

Supporting Integrated IFRS 9 and Stress Testing at DBS Bank



The Challenges:

Large banks in today's complex risk and regulatory compliance environment, face substantial hurdles in both developing the advanced risk analytics they require and implementing these risk models in their systems architecture that has been developed over many years.

Recent and evolving regulations such as IFRS 9, Stress Testing and now climate for credit risk are examples of rapid changes that require both brand new methodologies and implementation within 'As Is' risk and finance architectures. ***Supporting robust credit methodologies as well as efficient, cost-minimizing systems implementation is not an easy task for large banking institutions.***



The Solution:

This Case Study, highlights the Z-Risk Engine ('ZRE') implementation at DBS Bank in Singapore:

- Implementation of ZRE at DBS Bank, a leading Singapore bank, in 2018,
- Approved enterprise solution for all wholesale and commercial portfolios, to support IFRS 9 and Stress Testing,
- Full integration of ZRE Engine into DBS' Capital Reporting and Stress Testing platform for the purpose of ECL reporting in 2021.

The Approach: Implementing Z-Risk Engine at DBS Bank – 2018:

After piloting Z-Risk Engine, DBS chose ZRE in 2018 as its enterprise IFRS 9 and Stress Test solution and have been using ZRE, supplemented by in-house credit methodologies and tech solutioning, for the last 3-4 years to assess more robust ECLs by borrower, segment and credit model across their wholesale and commercial portfolios.¹ ZRE was implemented initially by a combined ZRE and DBS bank team as a customised, automated batch process.

The customized engine is able to compute ECL on both entity and consolidated levels. This allows DBS to operate an efficient and straight through process without having to build separate systems for each entity. In addition, with a centrally managed system, DBS can nimbly roll out changes quickly and seamlessly.

The ZRE team provided the full ZRE Source Code under an agreed licensing arrangement along with full functional specifications and the detailed ZRE methodology including empirical validation of ZRE's PIT credit measures. This joint project effort met the requirements of internal model validation and supported successful implementation in compliance with IFRS 9.



“Most external and internal wholesale credit ratings are mainly through-the-cycle, so are unable to capture the substantial short-term movements in risk that are needed for the point-in-time measures IFRS 9 requires,” says Sok Hui Chng, Chief Financial Officer, DBS. “The Z-Risk Engine Team has helped to resolve this challenge for DBS and delivered custom PIT and forward-looking calibrations for our credit models to capture expected credit losses under the IFRS 9 framework and to support our Stress Testing efforts. At the same time, we are pleased that the Z-Risk Engine Team has supported our implementation journey with strong consulting support.”

“When we launched the Z-Risk Engine solution, having known Sok Hui Chng for a number of years and given the bank’s overall reputation and approach to managing risk and compliance objectives, we were keen at that time to work with the bank”, said Dr Scott D Aguais, Managing Director, Z-Risk Engine.

“At that time in 2018, we were delighted to support DBS’ objectives in using our sophisticated credit analytics and the Bank’s objective of undertaking a joint implementation effort with our ZRE team. Ultimately, DBS was able to save measurable internal modelling and implementation budget costs using our innovative methodology, implemented in a centralized, automated batch process with ZRE Source code providing the bank with full, internal functional use of the platform. The ZRE team was able to provide a unique business proposition to DBS, combining more sophisticated analytics with full, seamless implementation”, Dr. Aguais explained.



1 See, Z-Risk Engine Case Study, ‘Inaccuracies Caused by Hybrid Credit Models and Remedies as Implemented by ZRE’, 2019. This paper provides benchmark empirical analysis demonstrating the enhanced credit loss prediction provided by the ZRE approach that incorporates detailed empirical credit cycles, that are more robust than using only MEV variables such as GDP.

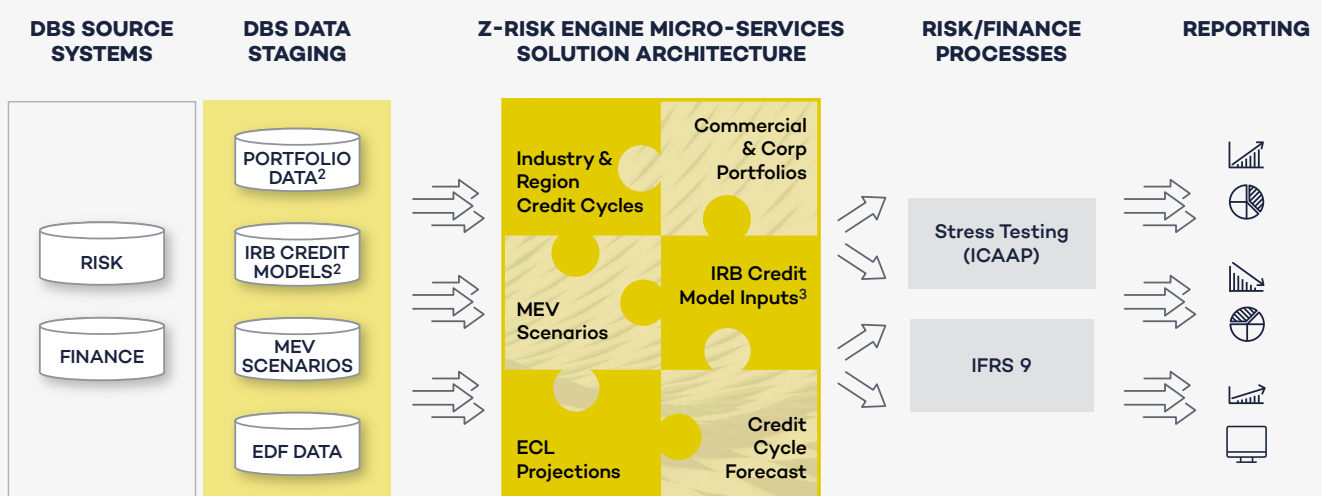
2021 Integration of Z-Risk Engine in **DBS** **Bank's Risk/Finance/Capital Architecture:**

