Stress Testing and Scenario Analysis for Capital and Liquidity Planning

International Workshop on Stress Testing and Risk Management

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Agenda

1. Objective of Stress Testing and Scenario Analysis

2. Current Practices

3. New Generation of Stress Tests: CCAR and EBA Stress Tests

4. Latest Developments in Stress Testing and Capital Management for Financial Institutions

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1 Objective of Stress Testing and Scenario Analysis

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Objective of Stress Testing and Scenario Analysis

- **The objectives of Stress Testing and Scenario Analysis are:**

  - ✓ Incorporate stress testing and scenario analysis into:

    - ✓ strategic and capital planning and

    - ✓ elaboration of the risk appetite statement and risk limit policies;

  - ✓ Consistently incorporate funding and liquidity considerations;

  - ✓ Identify early warning signals for adverse performance on key metrics;

  - ✓ Design, ahead of time, contingency plans based on cost/risk trade-offs; and

- **The above objectives require a comprehensive set of multiple scenarios (including the supervisory imposed ones: baseline, adverse, severely adverse).**

- **The framework should capture the initial impact of a shock and the snowball effect it has caused (systemic risk).**

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Objective of Stress Testing and Scenario Analysis

- **This proposed framework is consistent with the new expectations from the regulator.**

- **A new approach to bank supervision is taking hold in Europe for banks within the purview of the Single Supervisory Mechanism: SREP**

  - **Supervisory Review and Evaluation Process (SREP)** is an approach that introduces three fundamentally new principles to banking supervision :

    - ✓ *a forward-looking focus on the sustainability of a bank's business model (even under stressed conditions),*

    - ✓ *an assessment system that uses industry best practices as a guide, and*

    - ✓ *an expectation that all banks eventually will reach the same high standards.*

  - **ICAAP (*Internal Capital Adequacy Assessment Process*) and ILAAP (*Internal Liquidity Adequacy Assessment process*)** are the two key components of SREP

    - ✓ *ICCAP should incorporate stress testing and scenario analysis. The ICAAP should outline how stress testing supports capital planning for the firm.*

    - ✓ *ILAAP should incorporate the potential losses arising from liquidation of assets and increases in the cost of funding during period of stress.*

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Are These Objectives Met in Practice?

- **Are current regulatory stress tests useful?**

  - ✓ Thousands of daily stress tests at the risk factor level (infrastructure, analysis of limit breaches,…)

  - ✓ Viewed as regulatory constraints: not used in practice to improve risk management and capital planning

  - ✓ New EBA stress tests: many shortcomings

- **Need for a new framework.**

- **First, some brief historical perspective and current practices.**

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Current Practices

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Introduction

- The 1996 Basel Amendment to Market Risk lead to the universal adoption of **VaR** by banks worldwide to manage risk and derive regulatory capital against market risk.

- However, we cannot expect VaR calibrated in a low volatility, low correlation market regime to be an accurate measure of risk when markets jump to a high volatility, high correlation regime.
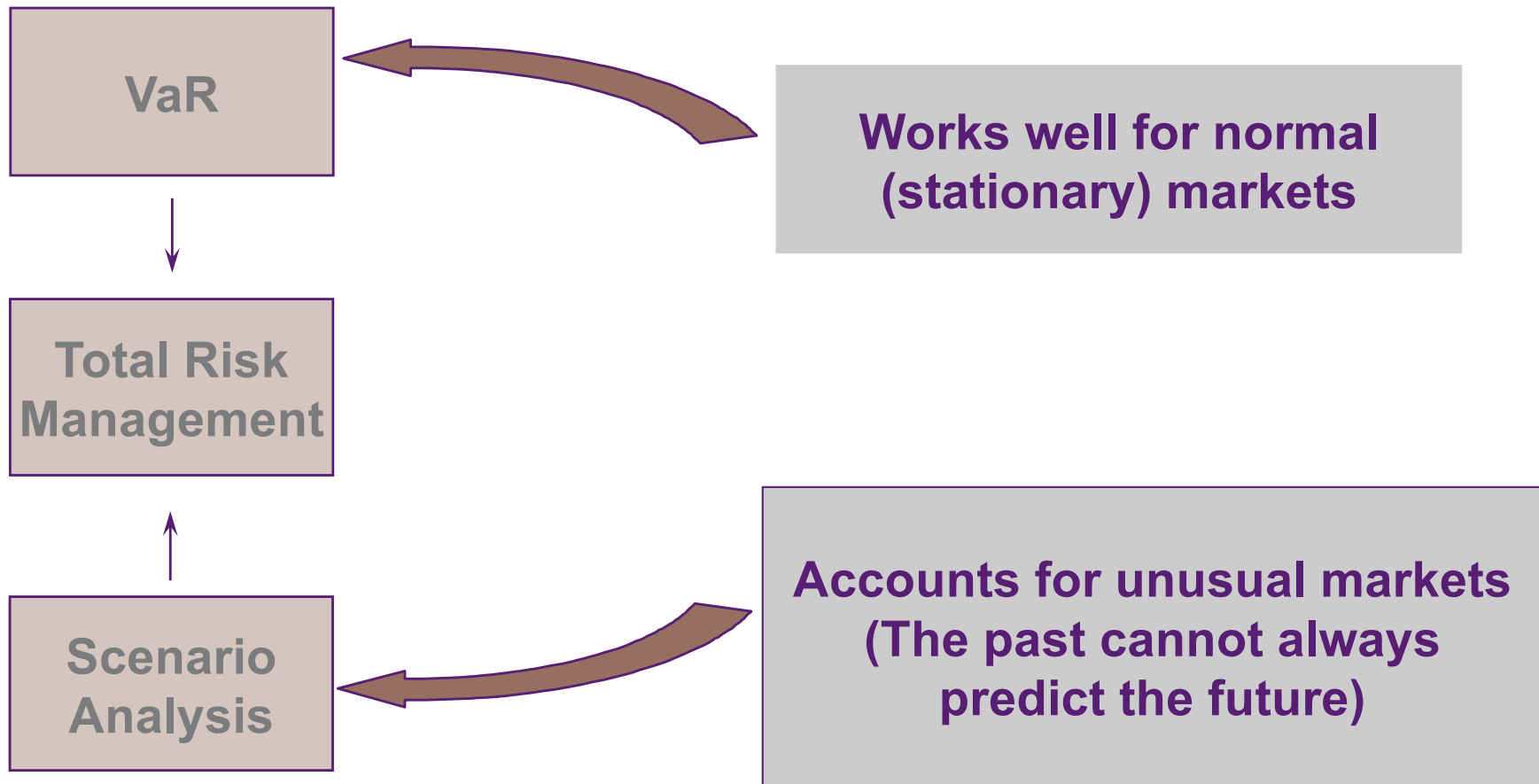
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Introduction

- **Each time there is a turmoil in financial markets, the limitations of VaR and other risk metrics are revealed:**

  - ✓ VaR is a static measure assuming liquid markets, and calibrated in pre-crisis regime underestimating volatilities and correlations that prevail during extreme market conditions.

  - ✓ August 1998 (LTCM) and the GFC (2007-2009) are illustrations of these shortcomings of VaR especially when such financial crises are accompanied by a drying up of market liquidity and the occurrence of large tail events.

- **No later than August 2007, the Chief Financial Officer of Goldman Sachs, David Viniar, commented to the *Financial Times*:**

  - ✓ "We are seeing things that were 25-standard deviation moves, several days in a row".

  - ✓ To provide some context, assuming a normal distribution, a 7.26-sigma daily loss would be expected to occur once every 13.7 billion or so years. That is roughly the estimated age of the universe.

