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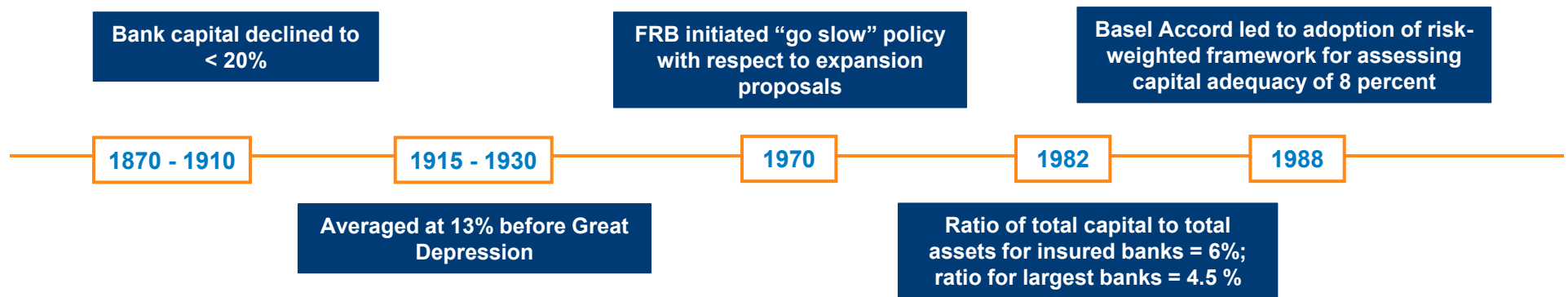
Basel II & Credit Risk Management: Risk Data and Modeling Considerations

Deloitte & Touche LLP

History of Banking Capital and Basel

- The Basel Accord was initially drafted in 1988 to improve the safety and soundness of the global banking system by enhancing the risk measurement and capital adequacy within Banks
- Aimed at placing internationally active banks on comparable footing with respect to capital requirements

Progression of capital level policies prior to the Basel Accord



Basel I - History and Overview

- The Basel Committee on Banking Supervision (BCBS) issued the first Basel Accord in 1988, and a market risk amendment in 1996

Overview

- Created a basic, global risk management framework for market and credit risk (did not account for diversification or operational risk)
- Established standard supervisory and disclosure requirements
- Created a top down Risk Weight based approach for credit risk
- Assigned an 8% capital charge to Risk Weighted Assets

Basel II - History and Overview

- Basel II refers to a comprehensive revision to the Basel I standards issued by the BCBS in 2004, and finalized in 2006

Overview

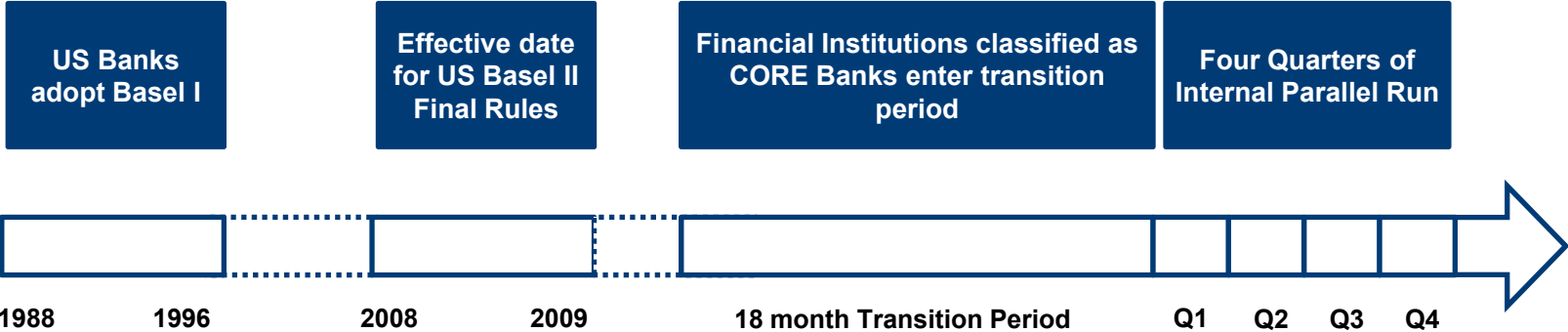
- Provides more flexibility in calculating minimum regulatory capital
- Improves risk sensitivity of regulatory capital framework, while maintaining current capital levels in the system
- Broadly aligns regulatory capital rules to economic capital used in large banks
- Incentivizes risk management and risk mitigation processes and practices

US Basel II Final Rules – Overview

- U.S. Basel II Final Rules were published in 2007
- Delayed due to Legislative and regulatory concerns
- Retention of Leverage Capital ratio in the U.S. limits risk sensitivity of the U.S. Final Rule, but was a non-negotiable item with some legislators and regulators
- Scope of applicability in the U.S. is limited to mandatory core banks and opt-in banks
- Core Banks: Bank Holding Companies (BHCs) and/or Depository Institutions (DI) with
 - » Total Assets > \$250 B, or
 - » Foreign Exposure > \$10 B

