MACRO STRESS TESTING

Case Study by Numerical Technologies

Learning from history – Bubble burst in Japan in 1991

After the surprising expansion of economy, which makes Japan the second biggest economy in the world, the burst of bubble changes the atmosphere drastically. Both stock price and land price plummeted, resulting in the lost two decades. The lost decades came with manpower reduction due to the aging society as well as hollowing-out of industry. This trend has been experienced by many developed economies.

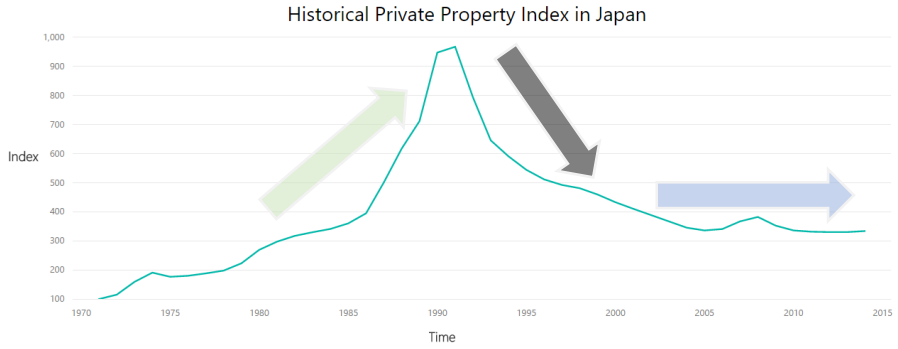

Figure 1: Historical pattern of residential property price index in Japan[1]

What could happen in Singapore

Singapore, as a developed economy, could follow the same trend in near future. Singapore economy has been expanding rapidly and it became a hub of financial institutions and many corporates.

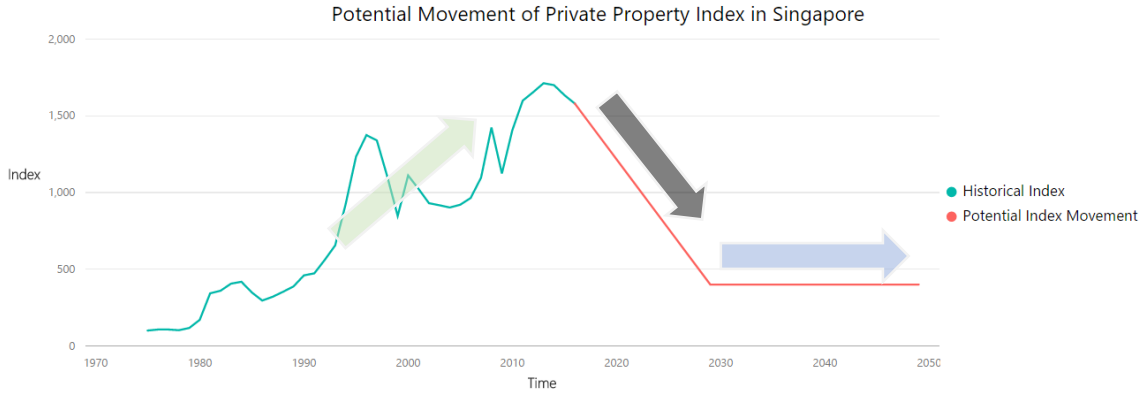

Figure 2: Historical pattern and potential future movements of residential property price index in Singapore[2]

[1] Data Source: Japan Real Estate Institute (index of year 1971 is adjusted to a base value "100", with the rest adjusted proportionally)
[2] Data Source: Urban Redevelopment Authority (index of year 1971 is adjusted to a base value "100", with the rest adjusted proportionally)

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What if following events happen?

- 50% decrease of real estate price
- 10% drop of oil and gas price
- 20% strengthen of Singapore dollar against Malaysian Ringgit, Thai Baht, Indonesian Rupiah and Chinese Yuan
- Outburst of epidemic, such as Zika or H1N1, which reduces the number of tourists drastically
- Low fertility rate and aging, causing local labor power scarcity

Singapore could follow Japan's footstep and lose several decades.

Prepare for the bad day

The best way to prepare for the negative impact is to understand what could happen under events similar to the one above. Numerical Technologies provides modules to help banks conduct macro stress testing in credit risk to see impact of the negative events.