Z-Risk Engine was first implemented at DBS Bank in 2018 working with a joint DBS-ZRE project team. Since then, DBS has been utilizing ZRE to support a number of key Risk and Finance objectives including satisfying IFRS 9 and Stress Testing compliance for their corporate and commercial portfolios. DBS recently fully integrated ZRE into its Capital Reporting and Stress Testing platform for the purpose of ECL reporting. During this effort the bank also worked with the ZRE team to jointly re-architect ZRE using a Python, micro-services, 'Lego-Block' architecture approach.

The bank runs ZRE in a monthly ECL batch for corporate and commercial portfolios to produce monthly ECLs to post these in support of their IFRS 9 reporting. For this objective, DBS uses the unconditional ZRE credit cycle simulation module based on empirically derived, industry sector and region credit cycles incorporating internal credit methodologies (such as ratings and credit watchlists). To support internal and regulatory Stress Test objectives, DBS also run the ZRE Scenario Forecasting Module ('SFM') on a quarterly basis using deterministic macro-economic scenarios, which supports the bank's ICAAP process. Finally, DBS also run ad-hoc scenarios on a periodic basis to support specific segment or specific borrower name 'what if' assessments.

The figure below, shows, at a high level, the key integration of ZRE in the bank's systems architecture that supports IFRS 9 and Stress Testing using a single E2E data architecture. This architecture ensures that a single 'golden source' of the same granular data (e.g. borrower, EAD) is implemented in a streamlined fashion for initiating ZRE ECL computations as well as feeding into the bank's capital calculations.

The ZRE single data architecture supports multiple E2E Risk Finance Processes/Objectives



2 The same data is also used for the bank's capital calculations.

3 Supplemented by the bank's internal credit methodologies (such as ratings and credit watchlists).

The ZRE **Business Benefits** for DBS Bank:

Overall, DBS has been running the ZRE solution for four years in production as the key commercial and corporate portfolio risk solution supporting both Risk and Finance. The bank's recent re-architecture effort has further integrated the ZRE engine with the Capital Reporting and Stress Testing platform within DBS Bank and their substantial benefits have included the following:

- Point-in-Time portfolio ECL projections utilizing detailed, **custom credit cycles** for our specific portfolio industries and regions,
- **Full integration** of the ZRE application with our IRB credit models, supplemented by internal credit methodologies,
- Capability to **support both ECL simulations** utilizing empirical credit cycles and deterministic MEV scenarios,
- **Substantial cost budget savings** utilizing ZRE's centralized batch processing and single PIT methodology compared to the alternative of estimating individual IFRS 9 models for each IRB model,
- Compute ECL on both entity and consolidated levels, which allows DBS to operate **an efficient and straight through process**,
- Ability to **nimbly roll out changes quickly and seamlessly** through a centrally managed system,
- Ability to **support the needs of individual entities** without having to build separate systems for each entity,
- **End-to-end visibility** of data and calculations,
- **Flexibility** to change or update code where required,
- Ability to **fully integrate** with the Bank's data/systems,
- Transparency of E2E methodology/ approach to support reporting, **management and compliance**,
- **Ability to respond** to management/ regulatory questions in a seamless and transparent manner.

Z-Risk Engine **Summary:**

The core of ZRE is a PIT/TTC Dual Ratings methodology developed and officially agreed under the Basel II IRB Waivers of Barclays Capital and Royal Bank of Scotland between 2007-14. ZRE utilizes detailed systematic credit cycles ('Zs') to predict more robust PIT credit estimates and ECLs by using these credit cycle Zs to adjust a Bank's own IRB wholesale and commercial PD/LGD/EAD models.

Many risk vendor credit analytics solutions, that may be provided as 'black box' methodologies, are often very hard to reasonably integrate within a bank's internal systems architecture. In addition, these 'black box' methodologies are usually not made fully transparent or are not fully customizable. As an alternative, the unique ZRE business model is designed to support a client's maximum E2E implementation flexibility as well as model transparency.