Basel II Timelines in the US

A parallel run—calculating both Basel I and Basel II capital—of at least four consecutive quarters must be completed as part of U.S. Basel II implementation



Basel III

- Basel III guidance was issued by BCBS as a comprehensive response to the global credit crisis.
- Basel II and Basel III, together, replace most elements of Basel I
- Basel III frameworks primary focus is on revised capital standards (such as leverage ratios), stronger capital definitions, and systemic risk overlays along with a new international framework for liquidity risk.
- Revised capital standards
 - » Leverage ratios were introduced as a supplementary measure
- Stronger capital definitions
 - » Market and Credit Risk Revisions were introduced
 - » Market risk capital can possibly increase by 2–4 times leading to smaller trading book.
 - » Significant credit risk capital increases for securitizations and capital market products are likely to lead to reduced activity and squeeze profitability.
- Liquidity Risk
 - » A new framework for liquidity risk measurement, standards, and monitoring.

Core Banks Implementing Basel II*



* Source: FFIEC <http://www.ffiec.gov/nicpubweb/nicweb/top50form.aspx>



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Key Data Considerations for Risk programs

Key Data Considerations for Risk programs



Data Standardization

- Data standardization refers to building a common language for sharing of key business information across organization and users (i.e. a single version of truth). The key components of data standards are:

Usability	Standardize the quality of information
Transferability	Enable an organization wide perspective
Measurability	Provide baseline metric to capture viability of data

- Data standardization issues are common in large Bank Holding Companies and Financial Institutions. These issues can result in the need to create additional transformation modules, translation efforts and exhaustive data validation. Such issues delay the process of system integration.

Key Industry Observation

- Acquisition of systems and use of multiple vendor product within a bank had resulted in a lack of uniformity of similar data. For example: the legal entity was referred to by different identifiers & values across the firm.
- M&A and consolidation at major banks over the last decade has resulted in numerous disconnected systems with duplicated data sets.

Solutions from the Industry

- Efforts have been undertaken to standardize information right at the source/ point of sale. Some firms have left the original systems as is and instead have created central translation systems to aid with the standardization of data values.
- Most of the banks have created central data warehouses and reporting data marts to bring the data from various Business Units together and allow for centralized data management.

Reference Data Unification

- Reference data typically refers to static or slowly changing dimensional data that is used across systems, such as customer and legal entity identifiers, FX rates, external ratings, contract id etc.
- Basel calculations, credit risk reports, loss-event monitoring and other risk and finance programs require clean and reliable reference data.
- Most Financial Services firms face issues affecting availability, accessibility, accuracy and unification of key reference data.

Key Industry Observation

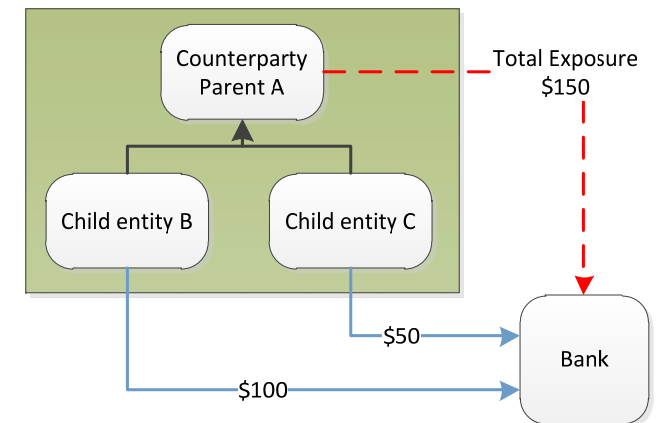
- Most large Financial Services Organizations and banks have issues in uniquely identifying customers across legal entities/jurisdictions
- Most of the Bulge bracket banks in US found it difficult to assess the credit risk in their loan portfolio due to the inconsistent view (because of inconsistent capture of risk type data like counterparty info etc.) of reference data across the source systems within the firm.

Solutions from the Industry

- Some firms have instituted new programs to collate customer information, within reason, to create a single customer view across the firm.
- The dispersed reference data within the firm (like counterparty info) are mapped to the standardized data located in centralized data-mart.

Data Hierarchy

- Today's organizations have complex business structures with hundreds of subsidiaries, affiliate sub-affiliate relationships, business units. The sum of these relationships can be defined as an organizational hierarchy.
- Most financial organizations find it challenging to create a counterparty hierarchy – understand the , organizational hierarchy of their customers based on legal entities
- Organizational data hierarchy (entities, business units etc.) and product data hierarchy are especially useful when it comes to the consistent usage of data for risk, marketing, fraud and operations across products, countries and region.



Key Industry Observation

- Many major banks have issues with identifying true concentration risk with a clear understanding of the true counterparty to their trades.

Solutions from the Industry

- Financial institutions have instituted programs to capture full legal entity structures of their counterparties (ultimate parent and all its subs) in an effort to understand the real exposure to a counterparty. They have additionally extended their risk monitoring and trade approval process to leverage this singular view of risk (enabled by an accurate entity hierarchy).

