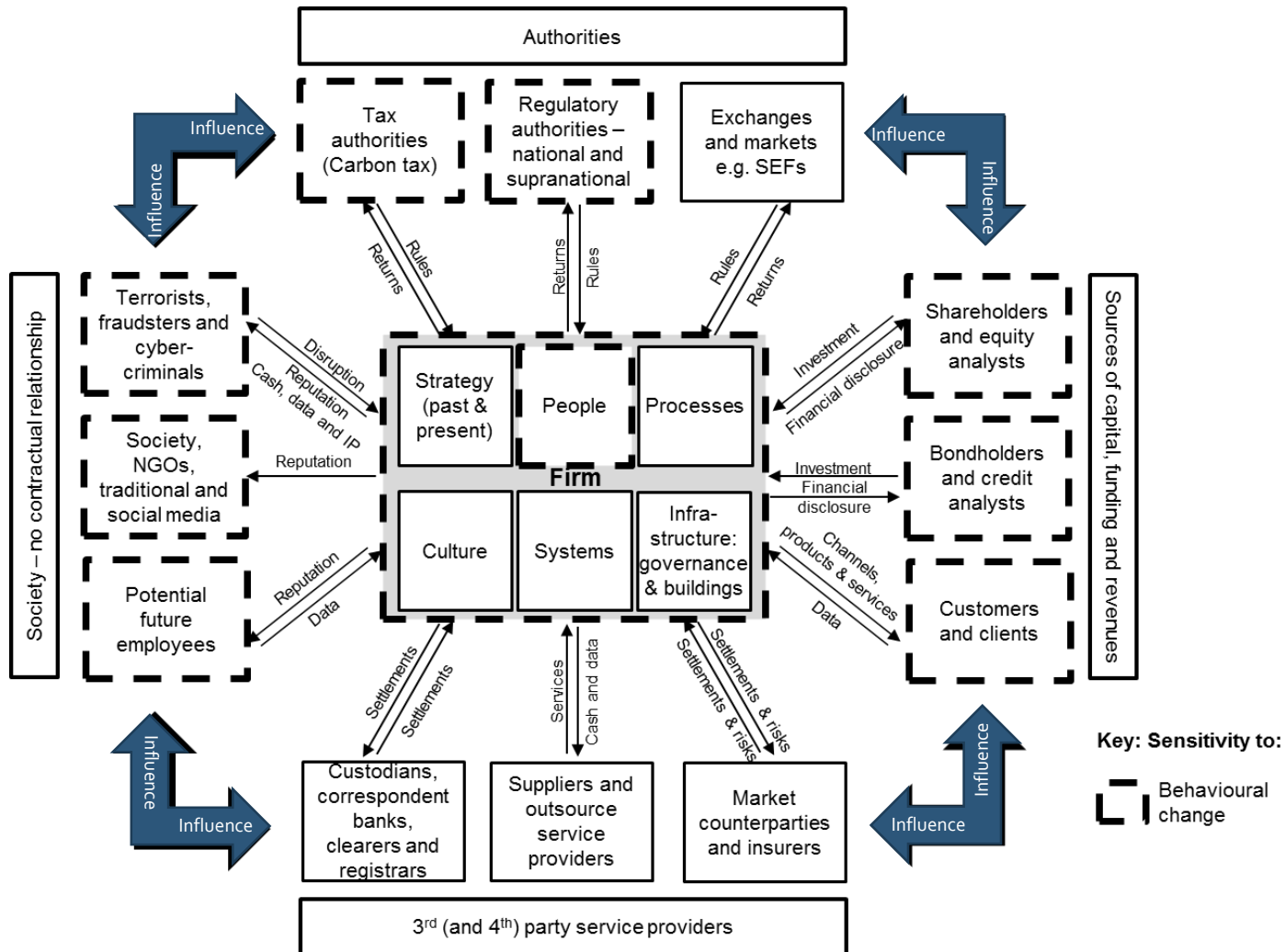
- Idiosyncratic events; and
- The use of behavioural models.

1. BEHAVIOURAL CHANGES



1. BEHAVIOURAL CHANGES – WHOSE BEHAVIOURS?

Climate Change is likely to change the behaviours of a firm and its stakeholders. Past crises & events may provide a guide:



- **Firms:** Inappropriate responses to crises e.g. inappropriate foreclosure (Global Financial Crisis).
- **Customers & investors:** changes in product demand and flight to “*Safe Haven*” assets e.g. gold.
- **Customers & staff members:** Fraud driven by deteriorating financial circumstances - “*Need*”.
- **Regulators:** Penalties for misconduct but will act to maintain financial stability (COVID-19).
- **Criminals:** exploited changes in customer behaviours and / or weakening of controls during the COVID-19 pandemic.

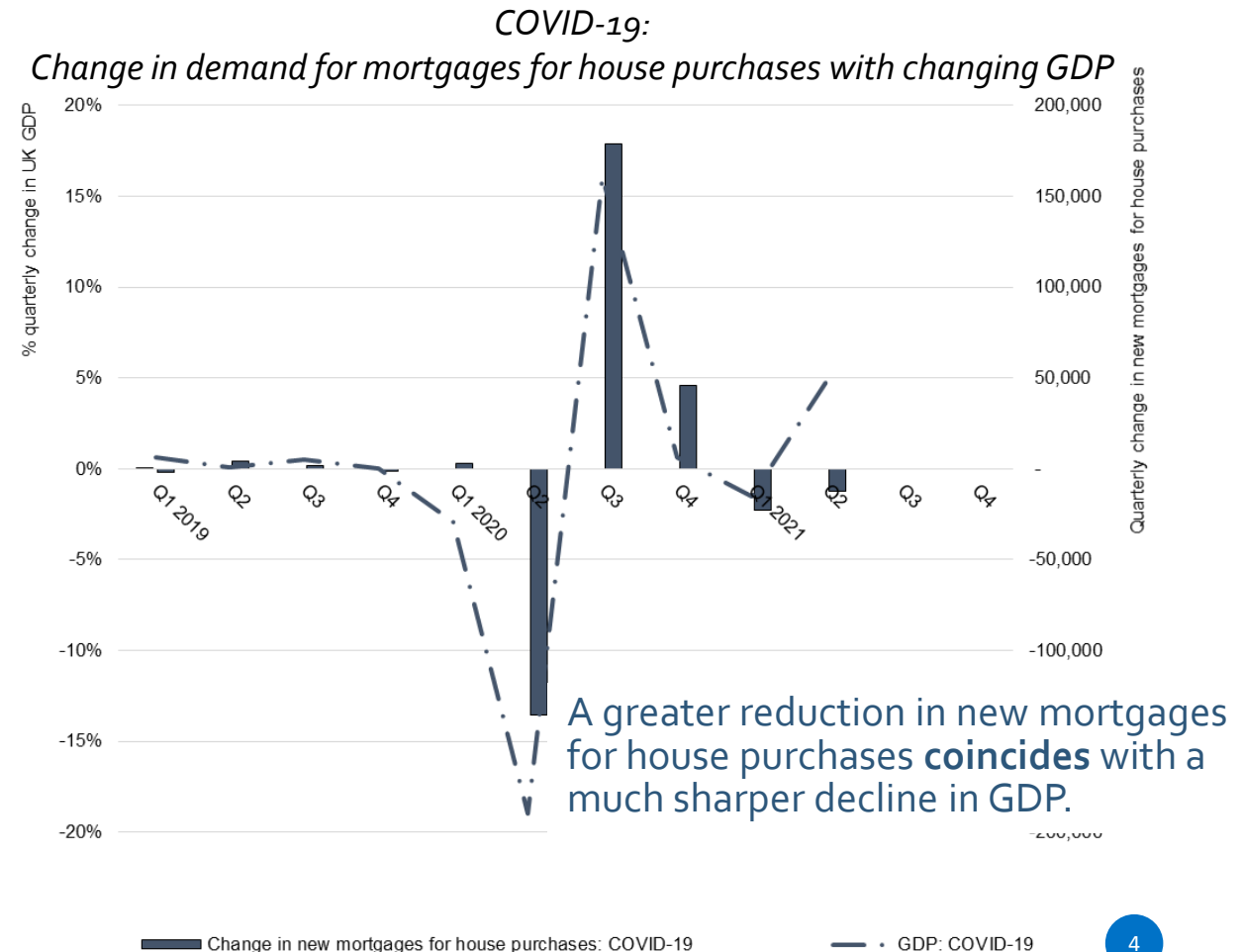
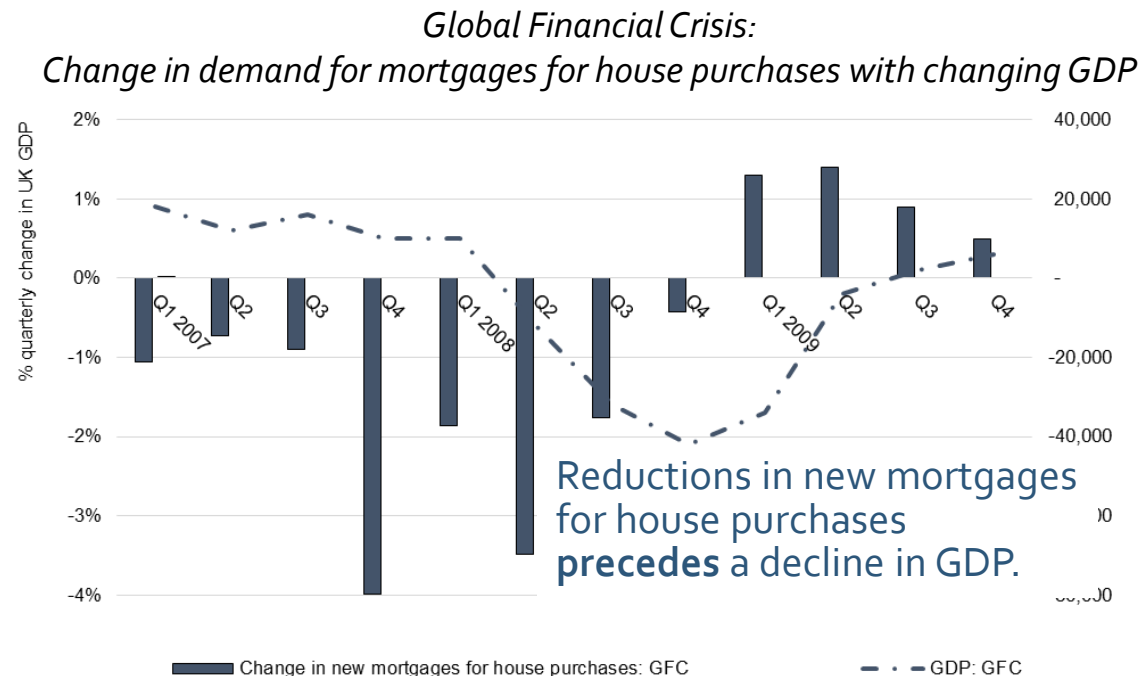
And,