As a unique effort undertaken with joint ZRE and bank teams, this approach supports a bank's full ownership in customizing, adapting and running the ZRE source code platform internally. The ZRE solution provides robust IFRS 9 and Stress Test projections and the ZRE business model allows banks full ownership to minimize the complexity and project risks associated with complicated systems implementation.

This case study has highlighted how one leading Singapore bank has been able to take full advantage of the ZRE solution, deliverables, and source code to not just support the direct risk and regulatory objectives but to also customize ZRE and seamlessly integrate the solution within the bank's broader Capital Reporting and Stress Testing platform.⁴

⁴ While this case study outlines a ZRE implementation using Python source code, ZRE is also available to license in SAS and also as a managed service.

Appendix: **ZRE – An Advanced IFRS 9/Stress Testing Solution:**

The Z-Risk Engine solution has a long history of development, going back to 2003 at Barclays Capital where the first full PIT/TTC Dual Ratings approach was developed as part of the successful Barclays Capital Basel II Waiver. Utilizing public-firm default models to develop detailed industry and regional 'Z' Credit Cycle Indices ('CCIs'), the ZRE methodology provides the most accurate market-based approach to modelling detailed systematic credit cycles which are required to obtain accurate multi-year ECL projections.

The ZRE solution is a centralized, automated batch process that utilizes each bank's own IRB credit models as inputs and then applies detailed Z CCIs to project PIT ECLs that incorporate credit cycle mean reversion and momentum. ZRE is customized to each bank's portfolios, customer segmentations and IRB credit models. The ZRE solution can be run with either a bank's internal macro-economic scenarios for IFRS 9, or Regulatory scenarios for Stress Testing. Finally, using the estimated empirical credit cycle models for industries and regions, ZRE can also assess simulated ECLs.

Summary ZRE business benefits:

- 1. Z-Risk Engine Advanced Accuracy** (See Bibliography): ZRE's Point-in-Time empirical accuracy using market-based credit cycles to convert Bank's own 'TTC' IRB models to full PIT, is substantially more accurate than Bank's own, in-house MEV-Based IFRS 9 models.
- 2. Z-Risk Engine Budget Cost Save Benefits** (See Bibliography): our recent business case studies have shown how Banks can save substantial model development and implementation cost budgets for IFRS 9 relative to the current two-stage IRB/IFRS 9 approach most banks are currently utilizing. For a large illustrative £900 bil European bank example, our recent business case analysis suggested IFRS 9 modelling, and implementation cost budgets could be reduced by about £20 million over 5 years.
- 3. Z-Risk Engine Implementation:** the unique business model provides ZRE Python source code to lower client implementation risk and maximize the customized integration of the solution within a bank's own Risk and Financer systems architecture.

ZRE Joint Client, E2E Implementation Approach:

As a full-service solution, ZRE provides flexible implementation options to allow banks to optimize the business case for ZRE and their associated business benefits. This objective is supported by the ZRE team's long-term experience developing advanced credit analytics, supporting successful compliance objectives, and undertaking full E2E implementation of advanced credit models. ZRE can be implemented either as a Managed Service or as a full Source Code implementation in a bank's own architecture in conjunction with a perpetual IP license.

Under the unique ZRE E2E Source Code implementation option, a client bank:

- Licenses the full ZRE E2E Source Code (Python or SAS) to support full internal implementation flexibility and code adaptation,
- Receives, full methodology and functional specifications,
- Customizes the ZRE model calibration parameters and customer segmentation to their own portfolio and IRB models,
- Undertakes a joint implementation project with the ZRE team to maximize ZRE knowledge transfer and minimize project risks, and,
- Is supported by the ZRE team for internal and external model validation and approval.

ZRE **Bibliography:**

'Automating a Centralized IFRS 9 Architecture to Reduce BAU Operating Expense Budgets by 40%', ZRE Insights, ZRE Web Site, February 2022.

'IFRS 9 Credit Model budgets can be reduced by up to 30% - by using more efficient model architecture', ZRE Insights, ZRE Web Site, November 2021.

Forest, L., and S. Aguais, (2019), 'Inaccuracies Caused by Hybrid Credit Models and Remedies as Implemented by ZRE', Z-Risk Engine Case Study Research Paper, ZRE web site, September.

Forest, L., and S. Aguais, (2019), 'Scenario Models Without Point-in-Time, Market-Value Drivers Understate Cyclical Variations in Wholesale/Commercial Credit Losses, Z-Risk Engine Case Study Research Paper, ZRE web site, June.

Forest, L., and S. Aguais, (2019), 'Variance Compression Bias in Expected Credit Loss Estimates Derived from Stress-Test Macroeconomic Scenarios', Z-Risk Engine Case Study Research Paper, ZRE web site, April.