



Financial Services Risk Management Capital Optimization Framework

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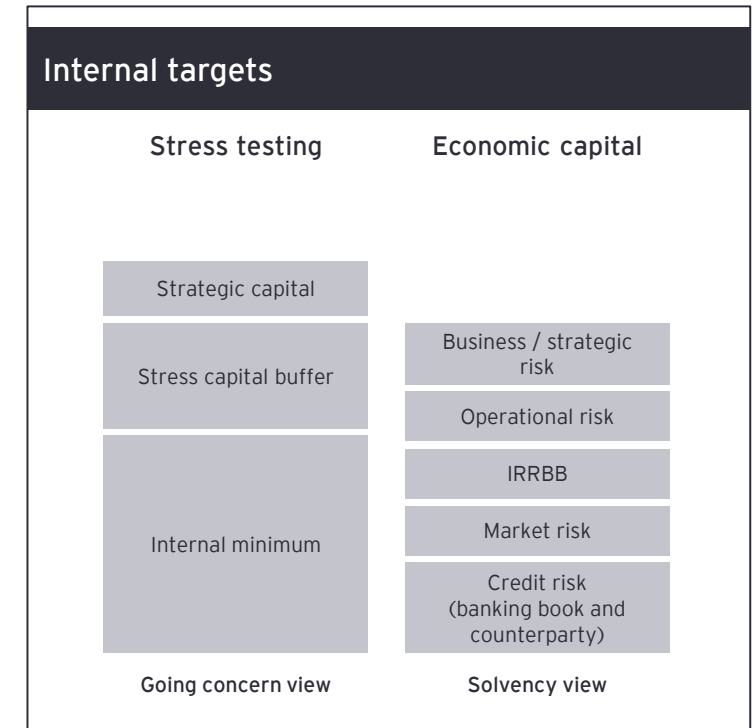
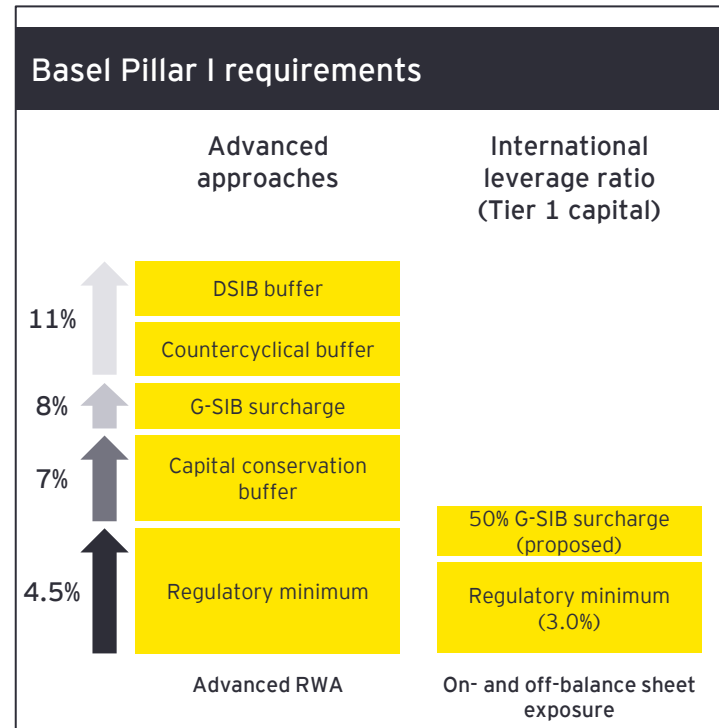
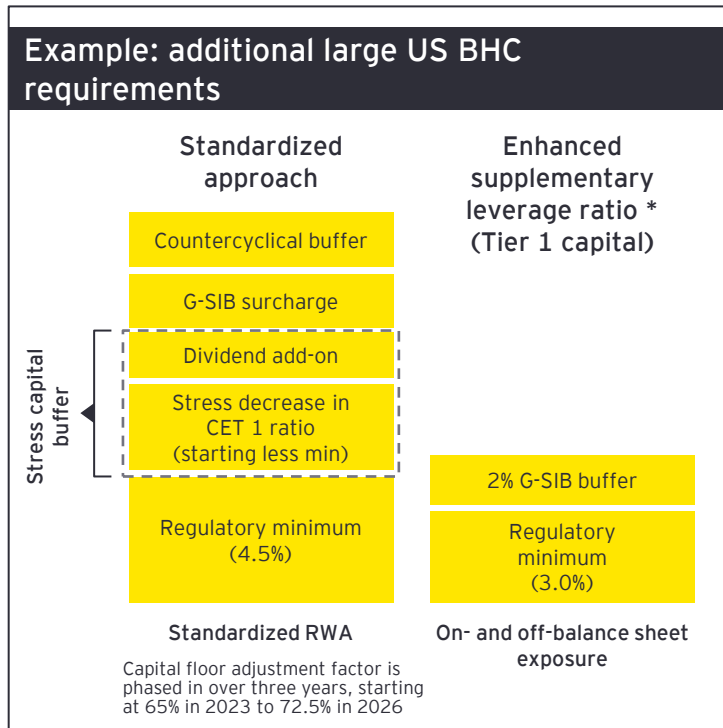
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1. Capital optimization - managing to multiple constraints