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Stress Testing and Scenario Analysis

VaR

Total Risk Management

Scenario Analysis

Works well for normal (stationary) markets

Accounts for unusual markets (The past cannot always predict the future)

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Current Practices

- **Scenarios are drawn both from:**

  - ➢ Historical events: e.g., 1994 Fed Tightening, 1987 Equity Crash

  - ➢ Hypothetical one-off events created to reflect the concerns of Management with respect to actual risk profile: e.g., Financial crisis (Lehman aftermath), Change in the Credit Cycle, Middle East Crisis,…

- **Hypothetical scenarios may have varying levels of severity - intended to approximate annual, every 5 years, every 20 years, and 'once in a lifetime', events.**

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Typical Historical Scenarios Run by Banks by Type of Asset

Asset type	Historical scenarios
Interest rates	1994 – bond market sell-off
	1997 – Asian financial crisis
	1998 – Combined Russian debt default and LTCM failure
	2001 – 9/11 terrorist attacks in the United States
	2003 – bond market sell-off
Equities	1987 – October Black Monday
	1997 – Asian financial crisis
	2000 – bursting of the IT bubble
	2001 – 9/11 terrorist attacks in the United States
Foreign exchange	1992 – EMS (European Monetary System) crisis
	1997 – Asian financial crisis
	1998 – Russian debt default
Commodities	1973 - 1974 – Oil crisis
Credit	1997 – Asian financial crisis
	1998 – Combined Russian debt default and LTCM failure
	2001 – 9/11 terrorist attacks in the United States
	2007 – Subprime debt crisis
	2008 – Lehman Brothers bankruptcy and counterparty credit risk crisis
	2010 – European sovereign debt crisis

Source: Committee on the Global Financial System, Stress Testing at Major Financial Institutions, Survey Results and Practice, Bank for International Settlements, 2005; augmented by the authors for historical scenarios after 2004.

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Example of Replication Scenario:
Stock Market Crash of October 1987

As an example of a historical replication scenario, consider a stock market crash reminiscent of the crisis in the global financial markets in October 1987, characterized by a combination of the following events:

➢ **Equity markets fall around the globe by 20 percent on average, with Asian markets, such as Hong Kong, declining by 30 percent, and an upward shift in implied volatilities from 20 to 50 percent.**

➢ **The U.S. dollar rallies against other currencies as a consequence of a flight to quality. Asian currencies lose up to 10 percent against the dollar.**

➢ **Interest rates fall in Western markets. Hong Kong interest rates rise by 40 bps at the long end of the term structure and by 100 bps at the short end.**

➢ **Commodity prices drop due to fears of a recession: copper and oil prices decline by five percent.**

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Example of Replication Scenario:
U.S. Monetary Tightening

In this example of a historical replication scenario, consider a U.S. inflation scare and a tightening of monetary policy by the U.S. Federal Reserve along the lines of that seen in May 1994, characterized by:

➢ A 100-bp increase in the overnight interest rate and a 50-bp upward shift in the long end of the curve.

➢ Interest rates also increase in other G-7 countries and Switzerland, but not as much as in the United States.

➢ G-7 currencies depreciate against the U.S. dollar as investors chase higher rates.

➢ Credit spreads widen

➢ Equity markets decline from 3 to 6 percent, with an upward shift in implied volatilities

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Societe Generale:
Stress Scenarios-2012

- **26 historical scenarios**

- **8 hypothetical scenarios**

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Societe Generale - 2012

In millions of euros

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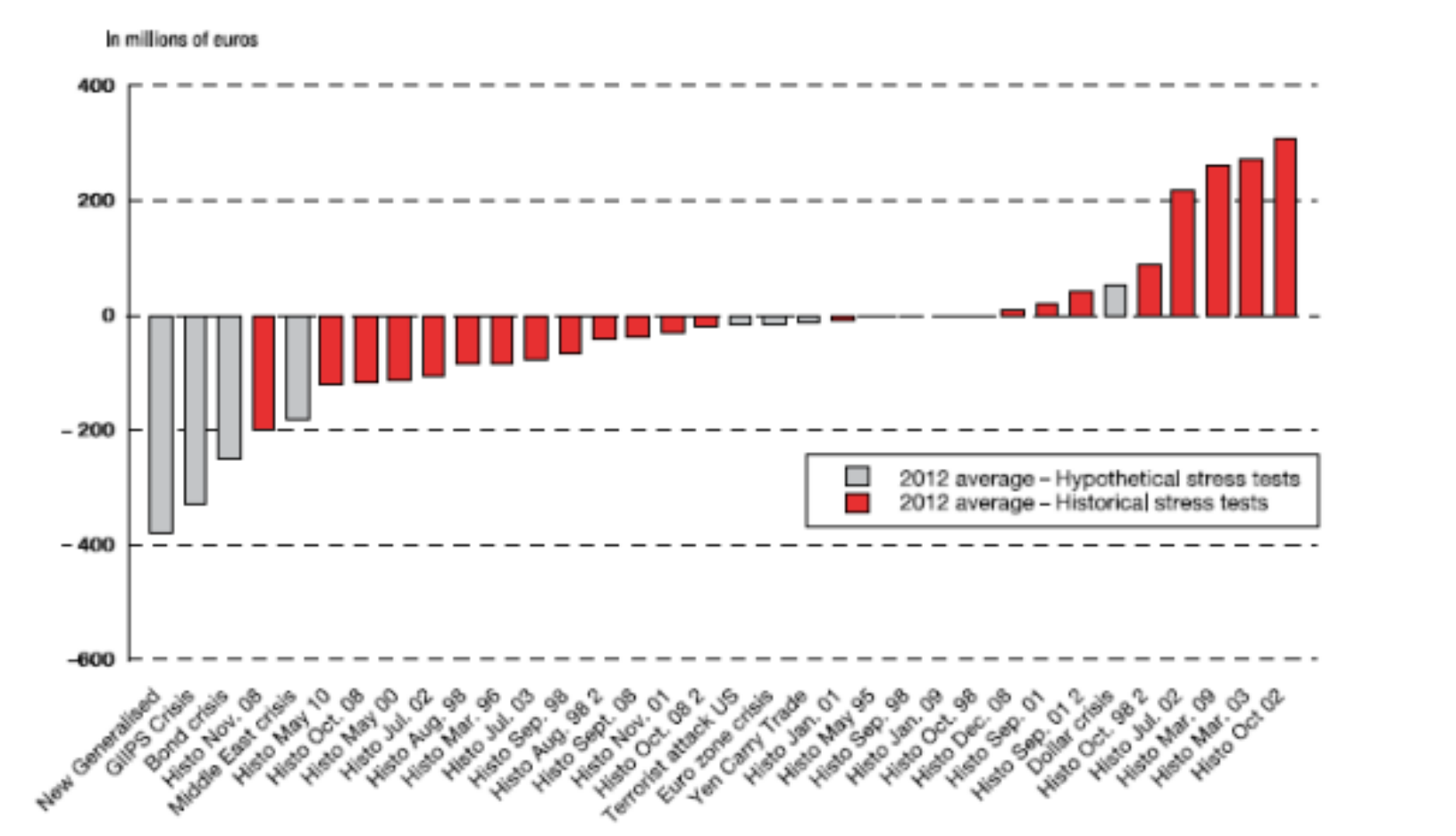
Shortcomings of Current Practices

- These stress tests are static and cannot be used for capital and liquidity planning.

- ST don't meet SREP guidelines (SREP: Supervisory Review and Evaluation Process)

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3 New Generation of Stress Tests:
CCAR and EBA Stress Tests

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New Generation of Stress Tests

- **After the GFC, regulators in the U.S., with the Dodd-Frank Act, undertook a "cultural revolution" by instituting:**

  - ✓ a top-down approach with macroeconomic scenarios unfolding over several quarters;

  - ✓ a focus on the effect of macroeconomic downturns on a series of risk including credit risk, market risk, operational risk, business revenues and liquidity risk;

  - ✓ a very demanding approach since risk drivers are not stationary and it requires to adjust along the scenarios PDs, EADs, LGDs, ratings, credit spreads, collateral calls, …

  - ✓ a "realistic" approach that allows for active management of the portfolios;

  - ✓ a framework that is fully incorporated into the business, capital and liquidity planning process of the bank.