NtInsight® for Macro Stress Testing, a member of our stress testing solution, establishes links between macroeconomic events and risk factors. One of its typical output is a stressed rating transition matrix. To visualize the magnitude, the corresponding cumulative probability of defaults are generated by the software under baseline scenario and the stressed event.

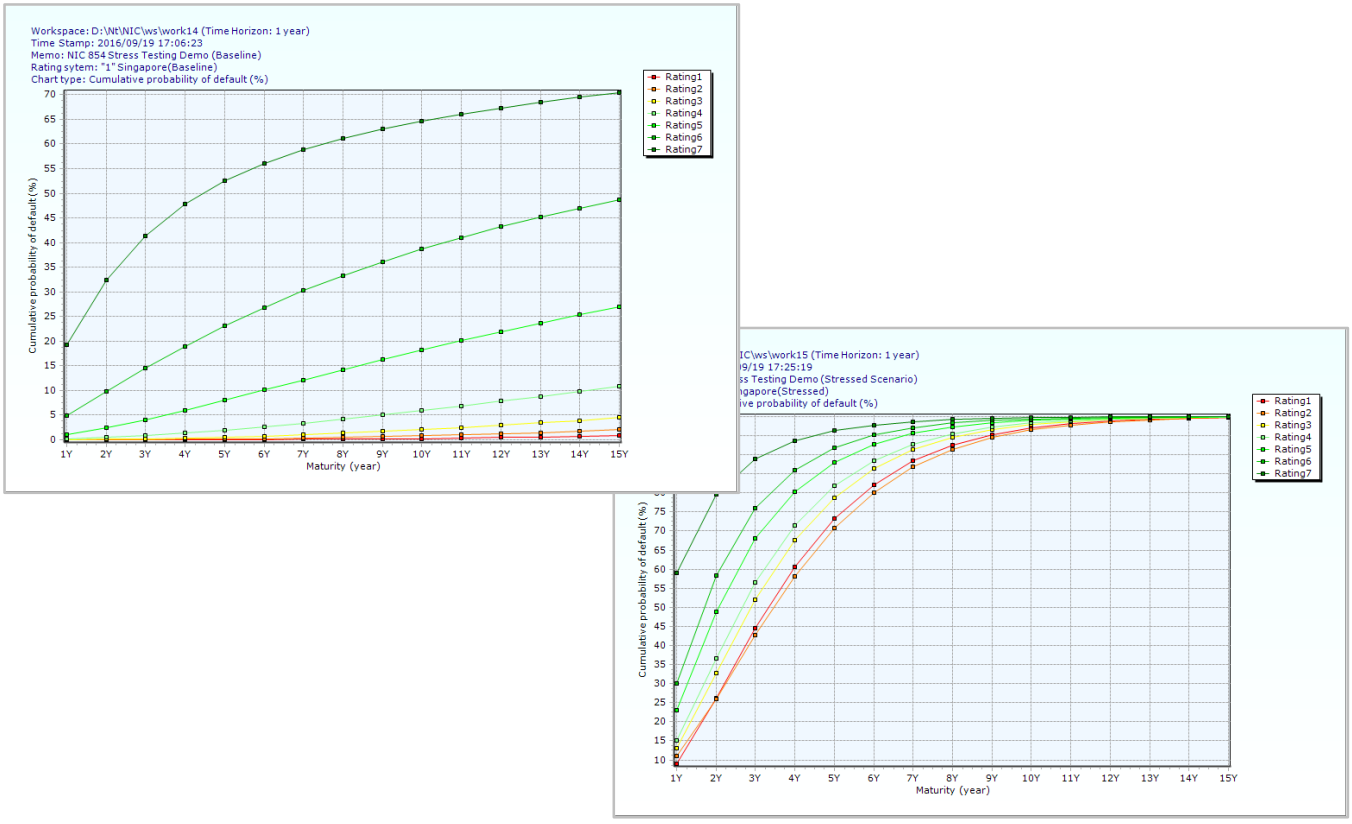

Figure 3: **[Software screenshots]** Cumulative probability of default before (left, top) and after the "bad day" (right, bottom)

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NtInsight® for Credit Risk, a credit risk software solution based on portfolio model CreditMetrics™, presents what could happen to the bank's portfolio from aggregate to transactional level. Here is a comparison between profit and loss distribution before and after the "bad day" generated by the software.