- ▶ Canada's domestic systemically important banks (D-SIB banks) have to manage to multiple capital views. Hence, it is critical to focus optimization efforts on the constraints that would add most value dependent on a federally regulated financial institution's (FRFI's) strategic view and business strategy.
- ▶ US and Canadian banks subject to such constraints have increasingly adapted a "going concern" view; i.e., a bank is unlikely to reach technical insolvency without first running out of liquidity arising from a market loss of confidence.
- ▶ Optimization efforts may focus on both stress scenarios, as well as more granular parameter-based charges (RWA and economic capital). It becomes critical to leverage metrics that not only reflect the riskiness of the portfolio, but also its profitability and efficiency with respect to deployed capital.



* US banks are additionally subject to a 4% well-capitalized leverage ratio (not shown).

1. Capital optimization - approach and considerations



tactical capital optimization (short-term outlook)

Making adjustments to the banks' products, underwriting criteria and requirements, or deals to make it more capital efficient for the bank.

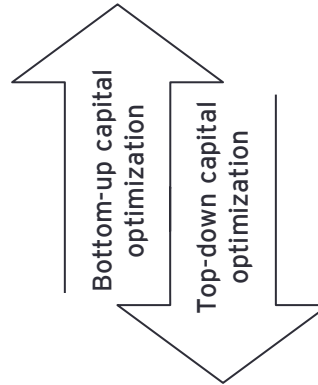
For example, collateral requirements, adjust contract clauses (committed vs. uncommitted, maturity), product swaps for overdrafts and revolvers.



Strategy capital optimization (long-term outlook)

Institutionalized RWA management with long-term strategies on effective capital optimization to identify customer segment and/or specific product offerings.

For example, evaluating available loss capacity for different portfolios through stress testing exercises/optimal portfolio composition analytics to maximize returns with reduced earnings volatility.



LEVER



DESCRIPTION

TACTICAL OPTIMIZATION

CVI, RWA and other performance metrics

- ▶ Explore effectiveness of currently implemented metrics for asset allocation and performance monitoring.
- ▶ Facilitate regulatory interpretation accuracy for exposure classification and retail portfolio segmentation, including commitment definitions for credit conversion factor application on unused limits, contingent liabilities, and collateral or risk mitigation recognition.

STRATEGIC OPTIMIZATION

Asset allocation

- ▶ Review segments (at both the customer/account and product levels) of retail portfolio that attract additional capital with limit profitability.
- ▶ Introduce a capital-centric metric to drive asset allocation and facilitate transaction approval.
 - ▶ Strategies such as : limit reduction, use bottom-up customer segmentation to identify segments of customers with low consistent utilization. Limit reductions can be identified to save capital.

2. Asset allocation - comparing widely used capital metrics

Return on equity (ROE) | return on asset (ROA) | return on invested capital (ROIC)