- **Society:** Campaigns against support for carbon emitters, and indirect causal contribution litigation.

1. SYSTEMIC SHOCKS – CHANGING NEW BUSINESS DEMAND

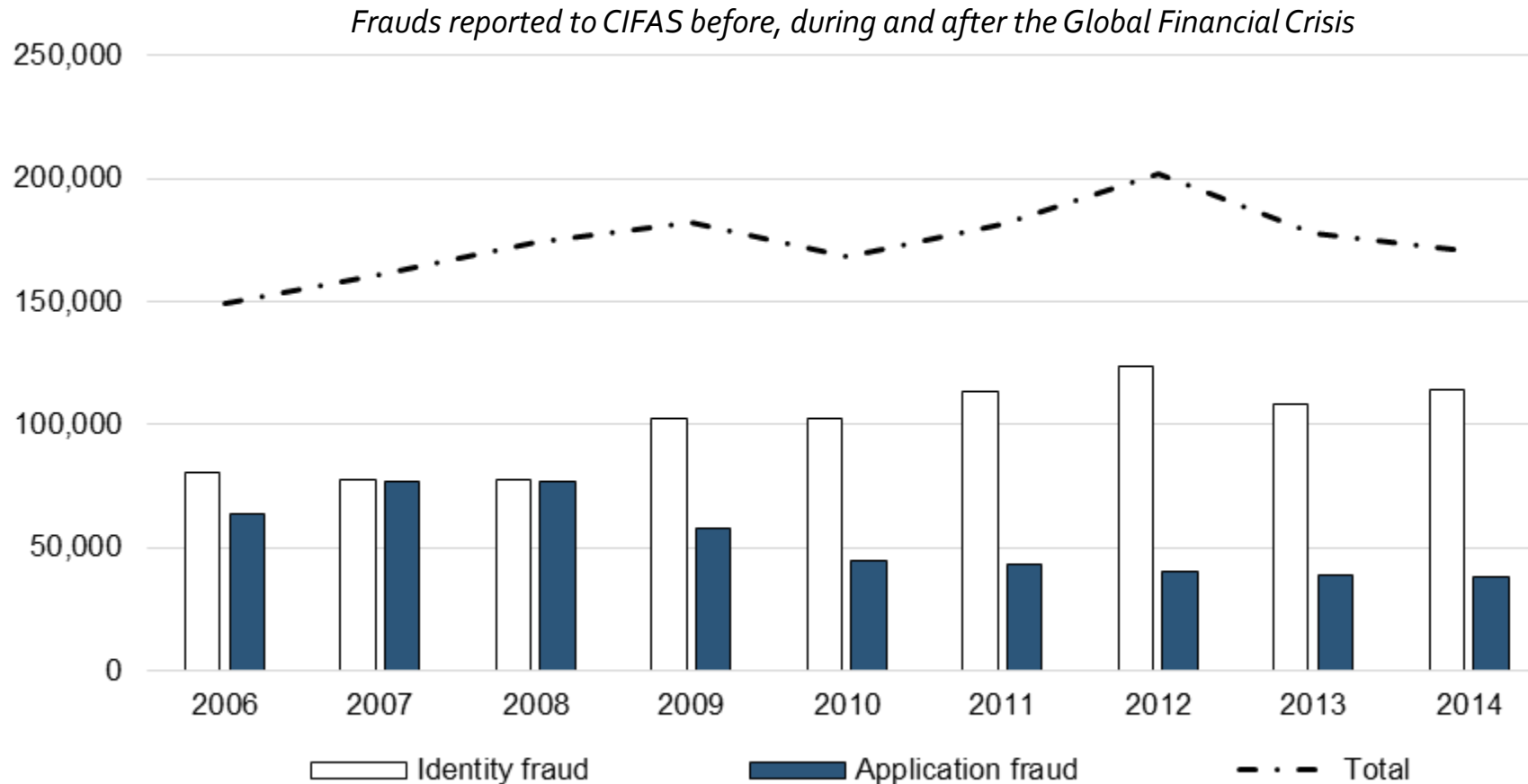
Changes in customer demand are illustrated by two recent crises i.e. the:

- Global Financial Crisis, which may be similar to Transition; and
- COVID-19 pandemic, which may be similar to a Physical event.



1. SYSTEMIC SHOCKS – CHANGING CRIMINAL BEHAVIOURS

Criminals respond to economic shocks and changing bank and customer behaviours. This was apparent both during the Global Financial Crisis and the COVID-19 pandemic – External Fraud losses collated by ORX show a €2bn increase in 2020 vs previous 5 years.