- **In addition, the stress tests look not only at each bank in isolation but across all institutions in order to collect**

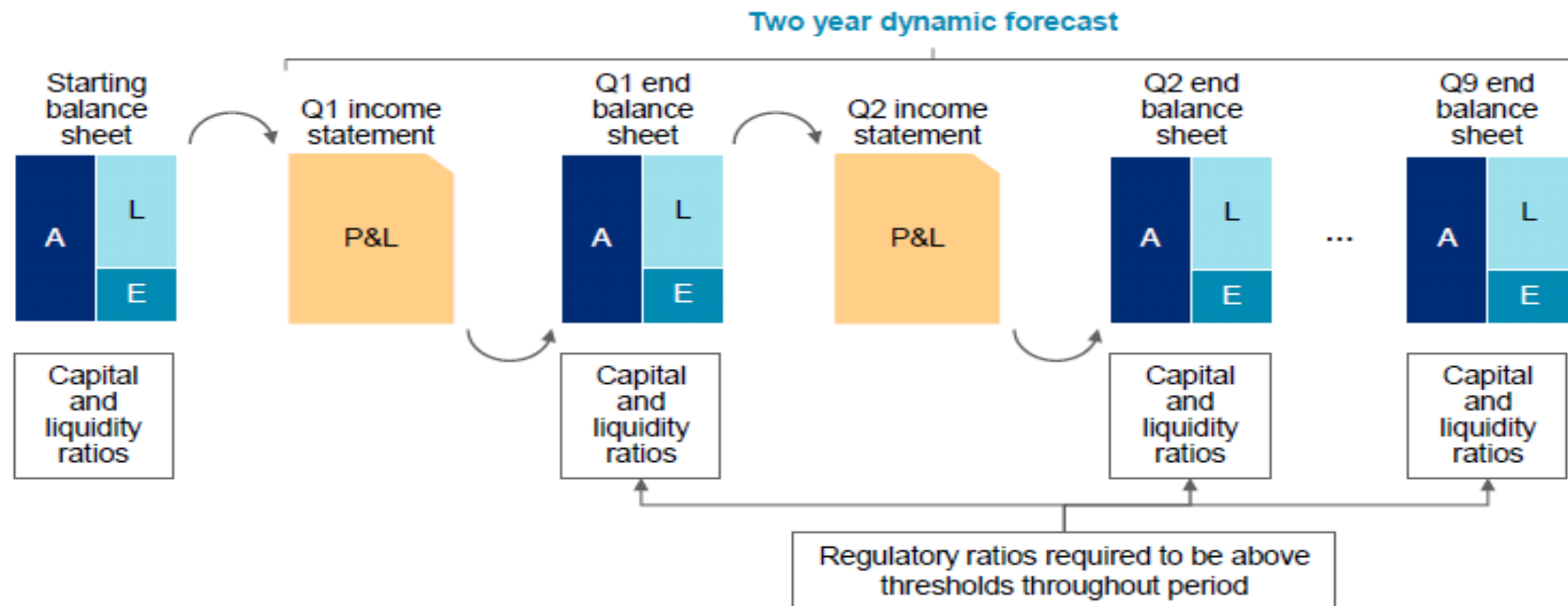**scenario would affect the largest banks collectively.**

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CCAR

- ***Large & noncomplex firms (17 in 2018)*** with total consolidated assets of $100 bn or more are requested to submit capital plans and demonstrate their ability to meet their minimum capital requirements under stress as part of CCAR's quantitative assessment

- ***Large and complex firms (18 in 2018)*** with total consolidated assets of $250 bn or more are subject to both the qualitative and quantitative assessment processes of CCAR

- **CCAR (Comprehensive Capital Analysis and Review)**

  - Annual exercise with the 3 supervisory scenarios (baseline, adverse and severely adverse scenarios) and 2 internally generated scenarios (BHC baseline and BHC adverse).

  - BHC to present a capital plan that describes all planned actions (e.g., dividend increases, share repurchases, major acquisitions) over a 9-quarter planning horizon.

  - Banks must maintain a Tier 1 capital ratio of at least 5% throughout the planning period. If it is not the case than the bank should revisit its "risk appetite" downward.

  - The Fed's qualitative assessment of the capital plan revolves around the adequacy of the internal processes.

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CCAR

Concretely, stress testing involves dynamic projections of revenue, income/losses, balance sheet, and regulatory ratios – a huge challenge!

Two year dynamic forecast

Starting balance sheet	Q1 income statement	Q1 end balance sheet	Q2 income statement	Q2 end balance sheet	Q9 end balance sheet
A / L / E	P&L	A / L / E	P&L	A / L / E	A / L / E
Capital and liquidity ratios		Capital and liquidity ratios		Capital and liquidity ratios	Capital and liquidity ratios

Regulatory ratios required to be above thresholds throughout period

- P&L link to balance sheet: how will components of P&L change?

- Volumes and margins: what will the impact on new volume and renewals and be?

- Balance sheet evolution
  - How will the structure (term, mix and availability) of liabilities evolve?
  - How can asset and liability changes be modeled?

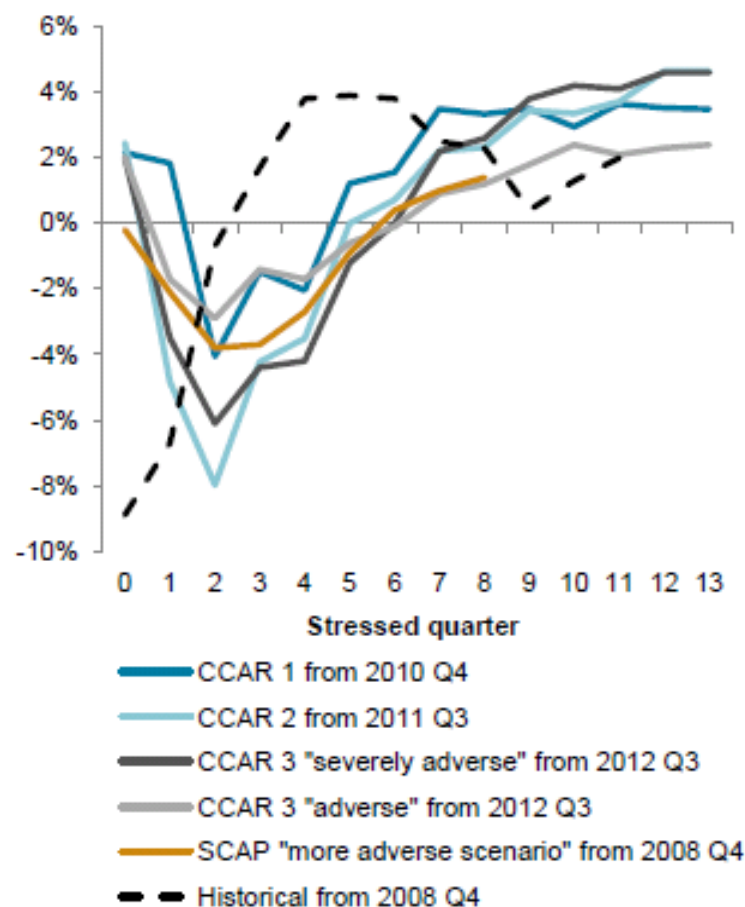Source: Oliver Wyman

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The Macroeconomic Scenarios

- **A typical macroeconomic scenario should include a recessionary economy characterized by:**

  - Declines in gross domestic product and employment

  - Declines in equity prices, credit quality and house prices

  - Consider different severities: baseline scenario, adverse scenario and severely adverse scenario

  - Recession is followed by a recovery

- **The macroeconomic scenario is specified via trajectories of 28 key economic and market variables over the nine quarters comprising the capital planning period.**

  - The typical macroeconomic stress scenario portrays a recessionary economy characterized by declines in gross domestic product and employment as well as declines in equity prices, credit quality and house prices.