Capital metric	Return on equity	Return on asset	Return on Invested Capital
Formula	$ROE = \frac{\text{Net income}}{\text{Shareholders' equity}}$	$ROA = \frac{\text{Net income}}{\text{Total assets}}$	$ROIC = \frac{NOPAT^{(1)}}{\text{Total debt + shareholders' equity}}$
Capital optimization focus	<p>Focuses on how efficiently the bank is using its equity.</p> <ul style="list-style-type: none"> Identify areas where capital can be optimized by focusing on improving the profitability of the company's equity investments. 	<p>Focuses on how efficiently the bank using its assets.</p> <ul style="list-style-type: none"> Identify areas where capital can be optimized by focusing on improving the efficiency of the company's asset usage. 	<p>Focuses on how efficiently a bank is using all of its invested capital.</p> <ul style="list-style-type: none"> Measures how efficiently a company is using all of its invested capital to generate profits, which can be useful for evaluating the returns to all capital providers and identifying areas where capital can be optimized.
Disadvantages	<ul style="list-style-type: none"> Same levels of net income can result in different ROE values depending on the value of debt. Artificially inflated by increasing debt levels or share buybacks and increasing shares. 	<ul style="list-style-type: none"> Same levels of net income can result in different ROE values depending on the value of debt. Artificially inflated by increasing leverage. 	<ul style="list-style-type: none"> Not widely used or understood, and can be difficult to calculate accurately. Can be affected by changes in interest rates, which can affect the cost of debt capital.



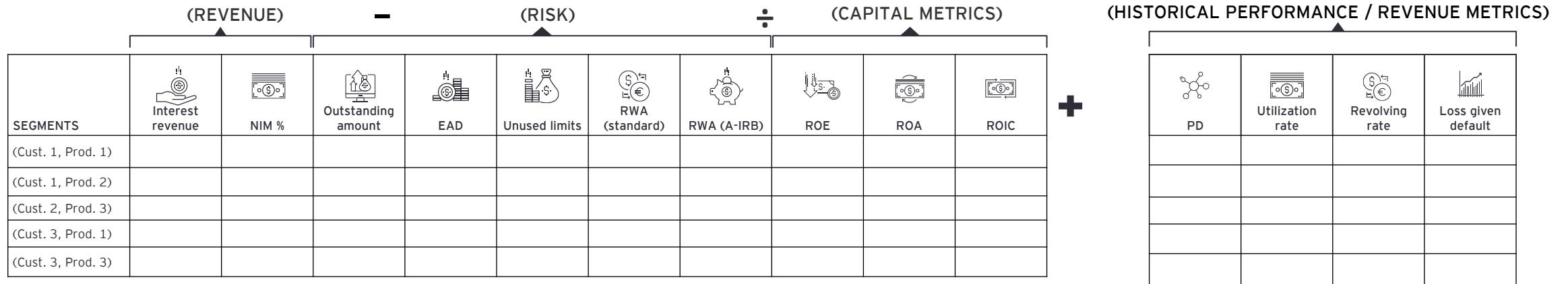
Recommendation: Leading practice is to implement an optimization process on a combination of two or three of the following performance metrics.

Internal alignment on the right capital metric | practical considerations for ROIC

- Ensuring correct treatment and classification of products as per CAR 2023 asset classes, including contractually committed/uncommitted facilities, collateral allocation, definition of contingent liabilities, and PD/LGD assignments.
- Internal alignment on which capital construct is being optimized (e.g., Pillar I versus stressed capital, etc.).
- Helps management focus on the underlying fundamentals of both profit and capital, eliminating potential elements of noise found in other commonly-used metrics such as ROE or ROA.
- Enables net present value (NPV) analyses by comparing to weighted average cost of capital (WACC) for investment decision-making.
- ROIC should act as the basis for establishing appropriate hurdle rates and pricing for various customer and product segments to guide transaction approvals.

3. Capital optimization exercise: an example for retail portfolio accounts, including assets and deposits, GICs and credit insurers

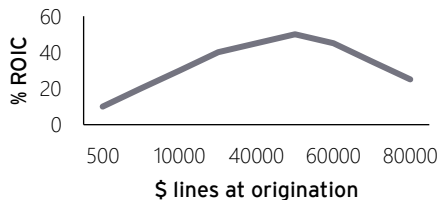
01 We build on your existing framework to streamline the process



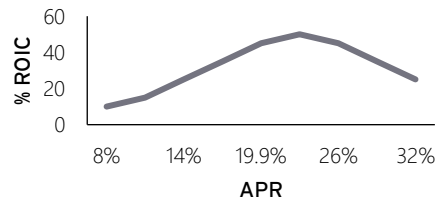
02 Forecast loss & revenue

Forward-looking revenue and loss model (establishing sensitivities to limits, APR shocks, etc.) that account for risk appetite constraints and enterprise-wide loss tolerances.