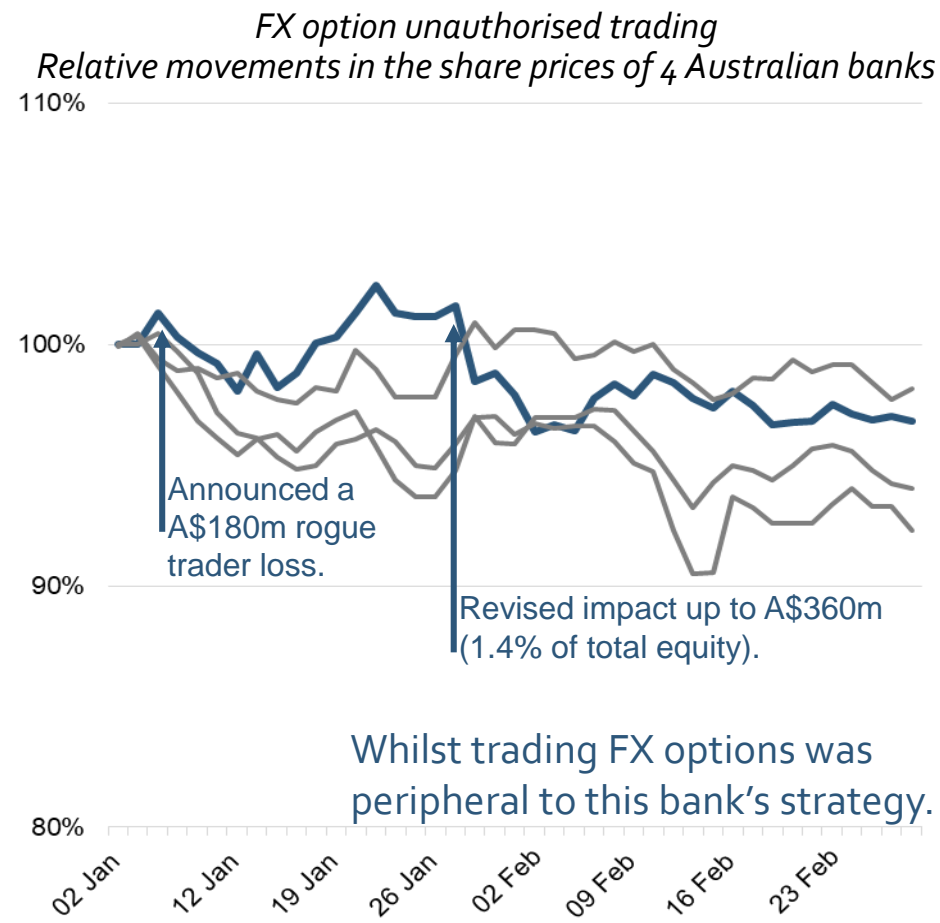
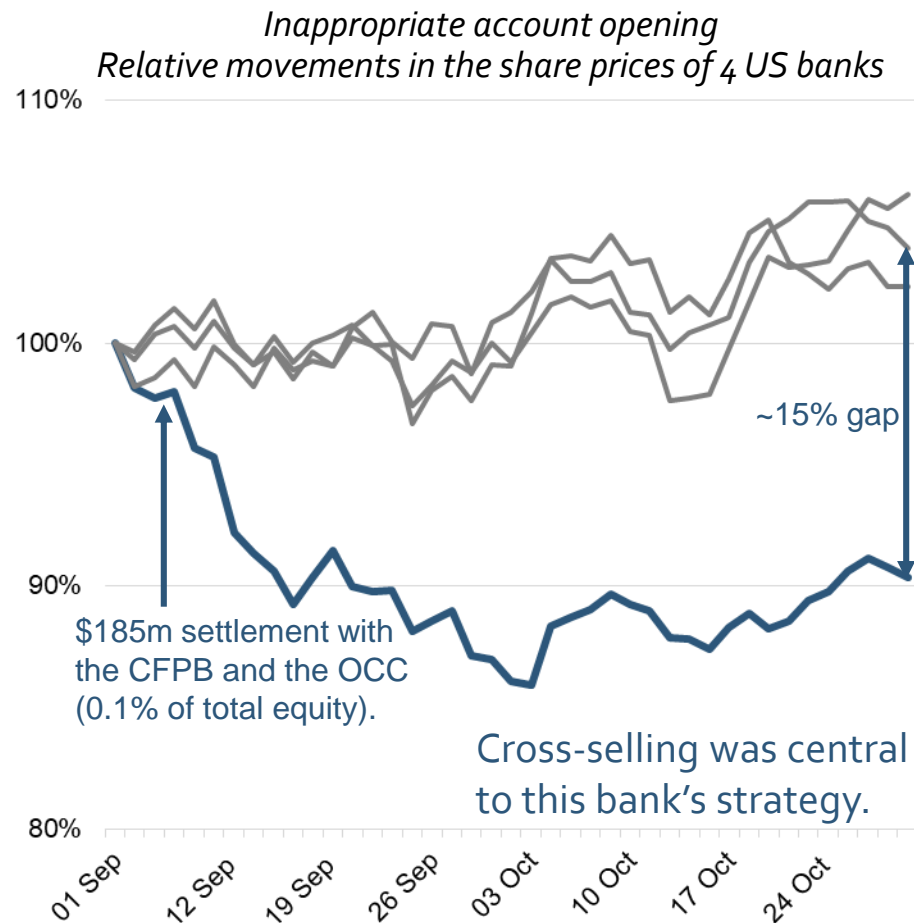
Optimal Foraging Theory suggests that professional criminals act to optimise their success, i.e.:

- Effort to locate victims;
- Effort to exploit victims; and
- Financial rewards.

Criminals will exploit changes that alter these parameters i.e. both systemic shocks, as well as idiosyncratic events, e.g. TSB's IT migration issues in April 2018 led to £49m of fraud and operational losses.

1. AN EVENT - CHANGES IN SHAREHOLDER BEHAVIOURS

Research conducted before the Global Financial Crisis on the impacts of Op Risk events on share prices found that some of the largest impacts arose from deceptive sales practices; concealment; anti-trust violations; and market manipulations.



Reputational damage may arise from both:

- **Risk events**, e.g. losses from the collapse of Archegos; and
- **Decisions**, e.g. the Dakota Access Pipeline.

Visible damage arises when stakeholders':

- Perceptions are changed; and they
- Are **able** to alter their behaviours:
 - Shareholders;
 - Investors;
 - Depositors, e.g. Northern Rock.
 - Clients.

Source: Dunnett et al (2005) "The hidden costs of Operational Risk", McKinsey.

Source: "Ten Laws of Operational Risk", by M. Grimwade, and due to be published by Wiley & Sons in December 2021.

1. AN EVENT - CHANGES IN CLIENT BEHAVIOURS

Some revenues are more susceptible to changes in client behaviours than others, ranging from Investment Banking (e.g. underwriting fees) to Net Interest Income.

The sensitivity of Investment Banking revenues to Reputational Risk

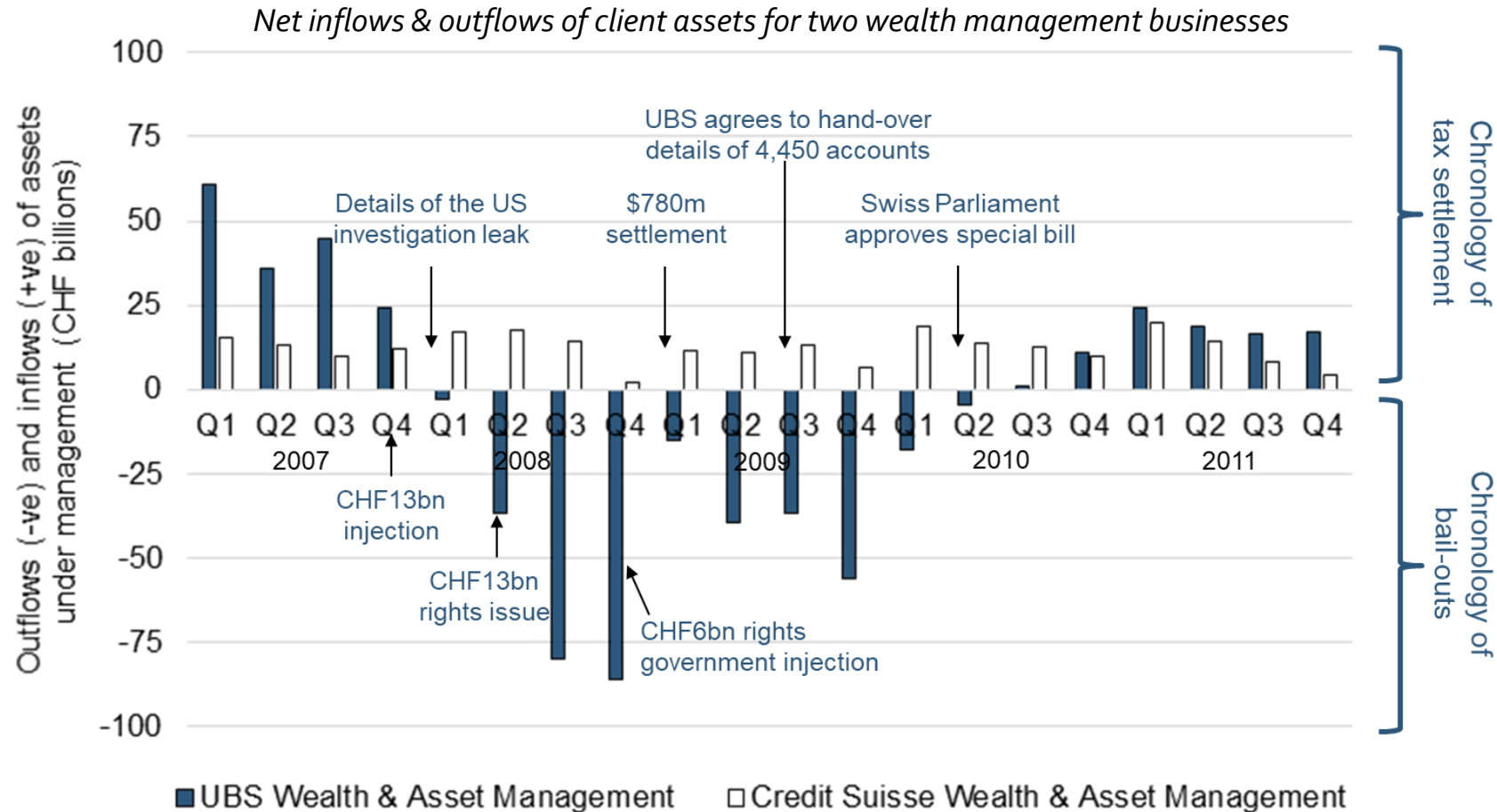


Two historical incidents have been overlaid on the composition of revenues of an investment bank in 2019:

1. Nomura suffered a 45% reduction in equity underwriting in Japan in 2012 following regulatory action on its abuse of customer data.
2. Citigroup suffered a 78% reduction in European government bond underwriting following its "Dr Evil" trading strategy in 2004.