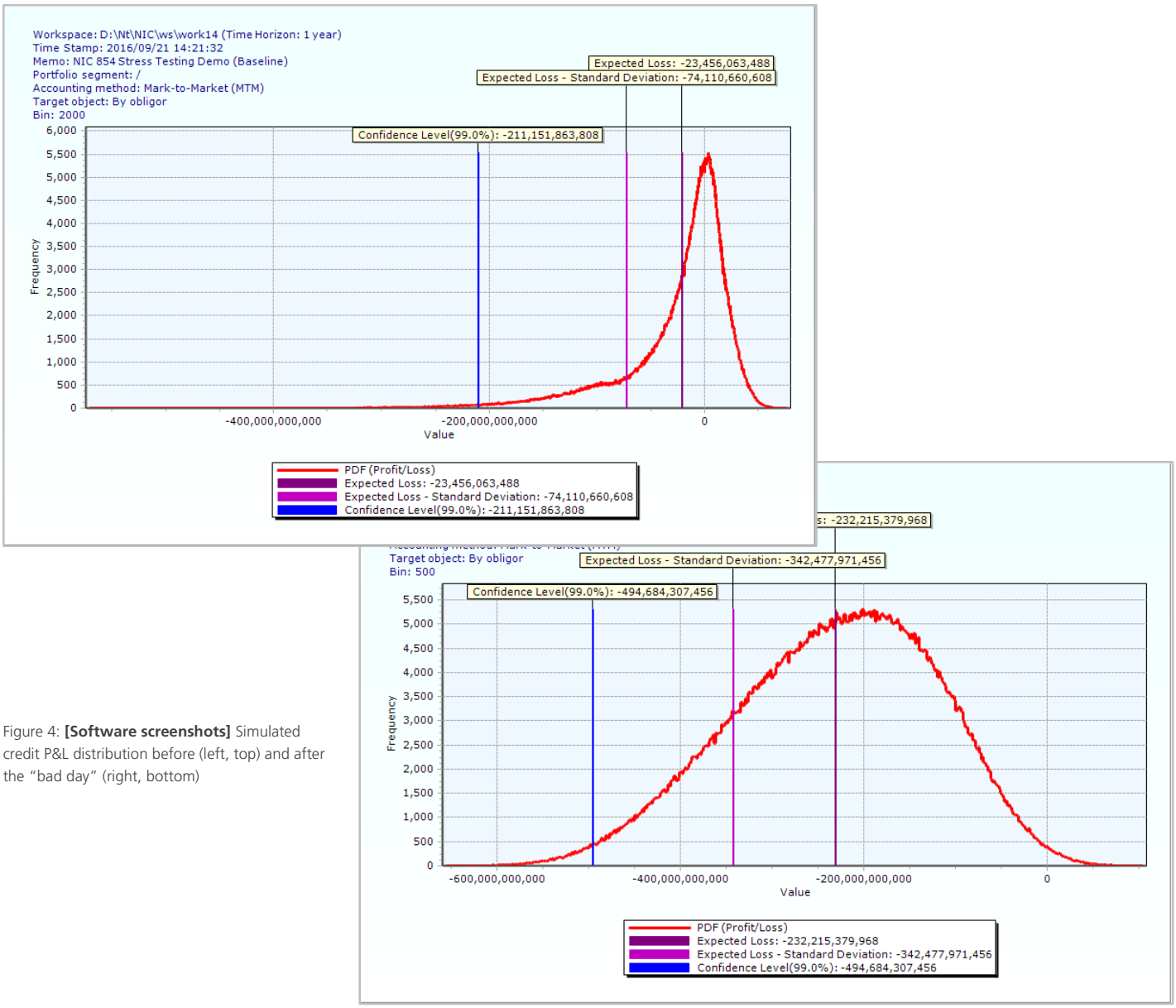

Figure 4: **[Software screenshots]** Simulated credit P&L distribution before (left, top) and after the "bad day" (right, bottom)

Challenges in stress testing

Banks face many challenges in stress testing: modelling issue, calculation adjustments and iterations, subjective judgement, etc. Taking subjective judgement as an example, subjective judgements and analysis on individual obligors are essential at times; however, its inefficiency and lack of objectivity are unpleasant side effects unavoidably. In NtInsight® for Credit Risk, tracking cash flows and risk metrics on individual obligor/transaction under stress scenario could help ease the pain by providing supports on more granular quantitative analysis.