Illustrative line yield curve (unsecured)

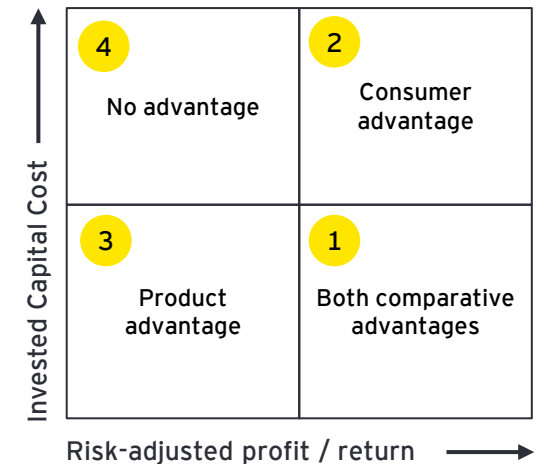


Illustrative line yield curve (unsecured)



03 Success outcome

Business unit	Strategy / market opportunity	Income and RWA impact (\$)
Credit cards w/o deposits	Reduce credit limit or charge higher interest rates to compensate for increased capital charges	\$
Transactors	Maximize ROIC by cross-selling other products like LoC, HELOCs, auto-loans etc.	\$



4. Industry use cases

- ▶ Strategic capital optimization can enable long-term synergies between bottom-up marginal lending decisions with top-down portfolio management strategies.
- ▶ Conventionally, financial institutions have a vision of risk management based primarily on loss rates. We propose a profitability-based risk appetite (PBRA) model incorporating profitability in the framework and optimizing for capital.
- ▶ PBRA is an industry-leading and unique profitability-based model-driven framework to make lending decisions across the consumer lifecycle (acquisitions, account management and collections).
- ▶ The framework entails:
 - ▶ Building revenue, risk, expense and capital prediction models for a given consumer product.
 - ▶ Optimizing return on capital for every lending decision based on model-driven statistical methods, resulting in significantly higher client revenue.

Acquisition



- ▶ Who do you approve?
- ▶ What credit exposure do you give?
- ▶ What interest do you charge?
- ▶ What rewards do you offer?

Account management



- ▶ How do you manage exposure?
- ▶ How do you provide client with evolving products/offers?
- ▶ How do you re-price a client product?
- ▶ How do you offer ongoing bundle offers?

Collections and recoveries



- ▶ How do you help clients stay current (early warning)?
- ▶ How do you contact a client?
- ▶ What offers do you give clients to avoid them defaulting?
- ▶ How do you recover defaulted loans?



Risk appetite foundation

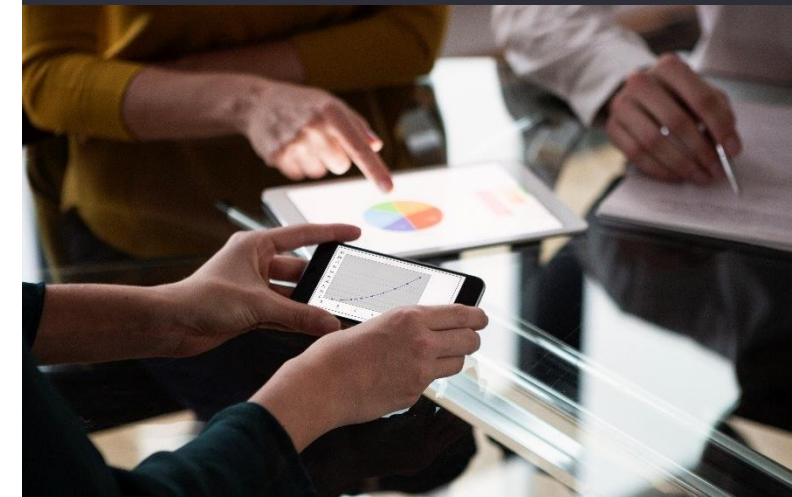
How to set risk appetite? How to optimize portfolio to maximize return on capital?

EY Credentials

- ▶ PBRA framework has been successfully implemented by EY personnel in several FIs in US, Canada and Latin America in recessionary and recovery times

Success stories

- ▶ Several US unsecured portfolios were turned around from ~% ROE to >15% ROE generating >\$10m in ann. net income.
- ▶ A banking portfolio in Mexico doubled its unsecured book with ~\$10m+ in net incremental income annually.
- ▶ A big 5 bank in Canada generated ~\$10m in annual incremental risk-adjusted returns. Currently, the bank is expanding this framework globally.