1. AN EVENT - CHANGES IN INVESTOR BEHAVIOURS

During 2008 and 2009 UBS's wealth management business experienced an outflow of Investments Under Management that coincided with the Global Financial Crisis and charges of facilitating tax evasion.



This may be illustrative of the consequences of a “*Greenwashing*” scenario for a fund manager.

Climate Change may also be seen as a moral issue, hence whistleblowing may occur if the public statements of fund managers differ from their private actions.

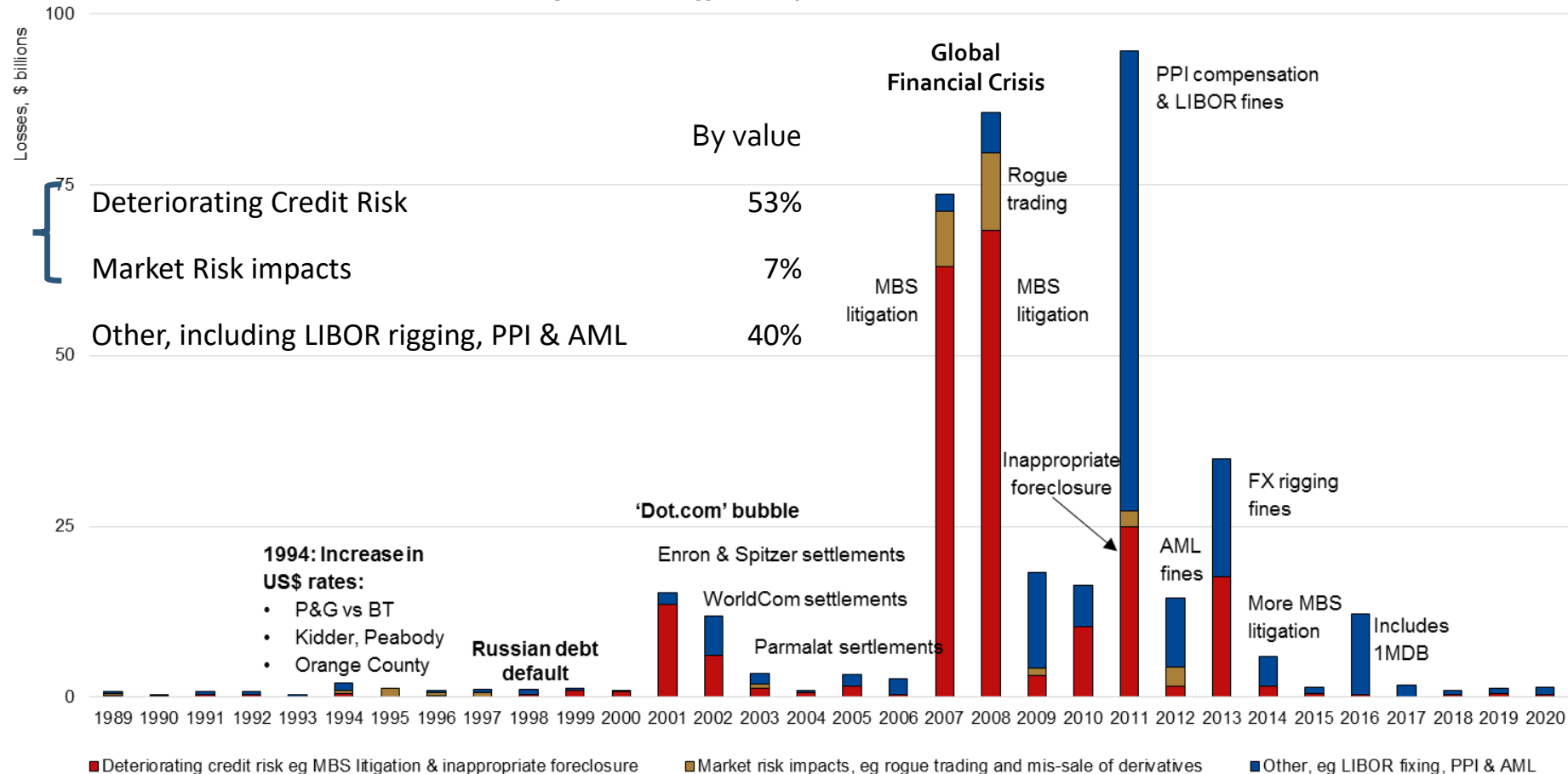
2. ECONOMIC CONSEQUENCES



2. PATTERNS IN OP RISK LOSSES OVER 3 DECADES

Historical patterns of Op Risk losses in relation to economic shocks may give insights into the potential impacts of Climate Change.

Patterns in large losses suffered by the G-SIBs over the last 3 decades



The majority of the value of these losses are underpinned by Credit and Market Risk, e.g.:

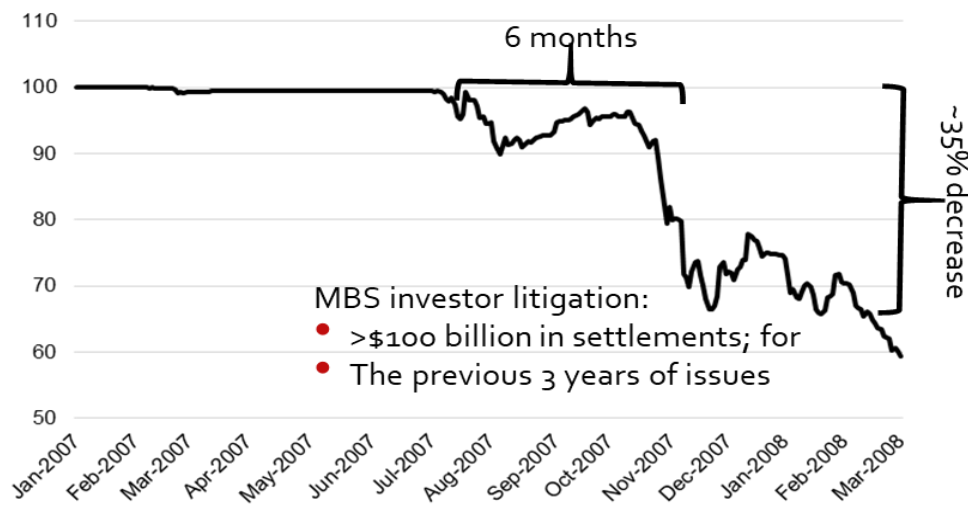
- MBS & CDO litigation;
- Inappropriate foreclosure;
- Swap litigation;
- Rogue trading.

2. OP RISK IS SENSITIVE TO SIGNIFICANT & RAPID CHANGE

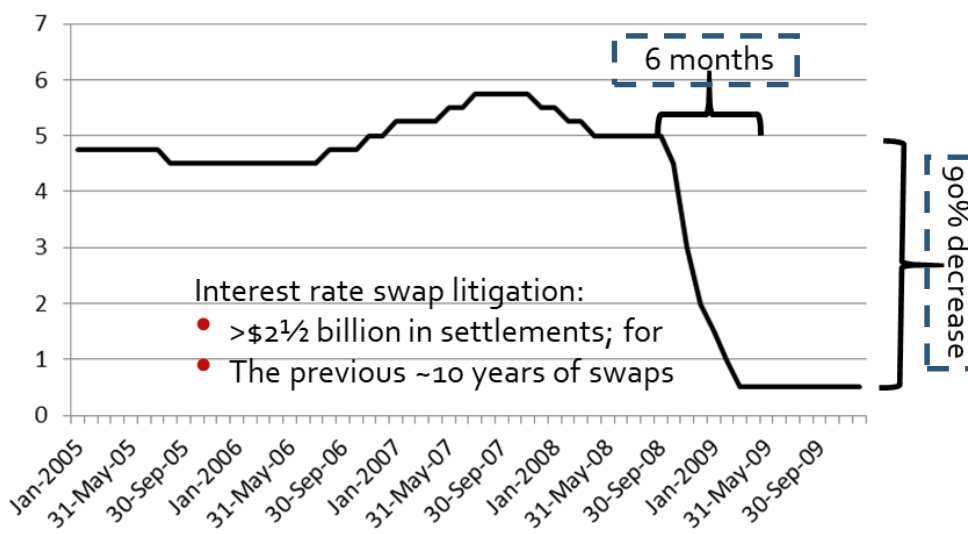
These two incidents involve the uncovering of past failures.