  - The typical scenario displayed a V-shape with the economy initially contracting and then recovering towards the end of the 9-quarter capital planning period

  - The V-shape is important because it determines that the most pressing time for the banks' capital adequacy ratios may be an intermediate point within the capital planning period when the capital ratios reach their minimum levels prior to the healing effects of the ensuing economic recovery

  - Banks should forecast the evolution of the risk drivers beyond the 28 provided by the Fed

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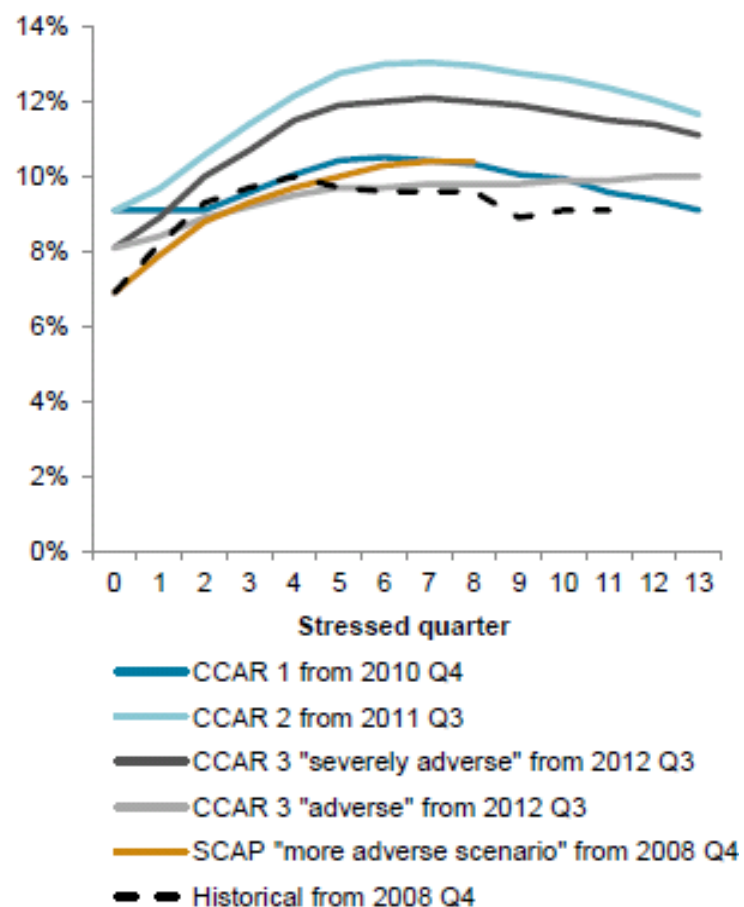# Comparing U.S. stress testing scenarios: SCAP (2009), CCAR (2011 to 2013)

Real GDP growth
Stress-test scenarios vs. recent historical observations
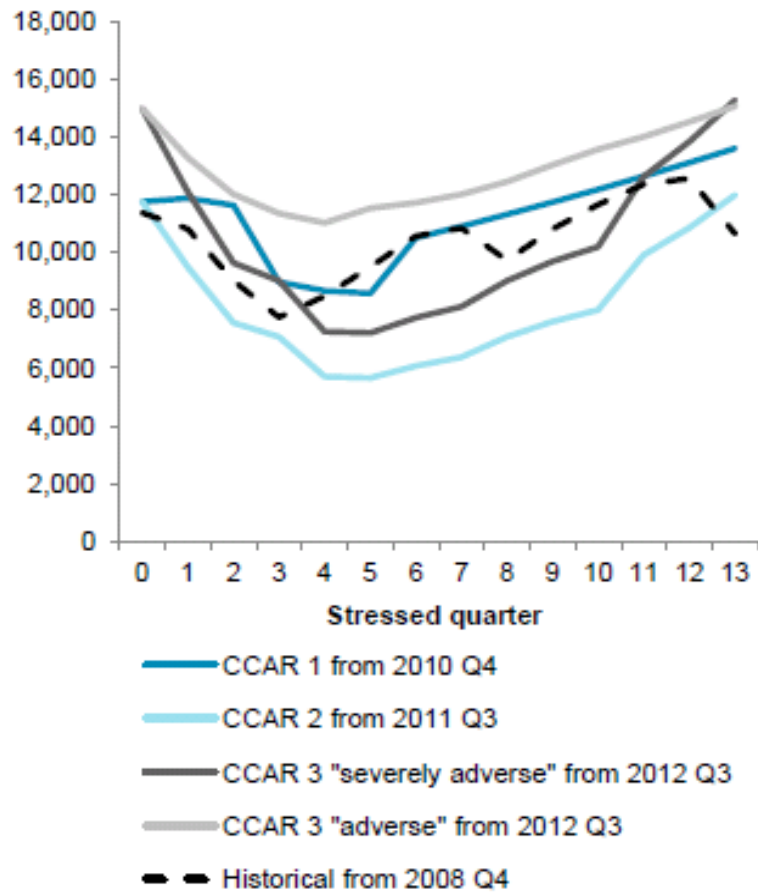
Unemployment rate
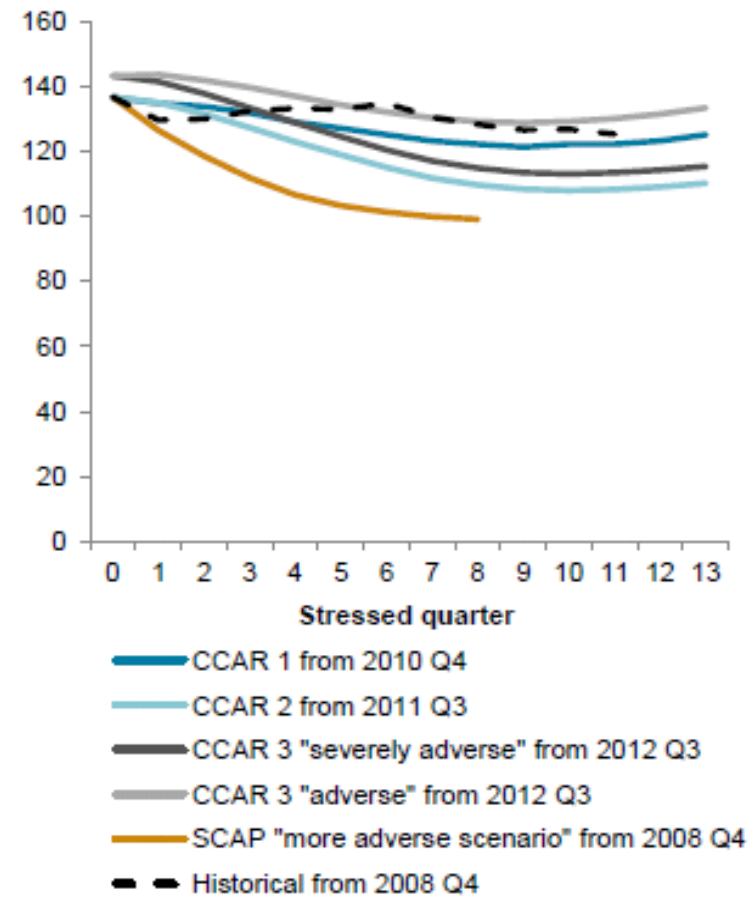Stress-test scenarios vs. recent historical observations

Stressed quarter

- CCAR 1 from 2010 Q4
- CCAR 2 from 2011 Q3
- CCAR 3 "severely adverse" from 2012 Q3
- CCAR 3 "adverse" from 2012 Q3
- SCAP "more adverse scenario" from 2008 Q4
- Historical from 2008 Q4