Case study #1: PBRA provides a bottom-up approach for customer underwriting at adjudication

Underwrite at a marginal segment for a cohort level

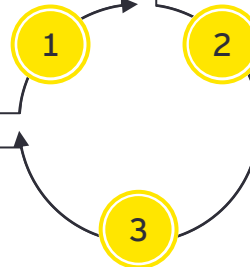
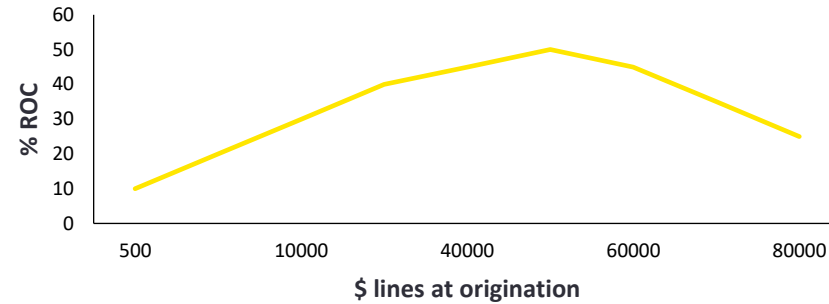


- ▶ All new accounts modelled on a grid of revenue and risk segments. Return on capital computed for each segment and optimized for underwriting parameters such as credit lines and pricing.
- ▶ Approve/decline cutoff decided by risk appetite and updated based on results from universe testing.
- ▶ Each segment has tests for lines (random lines test) and pricing (random pricing test) to calibrate individual models.
- ▶ Statistically significant sample approved in decline population on an ongoing basis.

Monitor performance with triggers

- ▶ Observe performance of cohort with triggers and associated actions over time.
- ▶ For example, trigger breach on 60+dollar loss rate trigger @ 6 month on book can lead to credit line decreases or no further acquisitions.
- ▶ Random lines and pricing test calibrates revenue and loss functions at the segment level.

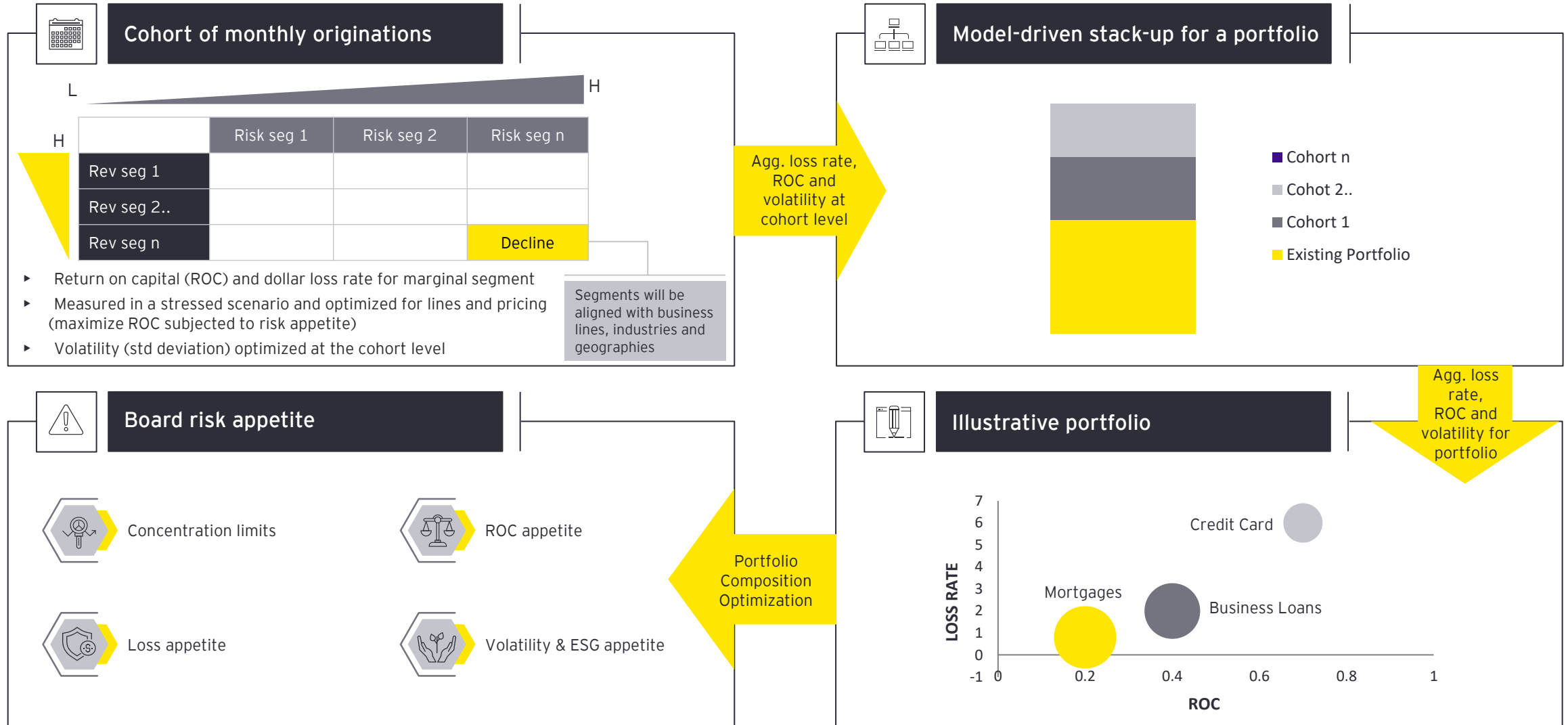
Illustrative line yield curve (unsecured)