The customers' Credit and Market Risk losses were transferred back to become the banks' losses because of their past misconduct.

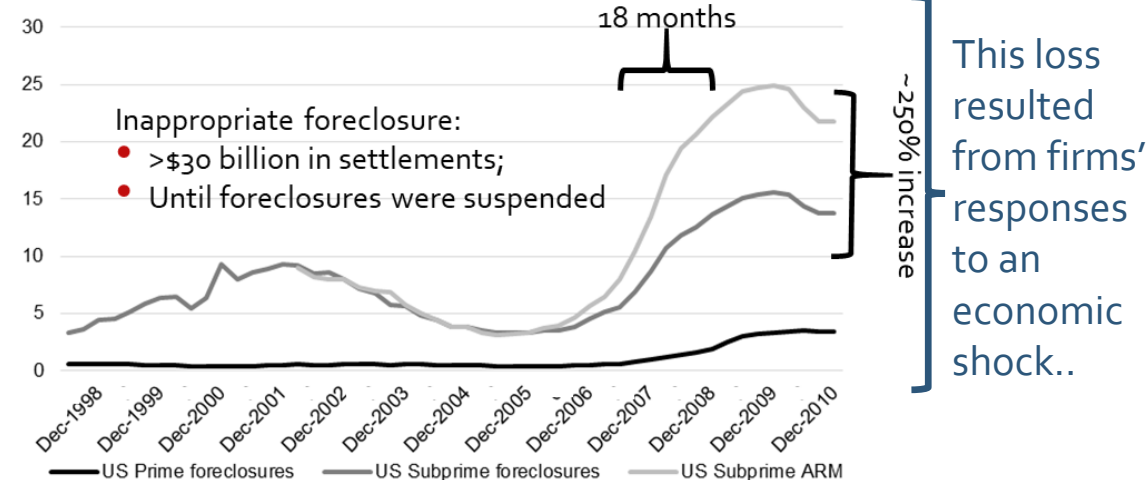
ABX AAA index: Driver for investor litigation



GBP base rates: Driver of customer litigation



US foreclosure rates: Driver of regulatory action



This loss resulted from firms' responses to an economic shock..

The key factors driving Op Risk losses include:

- The **significance** of the economic change (3rd Law) e.g. GBP interest rates fell by 90% after the Global Financial Crisis;
- The **rapidity** of the change in an economic metric e.g. this 90% reduction in GBP interest rates occurred in just over 6 months;
- The duration and scale of misconduct (4th Law), e.g. >10 years for the mis-sale of swaps to SMEs; and
- The transference of risk (e.g. Market Risk) from firms to customers (9th Law).

2. TRANSLATION INTO OP RISK LOSSES

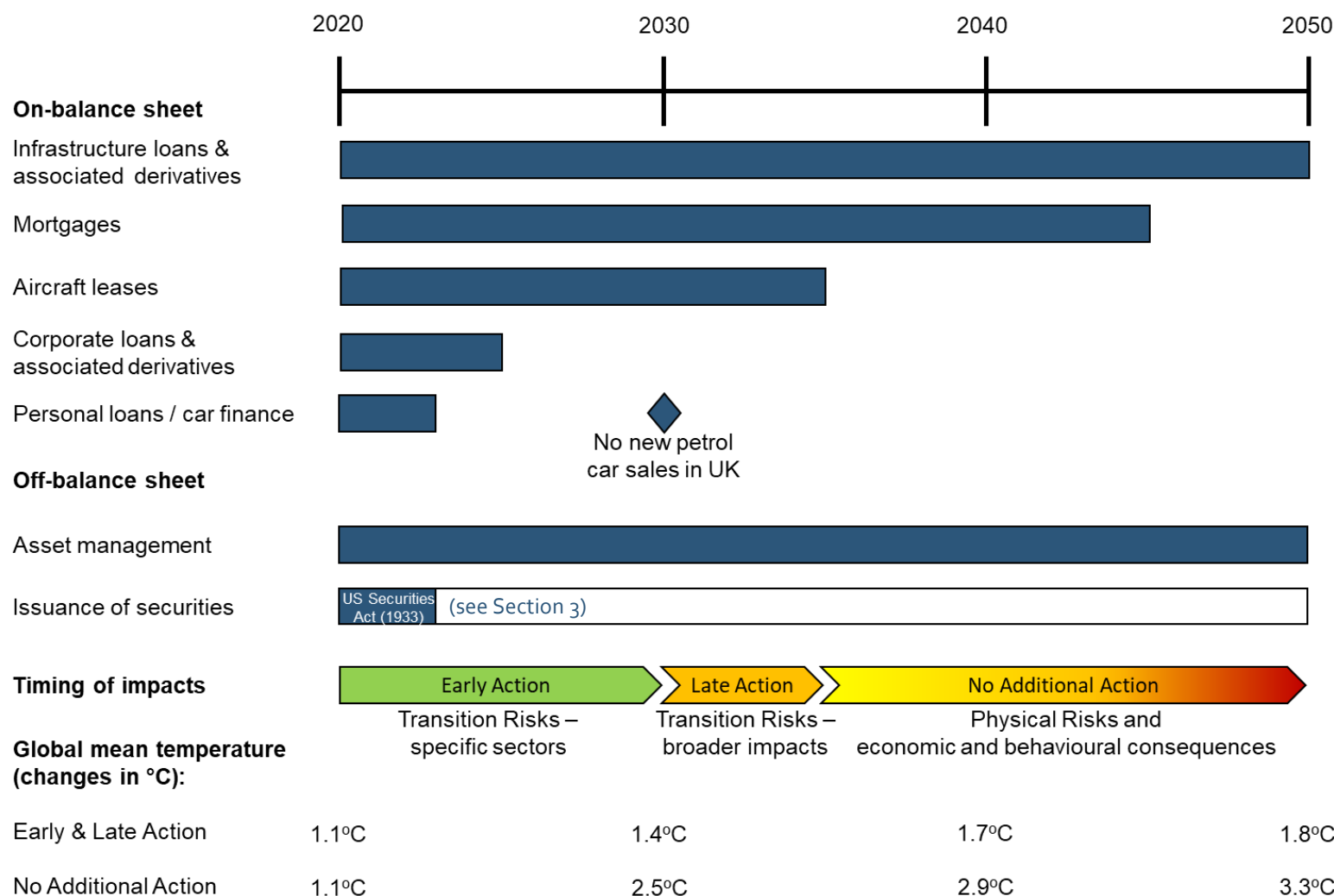
Economic shocks exacerbate existing losses; uncover historical failures; and lead to inappropriate responses.

Drivers of these Op Risk losses	Examples of losses from past crises - Global Financial Crisis and COVID-19
1. Existing losses are exacerbated, whilst others decline	<ul style="list-style-type: none"> • Changes in criminal behaviours: <ul style="list-style-type: none"> – A rise in account take-over frauds; but – A decline in application frauds (GFC, but not COVID-19). • Changes in customer behaviour / demand drive processing errors: <ul style="list-style-type: none"> – UK equities traded increased 140% in March 2020 vs March 2019. • Increased market volatility exacerbate fat-finger typing errors.
2. Historical failures uncovered	<ul style="list-style-type: none"> • Market moves led to claims of mis-sale MBS, CDOs and derivatives. • Negative rates revealed design deficiencies in structured products. • Defaults revealed failures in loan and security documentation • Customer defaults revealed 2nd party frauds i.e. “book-keeper” frauds. • Benchmark manipulation came to light in the crisis.
3. Responses to an economic shock may lead to new losses e.g.: <ul style="list-style-type: none"> • Firms; or • Individuals; or • Customers. 	<ul style="list-style-type: none"> • Inappropriate foreclosure in the US. • Failure to treat customers fairly in financial difficulties. • Mis-leading disclosures on ABS exposures. • Mis-marking of ABS books by staff. • Frauds driven by “Need” perpetrated by customers. • Staff litigation re: bonuses and dismissals.

These losses are sensitive
to Market or Credit Risks

2. TIME HORIZONS – PRODUCTS & SERVICES AND SCENARIOS

Today's new business may be impacted by different scenarios depending on its term. Action should be taken to mitigate these Op Risks.



Early Action scenario (Now):

Firms may already be exposed to risks of litigation relating to Climate Change disclosures for themselves; for their arrangement of the issuance of securities (see Section 3); and investor funds under management.

Late Action scenario (2030 to 2035):

A severe economic shock may lead to:

- The uncovering of historical errors and misconduct (e.g. mis-sale of swaps to SMEs);
- New behaviours and inappropriate responses to the crisis by criminals, staff members and customers e.g. crimes of "Need".