Stressed quarter

- CCAR 1 from 2010 Q4
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- CCAR 3 "adverse" from 2012 Q3
- SCAP "more adverse scenario" from 2008 Q4
- Historical from 2008 Q4

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Comparing U.S. stress testing scenarios: SCAP (2009), CCAR (2011 to 2013) (cont'd)

Dow Jones total stock market index level
Stress-test scenarios vs. recent historical observations

House Price index
Stress-test scenarios vs. recent historical observations

CCAR 1 from 2010 Q4
CCAR 2 from 2011 Q3
CCAR 3 "severely adverse" from 2012 Q3
CCAR 3 "adverse" from 2012 Q3
Historical from 2008 Q4

CCAR 1 from 2010 Q4
CCAR 2 from 2011 Q3
CCAR 3 "severely adverse" from 2012 Q3
CCAR 3 "adverse" from 2012 Q3
SCAP "more adverse scenario" from 2008 Q4
Historical from 2008 Q4

Interest rates and spreads

Interest rate environment
2012 CCAR supervisory stress test
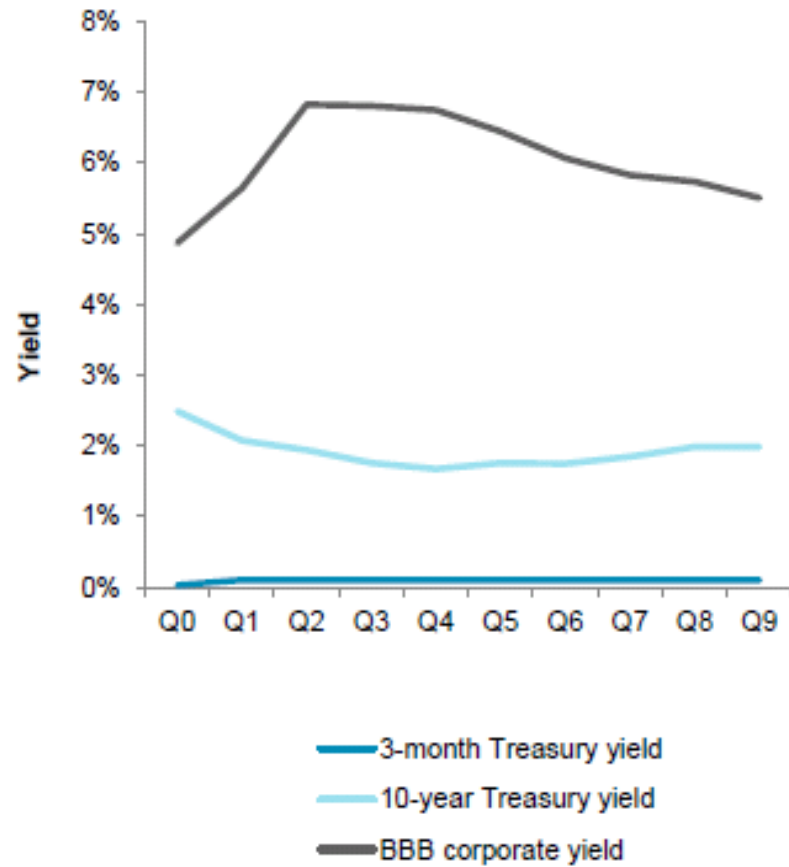
Interest rate environment
2013 CCAR supervisory stress test

EBA Stress Tests 2018

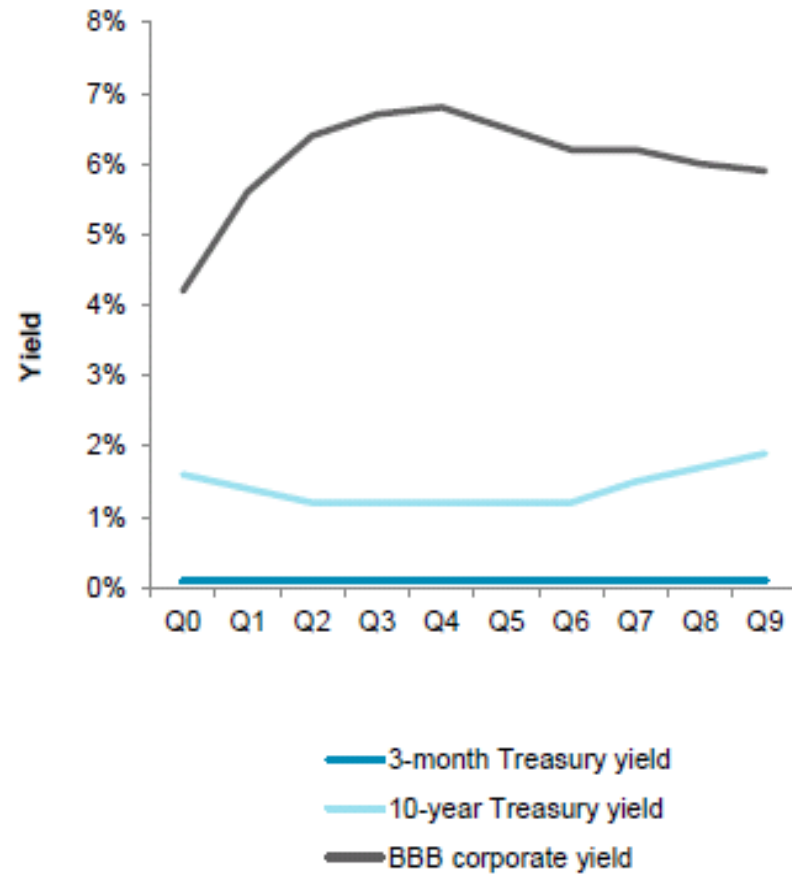- **European banks with assets of EUR 30 bn and above must run EBA Stress Test 2018 .**

- **Stress test is run at the consolidated level of the banking group (insurance activities are excluded).**

- **2 supervisory macroeconomic scenarios covering the 3-year period 2018 – 2020:**

  - ✓ **Baseline scenario**

  - ✓ **Adverse scenario**

- **Risk coverage:**

  - ✓ **Credit risk including securitization**

  - ✓ **Market risk and counterparty credit risk (CCR)**

  - ✓ **Funding risk (ALM - NII)**

  - ✓ **Operational risk, including conduct risk (e.g., lawsuits for misconduct issues).**

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Shortcomings

- EBA stress tests are essentially static.

- CCAR stress tests are dynamic but deterministic. Only a limited number of scenarios are analyzed.

- Need for many more scenarios to conduct sensitivity analysis, generate the distribution of KPIs (Key Performance Indicators: net income, tier 1 capital, earnings per share, credit losses…), elaborate contingency plans, etc.

4 Latest Developments in Stress Testing and Capital Management for Financial Institutions

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Current Focus of Leading Large International Banks

- Create integrated solutions across the entire global balance sheet.

- Leverage existing data and analytics from ALM, Credit and other departments (BIS 239).

- Project aggregated balance sheet with focus on strategic planning and capital management: ensure sustainability of business models and circle back to the risk appetite statement of the bank.

- Review impact of alternative management actions to identify vulnerabilities and develop contingency planning.

- Compare alternative balance sheets and potential actions on the same set of scenarios to select optimal capital allocation.