Annual feedback loop or AI-based continuous feedback

Calibration

Case study #2: PBRA enables capital optimization at the account level, customer level and portfolio level under evolving capital regimes



Case study #3: PBRA framework helps optimize both standardized and advanced (AIRB) capital requirements leveraging a barbell strategy between revolvers and transactors

Revolvers



- ▶ Mostly prime and lower customers, but have some super-prime segments.
- ▶ Increased capital requirements under CAR 2023.
- ▶ Strategy levers for capital optimization include increased rates and CLD strategy to reduce exposure, determined by PBRA framework.
- ▶ Real-time transaction monitoring for account management.
- ▶ Strengthened collections and EWS framework.

Transactors

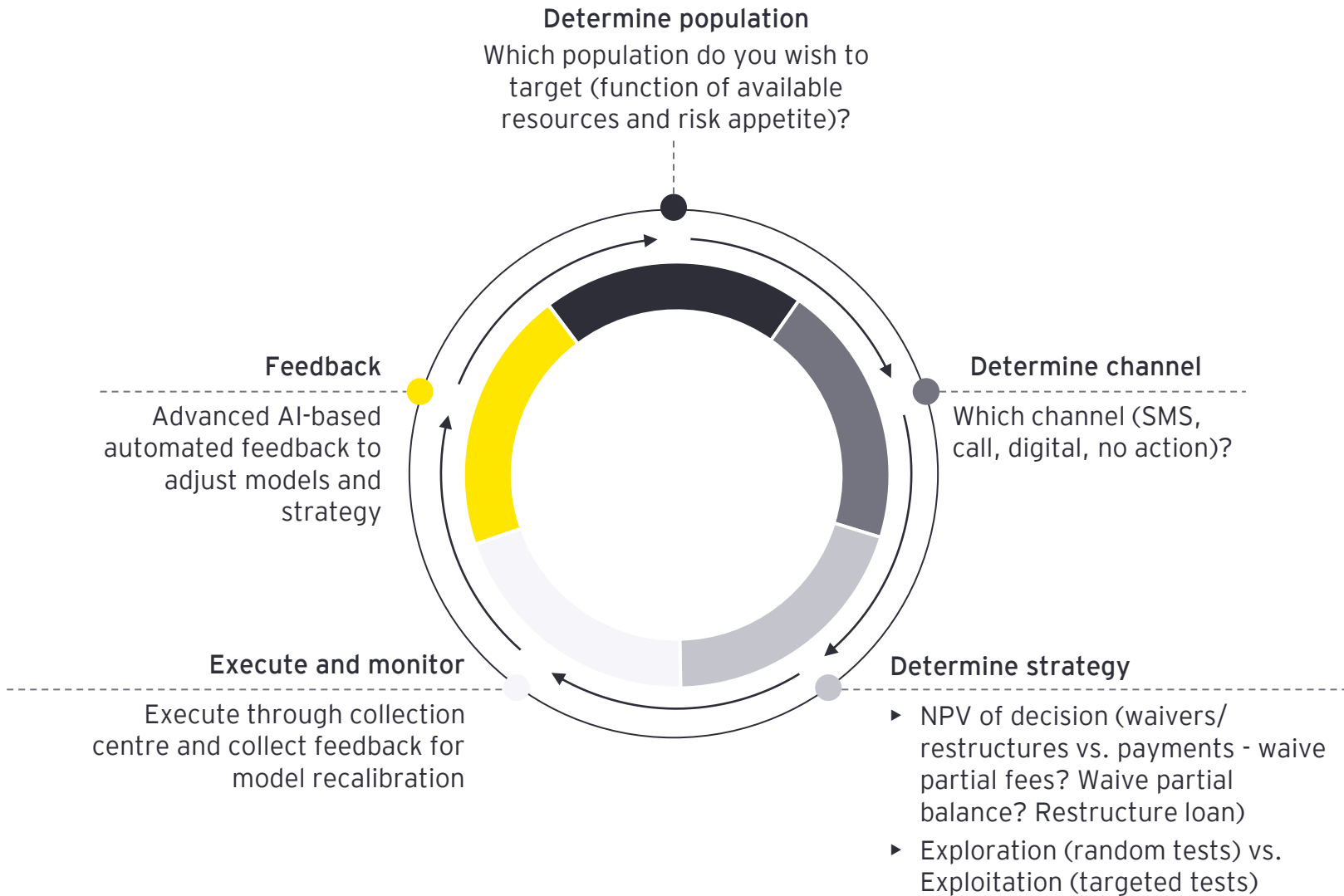


- ▶ Mostly super-prime, prime customers.
- ▶ Reduced capital requirements under CAR 2023.
- ▶ Capitalize by offering competitive reward products with competitive line assignment to acquire and retain customers.
- ▶ Bundle offers for cross-product penetration.
- ▶ Highly predictive risk models and cost optimization.

PBRA will help achieve a balanced resilient portfolio with high profitability and improved capital allocation



Case study #4: An NPV-based PBRA approach has significantly help in net write-offs reduction



Treatment model → risk model	Seg 1	Seg 2	Seg n
Seg 1			
Seg 2			
Seg n			



PBRA in action: simultaneous optimization of underwriting, capital and pricing leads to optimal capital allocation with due consideration to both standardized and AIRB approaches