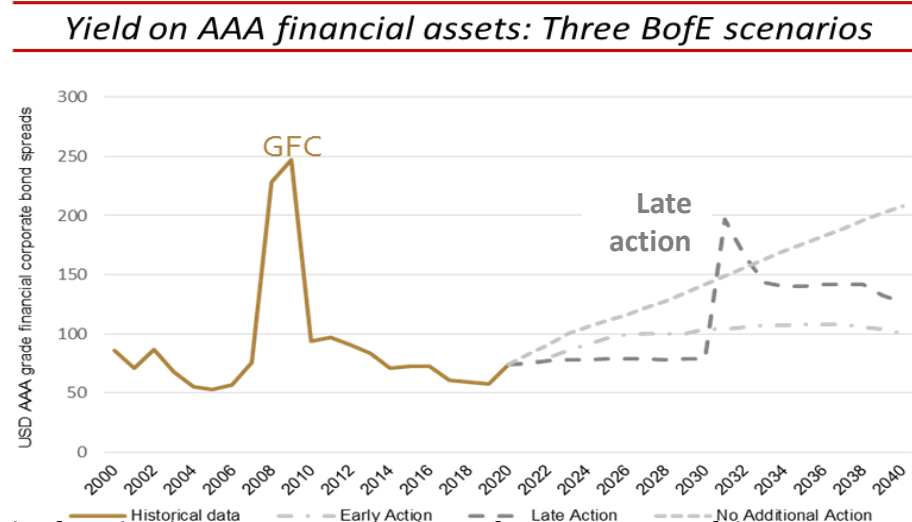
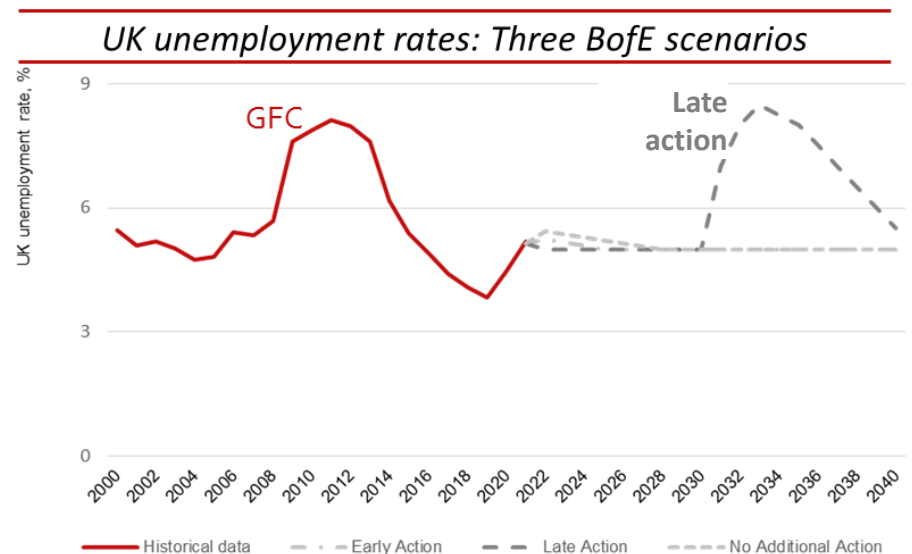
No Additional Action scenario (2045 onwards):

Additionally firms may be exposed to:

- Extreme weather events; and
- Threats to their staff from heat-stress and disease.

2. SIGNIFICANT & RAPID ECONOMIC CHANGE

The only Bank of England scenario that forecasts both **significant & rapid** economic change is the “*Late Action*” scenario.



The “*Late Action*” scenario has some similarities to the Global Financial Crisis, and hence may have the greatest financial impacts on CPBP / Conduct Risk.

The Global Financial Crisis provides a guide as to the potential scale of these impacts, as it led to a measurable increase in losses $\geq \$100$ million suffered by 31 current and former G-SIBs for 2007 to 2017 vs 1996 to 2006:

- **Frequency** (Occurrence & Detection) **increased 3.2x**; and
- **Severity** (Velocity x Duration) **increased 2.9x** The scale of the increase in Severity of Op Risk losses would be proportionate to the scale of any economic shock.

Source: Bank of England, (June 2021) “*Guidance for participants of the 2021 Biennial Exploratory Scenario: Financial risks from climate change*”.

Source: “*Forecasting the Op Risk Climate Change spike*”, M. Grimwade, Risk Magazine (August, 2021)

3. CAPITAL MODELS & LAGS

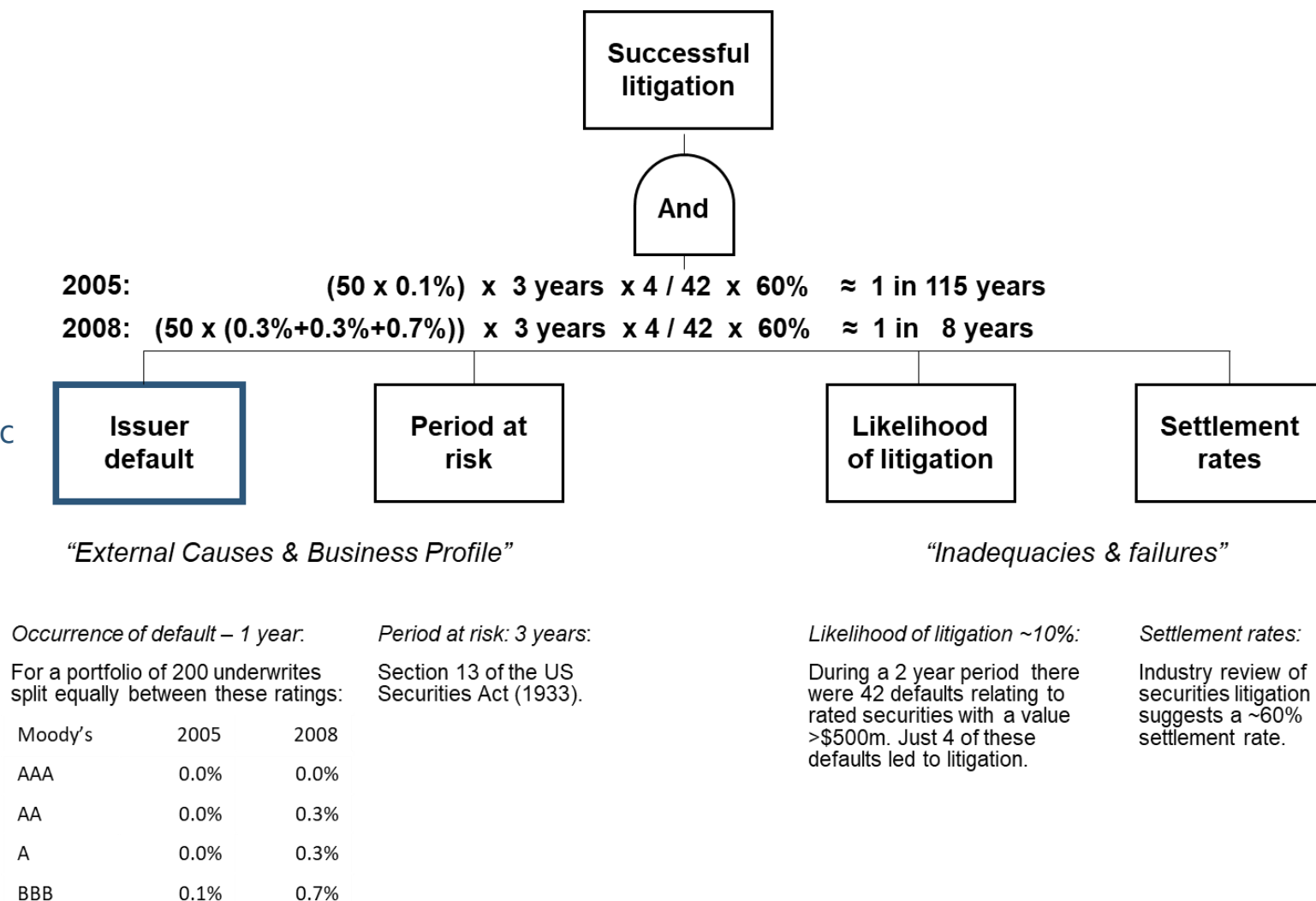


3. STRESS EXISTING SCENARIOS E.G. SECURITIES LITIGATION

Firms can stress their existing Op Risk scenarios for factors that are sensitive to Climate Change, using data from historical events.