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Stress Testing Process

Phase 1

Risk Drivers
- Macro
- Market
- Credit

Shock Events
- Macro
- Geopolitical
- Natural Disasters

Evaluate portfolios on these scenarios

Phase 2

Portfolio
- Industry/ Sector
- Ratings
- Maturities
- Coupons
- Hedges

Realistically Projected A/L Drivers

Index Value

Diffusion process

Jump

Diffusion process continues

110
105
100
95
90
85
80

1-May-11   21-May-11   10-Jun-11

Net Value Projection

Net Asset Value

99% Best Case

Average Case

99% Worst Case

150%
140%
130%
120%
110%
100%
90%
80%

Today   Q4   Q8   Q12   Q16   Q20
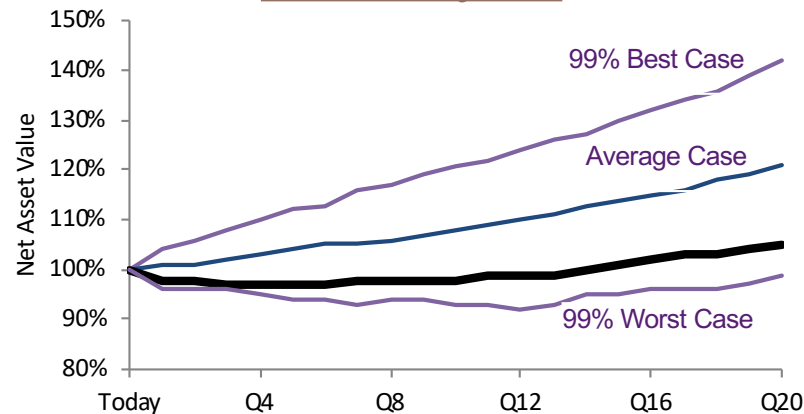
- Reverse Stress Testing
- Contingency Planning
- Portfolio Optimization
- Includes all Asset Classes and Liability Types
- Serves ALM Needs: capital and liquidity planning
- Risk Appetite

Stress Testing Process

Generate thousands of scenarios

Full list of risk drivers	*All potential shocks* *Systemic, Idiosyncratic, Combination*

Calculate capital ratios and other KPIs

PPNR	*Stress / Loss*

Synthesis: project KPIs on all scenarios

Full distributions of capital ratios and other KPIs	*Stress scenarios leading to the lowest percentiles of these distributions*

Distributions of KPIs

Other KPIs
Liquidity Ratios
Capital Ratios

STARTING POINT

CONTINGENT ACTION POINT

TIME

Q 0	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9

Materiality	• *Risk IDs correlations with adverse outcomes*
Narrative	• *Main themes for detailed design*

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Probabilities and Severities