Under CAR 2023, revolving retail exposures (e.g., credit cards, lines of credit) are expected to apply different risk weights as per transactors (15% RW) or revolvers classification (75% RW) (standardized approach). On top of that, instead of 0% CCF application for UCC (unconditionally cancellable commitments), new CAR guidelines proposed 25% CCF application for credit cards/charge cards and 10% for other unconditionally cancellable commitments.

Borrower type	Credit limit	O/S balance	Undrawn	EAD (CAR19)	EAD (CAR23)	RWA (CAR19)	RWA (CAR23)	Income	ROC
Borrower A (revolver)	\$5,000	\$700	\$4,300	\$700	\$1,775	\$525	\$1,331.25	\$105	79%
Borrower B (transactor)	\$5,000	\$700	\$4,300	\$700	\$1,775	\$525	\$266.25	\$10	38%

- ▶ Identifying borrowers A and B at the early stages through modelling techniques.
- ▶ PBRA approach for borrower A : Reduce credit limit or charge higher interest rate to compensate for increased capital charges.
- ▶ PBRA approach for borrower B : Maximize profitability by cross-selling other products like line of credit, HELOC, auto loans, etc.

Borrower type	Credit limit	O/S balance	Undrawn	EAD (CAR19)	EAD (CAR23)	RWA (CAR19)	RWA (CAR23)	Income	ROC
Borrower A (revolver)	\$2,000	\$600	\$1,400	\$600	\$950	\$450	\$712.5	\$90	126%
Borrower B (CC-transactor)	\$5,000	\$700	\$4,300	\$700	\$1,775	\$525	\$266.25	\$10	38%
Borrower B (LOC-transactor)	\$20,000	\$15,000	\$5,000	\$15,000	\$15,500	\$11,250	\$2,325	\$600	258%

Cross sold using PBRA

PBRA in action: for residential mortgages

Under CAR 2023, owner-occupied and rented residential mortgages are expected to apply different risk weights as per LTV buckets (standardized approach). Investor properties get more punitive RW treatment under CAR 2023 as compared to owner-occupied properties.