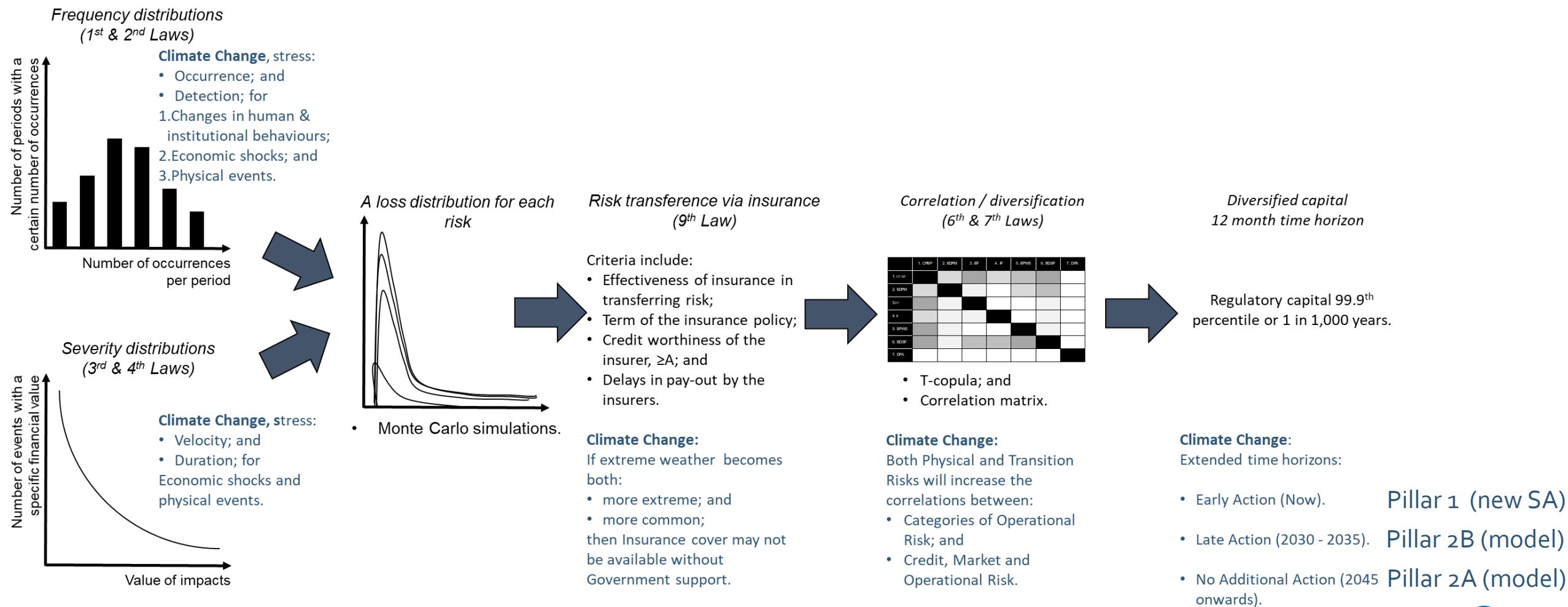
Issuer default is sensitive to economic shocks under either the:

- Late Action scenario; or
- No Additional Action scenario.



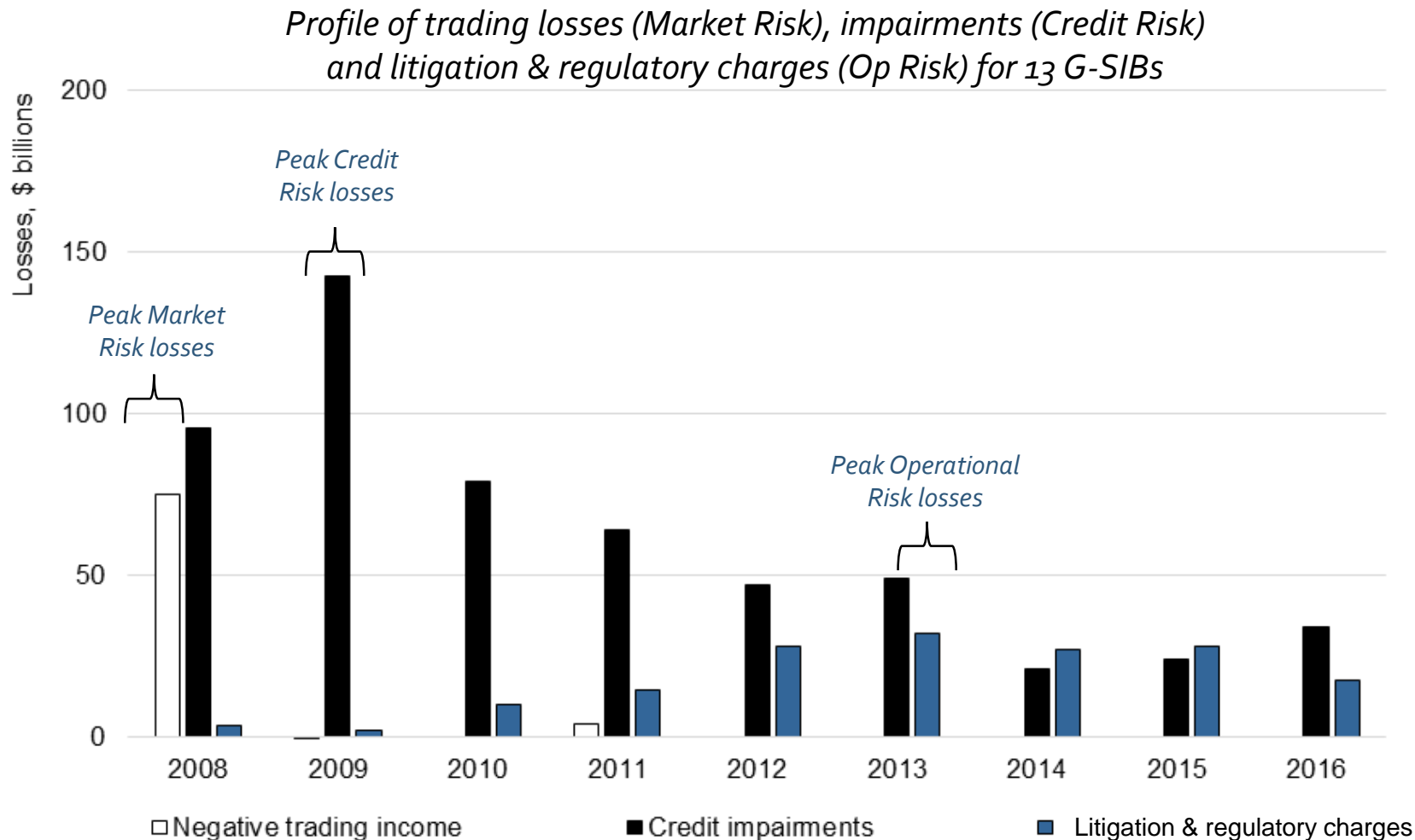
3. OP RISK CAPITAL – OVERLAYING CLIMATE CHANGE

Climate Change may impact a range of components of Op Risk capital and different pillars with different time horizons depending on the specific scenario e.g. the Late Action scenario occurs between 2030 and 2035 and will be a transient economic shock i.e. Pillar 2B.



3. LAGS IN SETTLEMENT – GLOBAL FINANCIAL CRISIS

After a severe downturn losses come in waves: first Market, then Credit, and finally Op Risk:



Physical Risk losses in the No Additional Action scenario would be instantaneous.

But in the Late Action scenario, a sharp decline in GDP in 2032 may not lead to a peak in CPBP losses suffered by firms until ~2037.

CONCLUSIONS

1. Behavioural changes

- Climate Change will change the behaviours of a firm's stakeholders through systemic shocks, individual events and decisions.
- This is most evident for stakeholders that are able to alter their behaviours e.g. shareholders, investors, depositors and criminals.

2. Economic consequences

- The last 3 decades demonstrate that Op Risk is sensitive to economic shocks that are significant & rapid.
- Economic shocks can exacerbate existing Op Risk losses; uncover historical failures; and lead to inappropriate responses.
- The most severe economic shocks may arise from Transition Risks in the "*Late Action*" scenario and Physical Risks in the "*No Additional Action*" scenario.

3. Op Risk capital and lags

- Today's new business may be impacted by different scenarios depending on term. Action should be taken to mitigate these Op Risks.
- Climate Change may impact a range of components of Op Risk capital and different pillars with different time horizons depending on the specific scenario e.g. the Late Action scenario occurs between 2030 and 2035 and will be a transient economic shock i.e. Pillar 2B.
- In the Late Action scenario, however, Op Risk losses may not peak until 2037.

Finally, it will be the next generation of bankers & risk managers that must deal with climate related Op Risks.