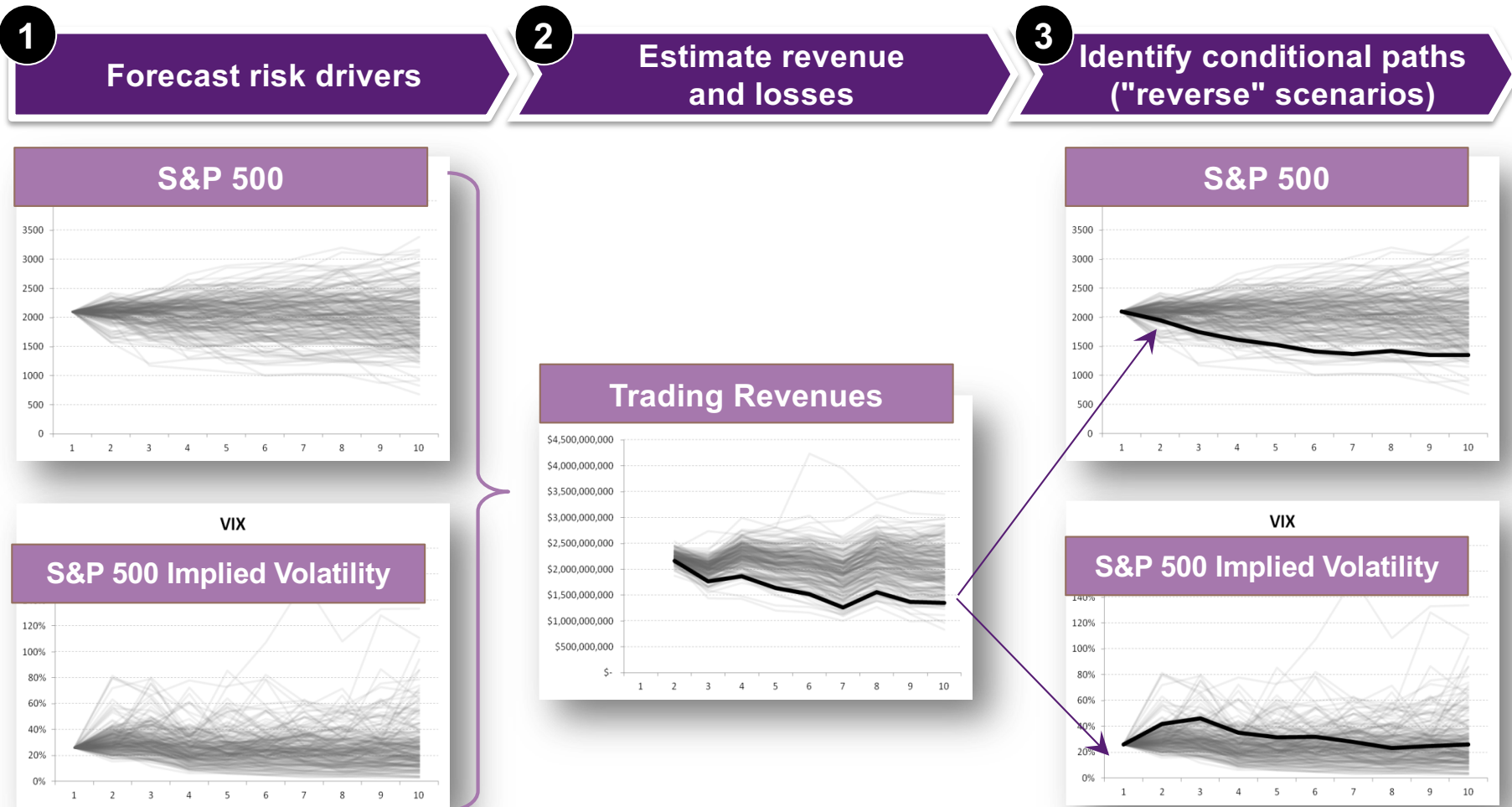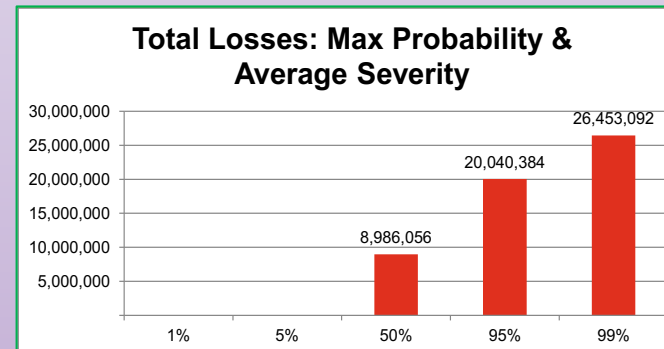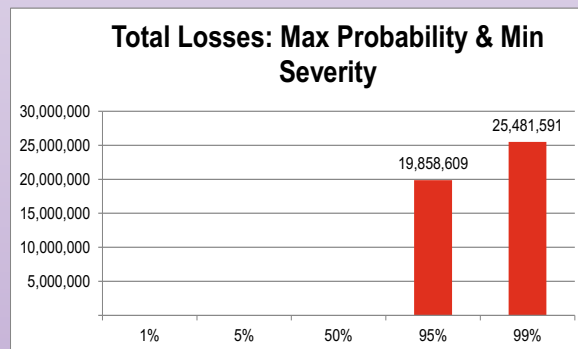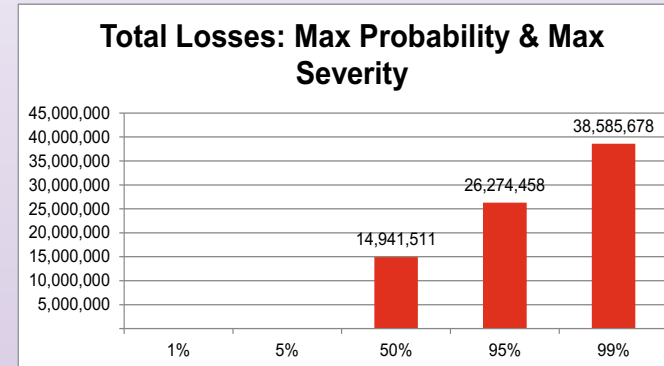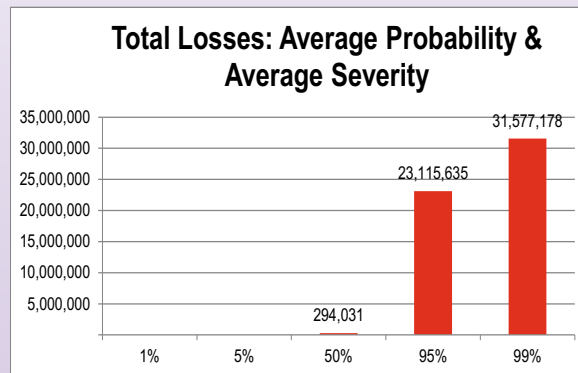| Shock Event Names (Hist proxy date)	China Event 30/09/2015			European Crisis 01/08/2011			Financial Crisis 15/09/2008			Oil Shock Up 30/06/2008			Oil Shock Down 31/01/2015		
Probability of Events: Low, Average and High	2,00%	3,00%	5,00%	1,50%	3,00%	5,00%	2,50%	3,50%	8,00%	10,00%	20,00%	30,00%	5,00%	10,00%	20,00%
Risk Driver Names	Min Impact	Historical Average	Max Impact	Min Impact	Historical Average	Max Impact	Min Impact	Historical Average	Max Impact	Min Impact	Historical Average	Max Impact	Min Impact	Historical Average	Max Impact
Dow Jones Total Stock Market Index	-3,86%	-4,29%	-19,33%	-1,50%	-10,00%	-19,33%	-5,00%	-6,30%	-19,33%	-5,00%	-6,30%	-19,33%	-1,00%	-4,00%	-19,33%
Market Volatility Index (VIX)	11,33%	30,00%	85,26%	20,00%	30,00%	60,00%	40,00%	64,58%	100,00%	5,00%	15,00%	30,00%	8,82%	15,00%	36,49%
US Unemployment Rate Total in	2,00%	3,00%	10,00%	2,00%	3,00%	10,00%	10,00%	12,00%	18,00%	1,00%	4,00%	6,00%	1,00%	3,00%	5,00%
Oil Prices	-5,00%	-15,00%	-30,00%	-3,00%	-6,00%	-15,00%	-20,00%	-30,00%	-40,00%	20,00%	30,00%	50,00%	-15,00%	-23,00%	-45,00%
3-month Treasury rate	0,00%	0,00%	10,00%	0,00%	0,00%	10,00%	-10,00%	-30,00%	-50,00%	2,00%	7,00%	30,00%	0,00%	0,00%	-10,00%
5-year Treasury yield	-3,00%	-5,00%	-15,00%	-3,00%	-13,00%	-40,00%	-4,00%	-6,00%	-20,00%	0,00%	10,00%	15,00%	0,00%	-18,00%	-25,00%
10-year Treasury yield	-2,00%	-7,00%	-20,00%	-6,00%	-26,00%	-40,00%	-2,00%	-6,00%	-20,00%	0,00%	6,00%	10,00%	0,00%	-16,00%	-25,00%
BBB corporate yield	1,00%	3,00%	10,00%	0,00%	-3,00%	-7,00%	2,00%	10,00%	20,00%	0,00%	2,00%	20,00%	0,00%	-4,00%	-10,00%
Euro Area Real GDP Growth	0,00%	11,00%	15,00%	-60,00%	-100,00%	-150,00%	-50,00%	-100,00%	-200,00%	-50,00%	-100,00%	-150,00%	5,00%	13,00%	20,00%
Real GDP growth rate	0,00%	-40,00%	-60,00%	0,00%	-70,00%	-100,00%	-100,00%	-200,00%	-400,00%	0,00%	-50,00%	-100,00%	0,00%	2,00%	5,00%
France CDS	-2,00%	-7,00%	-20,00%	10,00%	40,00%	50,00%	5,00%	30,00%	100,00%	0,00%	11,00%	50,00%	0,00%	-6,00%	-15,00%
CDS for Fin-AA	0,00%	2,00%	20,00%	2,00%	18,00%	30,00%	15,00%	45,00%	60,00%	0,00%	20,00%	30,00%	-2,00%	-6,00%	-10,00%
CDS for Fin-A	0,00%	2,00%	10,00%	2,00%	20,00%	25,00%	10,00%	30,00%	50,00%	5,00%	15,00%	35,00%	-2,00%	-6,00%	-15,00%
CDS for Fin-BBB	0,00%	1,00%	10,00%	2,00%	18,00%	25,00%	5,00%	30,00%	50,00%	10,00%	20,00%	50,00%	-2,00%	-6,00%	-10,00%
Industrials CDS -AA	1,50%	4,00%	10,00%	4,00%	28,00%	35,00%	5,00%	25,00%	50,00%	5,00%	10,00%	50,00%	-4,00%	-7,00%	-15,00%
Industrials CDS - A	0,00%	1,50%	10,00%	2,00%	21,00%	30,00%	10,00%	40,00%	60,00%	4,00%	9,00%	25,00%	0,00%	-5,00%	-10,00%
Industrials CDS - BBB	0,00%	6,00%	20,00%	1,00%	20,00%	30,00%	10,00%	35,00%	60,00%	5,00%	10,00%	30,00%	0,00%	-7,00%	-10,00%
Industrials CDS - HY	0,00%	3,00%	5,00%	0,00%	2,00%	10,00%	-1,00%	-7,00%	-20,00%	0,00%	-4,00%	-7,00%	0,00%	1,50%	5,00%
Oil CDS - AA	n/a	n/a	n/a	4,00%	22,00%	30,00%	10,00%	35,00%	40,00%	2,00%	12,00%	35,00%	n/a	n/a	n/a
Oil CDS - A	n/a	n/a	n/a	2,00%	15,00%	30,00%	2,00%	4,00%	20,00%	0,00%	-4,00%	-20,00%	n/a	n/a	n/a
Oil CDS - BBB	n/a	n/a	n/a	2,00%	25,00%	30,00%	2,00%	25,00%	60,00%	0,00%	-10,00%	-30,00%	n/a	n/a	n/a
Oil CDS - HY	-1,00%	-2,00%	-5,00%	-1,00%	-4,00%	-8,00%	-1,00%	-8,00%	-20,00%	-1,00%	-4,00%	-10,00%	1,00%	2,00%	5,00%
Wheat Prices	2,00%	3,00%	5,00%	-1,00%	-5,00%	-20,00%	-3,00%	-15,00%	-20,00%	-3,00%	-10,00%	-20,00%	-2,00%	-5,00%	-15,00%

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Case study: reverse scenarios

- **Quantitative analysis results in "reverse" scenarios and enables feedback loop to challenge scenario design choices**

1 Forecast risk drivers **2** Estimate revenue and losses **3** Identify conditional paths ("reverse" scenarios)

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Sensitivity Analysis

Compare the distributions for combinations of probabilities and severity (impacts)

Total Losses: Average Probability & Average Severity

1%	5%	50%	95%	99%
		294,031	23,115,635	31,577,178

Total Losses: Max Probability & Max Severity

1%	5%	50%	95%	99%
		14,941,511	26,274,458	38,585,678

Total Losses: Max Probability & Min Severity

1%	5%	50%	95%	99%
			19,858,609	25,481,591

Total Losses: Max Probability & Average Severity

1%	5%	50%	95%	99%
		8,986,056	20,040,384	26,453,092

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How to Optimize Capital Allocation

- Produce a wide range of scenarios with truly dynamic dependencies, in order to understand the full range of potential outcomes, including unprecedented ones.