Borrower type	Property value	O/S balance	RWA (CAR19)	RWA (CAR23)	Income	ROC
Borrower A (owner-occupied property, LTV=0.65)	\$1,000,000	\$650,000	\$227,500	\$195,000	\$32,500	167%
Borrower B (owner-occupied property, LTV=0.85)	\$1,000,000	\$850,000	\$637,500	\$340,000	\$42,500	125%
Borrower C (rental property, LTV=0.65)	\$1,000,000	\$650,000	\$227,500	\$292,500	\$32,500	111%
Borrower D (rental property, LTV=0.85)	\$1,000,000	\$850,000	\$637,500	\$510,000	\$42,500	83%

- ▶ Identifying borrower with different borrowing needs at the early stages through modeling techniques.
- ▶ PBRA approach for borrowers A & B: maximize profitability by cross-selling other products like line of credit, HELOC, auto loans, etc.
- ▶ PBRA approach for borrowers C & D: reduce exposure to borrower or charge higher interest rate to compensate for increased capital charges.

5. A proposed strategic approach that can accelerate your journey



Duration: 1-2 months

Duration: 1 month

Duration: 1-2 months

Duration: 1 month

TASKS	Alignment	Segmentation development	Delivery	
<ul style="list-style-type: none"> Analyze current state concentrations, risk adjust return metrics, and capital allocation strategies. Establish a comprehensive understanding of the current enterprise risk appetite construct, and the allocation of capital/limits to different portfolios and lines of business. Recommend high-priority items in line with industry leading practices. Collect historical data to identify most profitable industries and products generating growth, RAROC, ROA and other strategic KPIs. 	<ul style="list-style-type: none"> Assess key metrics to measure capital consumption and profitability for different portfolio segments and lines of business. Understand maturity profile and/or correlations contributing to increase in RWA. 	<ul style="list-style-type: none"> Develop illustrative segmentation framework as a tactical bottom-up approach to drive new product offering strategies and customer acquisition channels. New segmentation will optimize for both capital consumption and profitability based on advanced modeling techniques. 	<ul style="list-style-type: none"> Final finding reports and presentations to executive team, highlighting realized value added. Develop roadmap for implementation of PBRA in line with recommendations. 	
DELIVERABLE	<ul style="list-style-type: none"> Recommend high-priority items in line with industry leading practices. Identify focus areas within the wholesale and retail portfolios to prioritize for capital optimization exercises. 	<ul style="list-style-type: none"> Metrics for capital consumption and profitability. Priority portfolio to serve as basis for segmentation framework. 	<ul style="list-style-type: none"> Sample framework to optimize capital deployment strategies in the portfolio. Impact assessment based on analysis and recommended strategies. 	<ul style="list-style-type: none"> Framework with impact assessment and potential next team.
STAKEHOLDERS/ INVOLVED FUNCTIONS	<ul style="list-style-type: none"> Lines of business (1st LoD) Risk management (2nd LoD) Finance 	<ul style="list-style-type: none"> Risk management (2nd LoD) 	<ul style="list-style-type: none"> Enterprise-wide stress testing Lines of business (1st LoD) Risk management (2nd LoD) 	<ul style="list-style-type: none"> Executive team

SAMPLE OUTPUTS

Industry	New limits (Committed)	Expense		SFR	Engagement breakdown	Credit loss breakdown (Fig 1)	Profitability		Risk					
		Commercial amount	Operating principal amount				Revenue as a % of asset	RAROC	Financial default rate (90-mo-avg)	Operational loss rate (90-mo-avg)	Utilization rate	PD variability	Loss severity (LL/losses) %	
A	10%	0.47%	1.0%	3.0%	22.5%									
B	20%							24.4%					0.3%	
C	10%							27.8%						
D	10%				6.0%			3.7%				41.6%		
E	10%													0.26%
F	10%										0.8%			
G	5%													0.2%
H	10%													
I	10%							1.1%		2.4%				
J	10%			7.0%		1.5%		0.43%				48.6%		
K	10%				5.0%	10.0%				17.0%				
L	10%				8.0%	3.3%				1.7%				0.77%

Ratio of non-performing loans to gross loans-big 5 banks

RAROC trend by industries

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