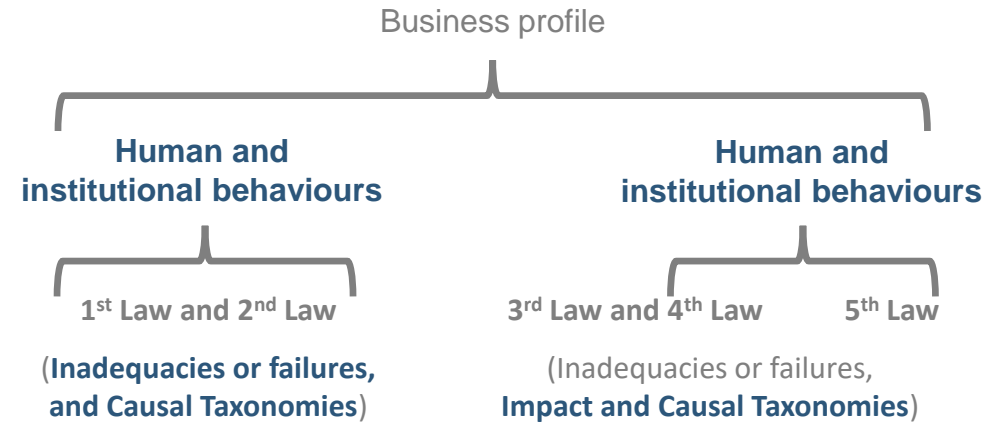
APPENDICES



AN OVERARCHING FORMULA FOR THE TEN LAWS OF OP RISK

This overarching formula for Operational Risk highlights how it may be influenced by Climate Change.

Laws that drive individual events and losses

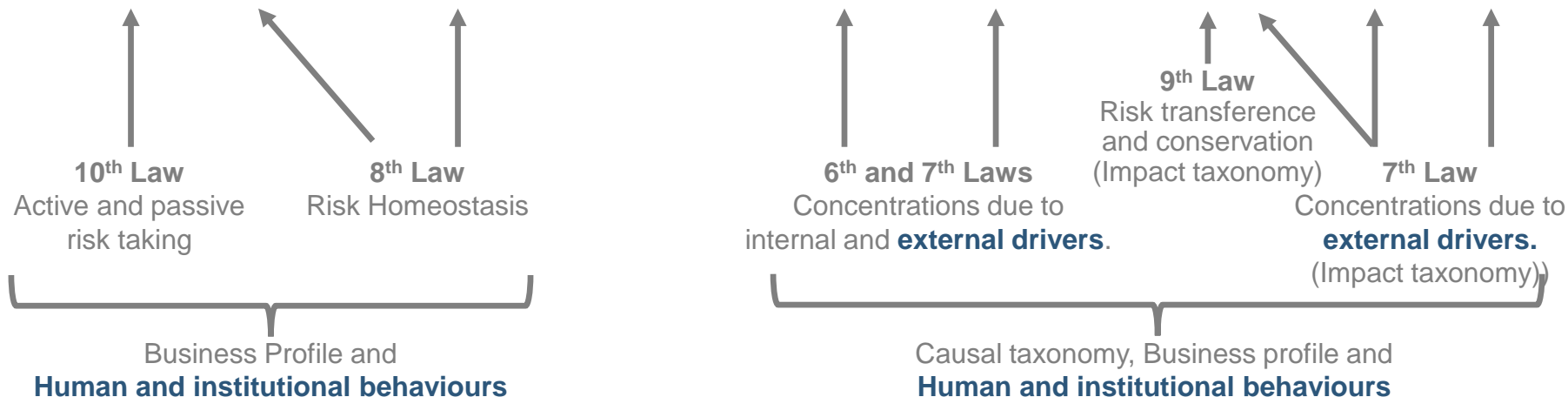


Climate Change may influence both directly and indirectly Op Risk losses through changing:

- **Frequency** (Occurrence and Detection);
- **Severity** (Velocity x Duration); and
- **Lags** in settlement.

$$\text{Appetite} \approx \text{Losses settling in the current year} = (\text{Occurrence, Detection}) \times (\text{Velocity} \times \text{Duration}), \text{ Lags}$$

Laws that drive patterns and inter-relationships



Additionally, it may also act as a causal factor through the weakening of controls e.g. increasing staff illness / absence.

SUMMARY OF IMPACTS – THE CURRENT TOP THREE

The most significant increase in losses after the Global Financial Crisis was CPBP This is likely to be the same for Climate Change.

Basel II Op Risks and the nature of events	Transition Risks		Physical Risks	
	Examples of direct impacts	Examples of direct & indirect Op Risks	Examples of direct impacts	Examples of direct & indirect Op Risks
1. CPBP – Investor and client litigation: • Misconduct.	Changes in demand lead to increased market volatility and changing long term asset values: • Energy prices. • Commodity prices. • Interest & FX rates. • Security values.	<u>Detection / Duration and Velocity:</u> Customer and investor litigation arising from: • Losses; and / or • Lost opportunities; and / or • Disclosure issues. Litigation for financing carbon emitters.	Changes in supply lead to increased market volatility and changing long term asset values: • Energy prices. • Commodity prices. • Interest & FX rates. • Security values.	<u>Detection / Duration and Velocity:</u> Customer and investor litigation arising from: • Losses; and / or • Lost opportunities. Litigation for financing carbon emitters.
	Rising defaults in affected sectors.	<u>Occurrence & Velocity:</u> Not treating customers in financial difficulties fairly.	Rising defaults in affected sectors.	<u>Occurrence & Velocity:</u> Not treating customers in financial difficulties fairly.
	Expansion of regulation.	Regulatory breaches.		
2. EDPM: • Mistakes and omissions.	• Changing customer and investor behaviours. • Disorderly price adjustments. • Changing customer and investor behaviours.	• <u>Occurrence:</u> Changing transaction volumes may increase error rates. • <u>Detection:</u> Historical errors. • <u>Velocity:</u> Fat-fingered typing errors more expensive.	• Changing customer and investor behaviours. • Disorderly price adjustments. • Changing customer and investor behaviours.	• <u>Occurrence:</u> Changing transaction volumes may increase error rates. • <u>Detection:</u> Historical errors. • <u>Velocity:</u> Fat-fingered typing errors more expensive.
3. EF: • Malicious acts.	Change in criminal behaviours i.e. opportunistic frauds exploiting: • Customer uncertainty. • Disruption to banks.	<u>Occurrence:</u> • Customer and investor litigation if these losses arise from bank negligence. • Direct losses suffered by firms e.g. Ransomware.	Change in criminal behaviours i.e. opportunistic frauds exploiting: • Customer uncertainty. • Disruption to banks.	<u>Occurrence:</u> • Customer and investor litigation if their losses arise from bank negligence. • Direct losses suffered by firms e.g. Ransomware.

Currently the largest financial impacts

Both Transition and Physical Risks may drive increases in CPBP losses, primarily through an economic shock i.e. in either the:

- Late Action scenario; or
- No Additional Action scenario.

Based on the Global Financial Crisis, settled large CPBP losses would peak ~5 years after an economic shock.

SUMMARY OF IMPACTS – THE OTHER FOUR RISKS

For the remaining four Op Risks, the Physical Risks are most significant i.e. primarily under the No Additional Action scenario.

Basel II Op Risks and the nature of events	Transition Risks		Physical Risks	
	Examples of direct impacts	Examples of direct & indirect Op Risks	Examples of direct impacts	Examples of direct & indirect Op Risks
4. EPWS • Acts of God.	• N/A	• N/A	• Extreme weather e.g. heat-stress. • Spread of diseases to temperate zones.	<u>Occurrence:</u> • Higher levels of sickness. • Incremental costs. <u>Cause:</u> • Reduced resourcing levels.
5. IF	Economic consequences: • Changing asset values. • Rising defaults. • Rising unemployment.	• <u>Occurrence:</u> Inappropriate responses to financial pressures. • <u>Detection:</u> Historical frauds.	Economic consequences: • Changing asset values. • Rising defaults. • Rising unemployment.	• <u>Occurrence:</u> Inappropriate responses to financial pressures. • <u>Detection:</u> Historical frauds.
6. BDSF • Acts of God; and • 3 rd and 4 th party failures.	• Retirement of coal fired power stations within Europe and North America.	<u>Occurrence & Duration:</u> • Increased risk of power outages due to the variability of renewables, such as, wind power. • 3 rd and 4 th party failures.	• Rising temperatures. • Extreme heat. • Rising sea levels and larger rogue waves. • Increased storms. • Increased flooding and storm surges. • Droughts and wildfires.	<u>Occurrence & Duration:</u> • Physical disruption to services e.g. staff unable travel to work. • Heatwaves will place increased demand for electricity for air conditioning. • 3 rd & 4 th party failures.
7. DPA: • Acts of God; and • 3 rd and 4 th party failures.	• N/A	• N/A	• Rising temperatures. • Extreme heat. • Rising sea levels and larger rogue waves. • Increased storms. • Increased flooding and storm surges. • Droughts and wildfires.	<u>Occurrence & Velocity:</u> • Physical damage to infrastructure of firms and 3 rd and 4 th parties, e.g. – By storms to offices; and – By heat to IT equipment. • Physical damage to assets owned by leasing banks. • 3 rd & 4 th party failures.