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For instance, the process of capturing concentration risk of individual obligor can be described as:

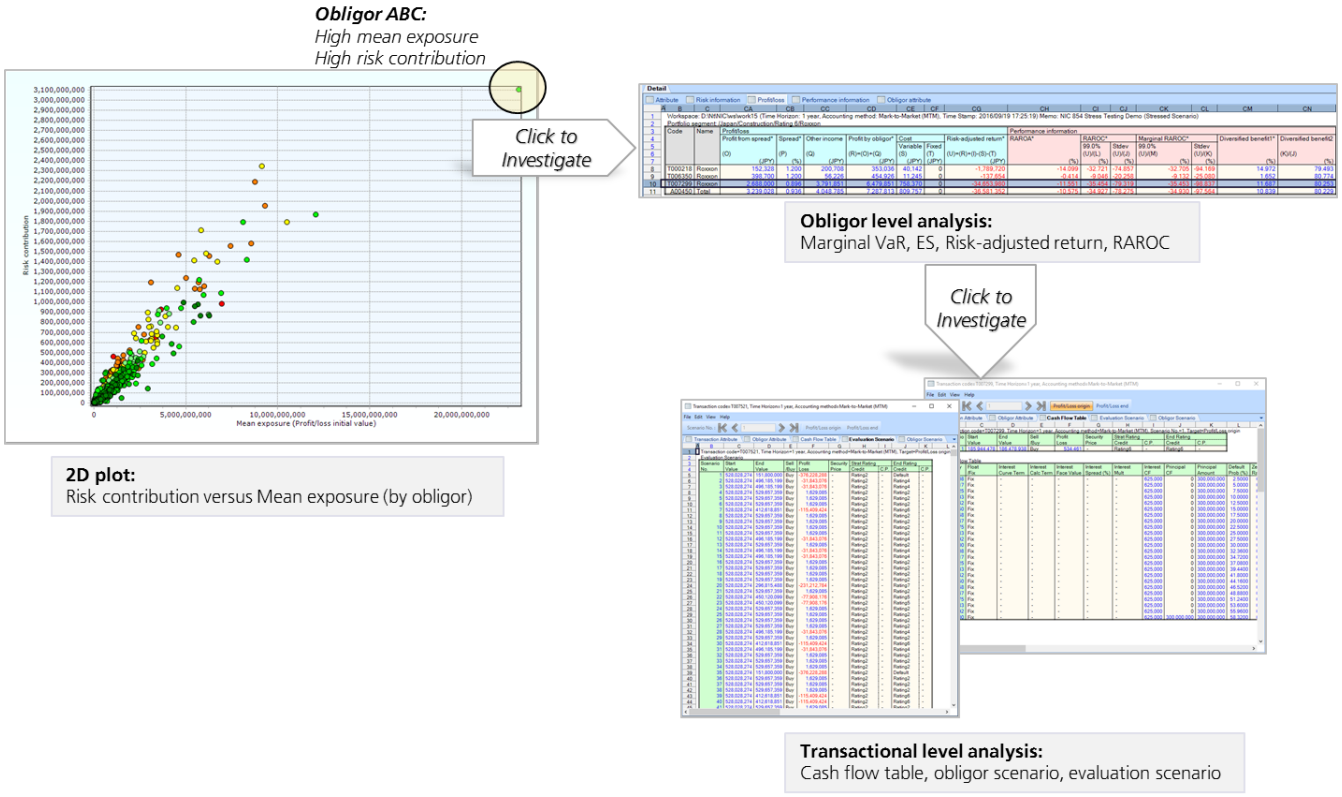

Figure 5: **[Software screenshots]** Detect concentration risk and investigate on obligor/transactional level in NtInsight® for Credit Risk

Stress testing – not only a regulatory requirement

The bank has been conducting stress testing since it is required by its regulators. Numerical Technologies believes that the importance of stress testing cannot be overestimated under the current volatile situation with many uncertainties.

Numerical Technologies keeps supporting financial institutions to manage their risks now and in future.

About Numerical Technologies

Numerical Technologies is a financial risk management software company and consulting firm that specializes in high-performance computing (HPC), parallel Monte Carlo simulation, and financial modeling. Since 1998, we have been helping some of the largest banks and insurance companies globally to quantify risk, identify opportunities, and meet economic and regulatory capital requirements. Numerical Technologies holds office in Singapore and Tokyo. Visit us at www.numtech.com for more information.

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