- Formulate transparent risk appetite statements:

  ➢ Earnings per share or net income should not fall by more than a pre-specified amount in any single quarter for the next three years; or

  ➢ Capital and liquidity ratios should always be above a given threshold at any time; etc.

- Consistently incorporate funding and liquidity considerations.

- Review capital and liquidity ratios as well as other KPIs under each scenario.

- Identify capital allocations producing the optimal risk/return trade-off consistent with risk policies.

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Capital Optimization through Holistic Risk Management

For each alternative allocation, various KPIs are measured

*For example : taking into account hedging, simulating the impacts of an acquisition or a sale of a business*

	Loan Segment 1	Loan Segment 2	Loan Segment 3	Loan Segment 4	Loan Segment 5	Expected CET1 Capital	1st %tile CET1 Capital	Expected CET1 Ratio	1st %tile CET1 Ratio	Expected NCO	1st %tile NCO
Orig Allocation	25.05%	4.70%	5.32%	0.22%	64.71%	3,278,457,441	2,539,060,150	0.06754	0.05247	4,089,942	10,850,282
Alt Allocation 1	100.00%	0.00%	0.00%	0.00%	0.00%	3,363,583,717	3,012,529,810	0.07098	0.06501	5,134,100	13,863,573
Alt Allocation 2	0%	100%	0%	0%	0%	3,177,633,766	2,105,820,744	0.06815	0.02841	2,448,233	7,882,612
Alt Allocation 3	0%	0%	100%	0%	0%	3,481,643,053	2,873,302,341	0.05753	0.03320	6,010,887	18,305,156
Alt Allocation 4	90%	10%	0%	0%	0%	3,354,659,788	2,989,731,281	0.07193	0.06735	4,865,413	12,849,562
Alt Allocation 5	90%	0%	10%	0%	0%	3,379,499,715	3,014,816,408	0.07067	0.06380	5,221,599	14,075,123
Alt Allocation 6	90%	0%	0%	10%	0%	3,356,752,276	3,003,175,537	0.06940	0.05507	5,364,701	15,574,039
Alt Allocation 7	90%	0%	0%	0%	10%	3,179,903,431	2,838,623,434	0.07483	0.06491	4,737,282	12,784,859
Alt Allocation 8	85%	0%	15%	0%	0%	3,387,018,123	3,004,004,064	0.07041	0.06272	5,265,618	14,292,673
Alt Allocation 9	80%	0%	20%	0%	0%	3,394,246,290	2,995,345,267	0.07001	0.06131	5,309,457	14,603,155
Alt Allocation 10	95%	0%	5%	0%	0%	3,370,159,032	3,018,117,197	0.07087	0.06490	5,161,741	13,941,971
Alt Allocation 11	91%	0%	9%	0%	0%	3,377,956,680	3,016,082,208	0.07072	0.06389	5,212,609	14,038,744
Alt Allocation 12	89%	0%	11%	0%	0%	3,381,025,353	3,012,734,510	0.07063	0.06354	5,230,484	14,111,501
Alt Allocation 13	92%	0%	8%	0%	0%	3,376,385,114	3,016,678,785	0.07075	0.06392	5,203,209	14,002,365
Alt Allocation 14	70%	0%	30%	0%	0%	3,407,919,462	2,994,877,233	0.06886	0.05724	5,397,136	15,007,766
Alt Allocation 15	60%	0%	40%	0%	0%	3,420,699,052	3,001,292,704	0.06736	0.05311	5,484,814	15,162,886
Alt Allocation 16	50%	0%	50%	0%	0%	3,432,714,799	2,983,135,264	0.06571	0.04871	5,572,493	15,525,131

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Capital Optimization through Holistic Risk Management

Find where different combinations of Capital Allocation lie relative to the Efficient Frontier

Analyse several KPIs at the same time, zoom on the most important ones and find the optimal combination of KPIs that match the bank's current strategy

	Capital VAR	Expected Average QTR Net Profit	1st %tile AVG QTR Net Profit
Orig Allocation ◆	**739,397,291**	**65,920,765**	**-130,561,713**
Alt Allocation 1	351,053,907	89,750,477	-4,229,837
Alt Allocation 2	1,071,813,022	47,102,818	-242,611,086
Alt Allocation 3 ◆	608,340,712	126,576,832	-38,035,897
Alt Allocation 4	364,928,506	87,852,439	-10,203,131
Alt Allocation 5 ◆	364,683,308	94,570,267	-2,797,512
Alt Allocation 6	353,576,739	88,024,358	-4,857,067
Alt Allocation 7 ◆	341,279,997	50,683,558	-37,989,762
Alt Allocation 8 ◆	383,014,059	96,881,703	-3,911,865
Alt Allocation 9 ◆	398,901,022	99,121,709	-5,070,765
Alt Allocation 10	352,041,835	91,547,712	-4,519,066
Alt Allocation 11 ◆	361,874,472	94,096,967	-2,573,643
Alt Allocation 12 ◆	368,290,844	95,037,765	-3,020,382
Alt Allocation 13 ◆	359,706,329	93,609,050	-2,968,423
Alt Allocation 14 ◆	413,042,229	103,389,007	-7,642,267
Alt Allocation 15	419,406,348	107,398,671	-10,173,355
Alt Allocation 16 ◆	449,579,535	111,181,353	-13,525,615

Expected Average QTR Net Profit vs Capital VAR

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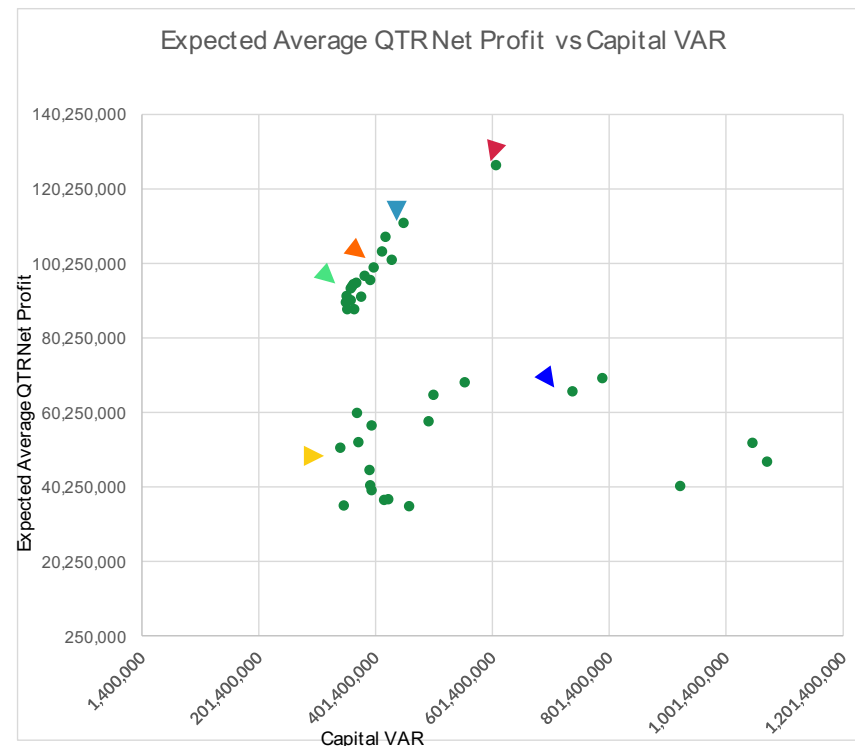
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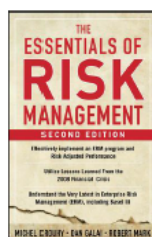
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