Single Customer View (1 of 2)

- A lack of a unified customer view across divisions and systems is one of the biggest problems that Banks face.
- Basel II and other regulatory risk programs require banks to have a single view of their customers across jurisdictions and divisions.

Key Industry Observation

- Most large financial services firms don't have a single customer view that allows them to view all activities/trades that the bank has with a single named customer. This issue is usually worse for internationally active banks where the customer data from international locations needs to be kept private due to privacy concerns.

Solutions from the Industry

- Many of the top 10 US banks have instituted projects that attempt to uniquely identify customers and their sub-entities. A large US bank has opted to gathered customer information along with their child entities into a central customer database that tags the primary/parent customer entity along with all or most of the sub-entities that roll up into this parent.

This single view of the customer is then going to be used across the various risk programs within the banks to assist with risk analysis including programs such as “single named risk” that attempt to identify risk concentrations.

Single Customer View (2 of 2)

Key Industry Observation

- The Recent crisis has prompted all the Core Banks in the US to revisit their approach to maintaining customer data. This has resulted in big efforts to build centralized client repositories and integration of current client datasets.

Solutions from the Industry

- A few banks have invested heavily in managing their data by incorporating unique identifiers in their CRM and introduce common definitions for data used to run the bank and move it forward.

Metadata and Data Governance

- Metadata is the information about the data in the different systems, and data governance is the end to end management of such data.
- Most of the Banks currently have weak policies around metadata management; making data translation and transfer across systems a costly exercise. A lack of metadata typically results in poor data standards over time, and suspect data quality in downstream systems.

Key Industry Observation

- A major bank holding company did not have the data dictionaries of its key risk modeling system updated, which delayed model development process
- A major bank implementing Basel II faced problems in integrating potential Basel II data sources into a common Operational Data Store due to inconsistent metadata

Solutions from the Industry

- Most large financial services firms are introducing metadata documentation standards during the Systems Development Life Cycle
- Major Banks implementing Basel II are resorting to sound data oversight policies and metadata driven projects. Central metadata repositories are being created with metadata collection points being deployed into new systems.

Loss Event Data

- An account of historical losses that a firm suffers due to counterparty defaults, frauds, damages, etc.
- Lack of accuracy in defining and recording loss event data poses a major challenge to the risk management programs, as it reduces the accuracy and effectiveness of risk models.
- Institution's internal loss data must be comprehensive in that it captures all material activities and exposures from all appropriate subsystems and geographic locations

Key Industry Observation

- In banks, loss data is typically detected and captured manually. Manual touch points increase chances of error which in turn affects risk modeling and validation.

Solutions from the Industry

- While this problem is ongoing, Banks have started building systems that automate the capture of loss data
- Some banks have acquired publicly available loss event data to supplement their internal data capture and to aid with improving the accuracy of their risk models.
- Banks are further exploring possibilities of reconciling individual loss events to the General Ledger to facilitate material completeness of data

Data Lineage

- Data lineage is the process of tracing a data path from reports back to the origination source systems
- Critical for firms striving to get an accurate assessment of the risk on their books and to ease investigations and audits, as well as mandated by many regulators for large bank holding companies and banks.
- Effective data lineage helps in identifying key data dependencies and helps in transparency

Key Industry Observation

- Source data undergoes various transformations during its lifecycle from trade capture, sales confirmations to settlement and post trade activities. The regulators are often dissatisfied with poor audit trail for data used in risk systems, which affects investigations and audits

Solutions from the Industry

- This is an ongoing problem in banks, but recently they have started focusing on having a homogenous ETL environment and strong audit trails to deal with data lineage issues.

Historical Data (1 of 2)

- Basel II advanced approaches require maintaining sufficient history of appropriate Basel II related data for risk parameter estimation (typically ranging from 5 to 7 years of history)
- Historical data should be captured at varying levels of granularity (transactional data such as balances, principal amounts etc.; reference data such as rates, ratings etc.; and other customer/counterparty data)
- Banks need to ensure that Historical data is of high quality for comprehensive and accurate assessment of risk
- Most risk models are calibrated using history data, and poor quality or availability of history data impacts the effectiveness of these risk models

Key Industry Observation

- Most of the banks don't have concrete historical data primarily because of legacy systems on-boarded as part of past acquisitions or due to acquisitions of smaller firms with poor data management capabilities.

Solutions from the Industry

- A major Institution recently implemented strong data retention policies to ensure that data does not become redundant once the current system is transitioned to a new one.

Historical Data (2 of 2)

Key Industry Observation

- Most large banks have recently started instituting policies to facilitate sufficient data retention, by creating central warehousing projects to store historical credit-risk related data.

Solutions from the Industry

- Post Basel II, banks are building data warehouses that maintain sufficient history of risk data
- Newly introduced systems in a few firms have been assessed by risk to identify key data elements that will be of interest for risk modeling purposes, and long term retention.
- Banks have started building appropriate interfaces to the risk data warehouse apart from introducing effective retention policies

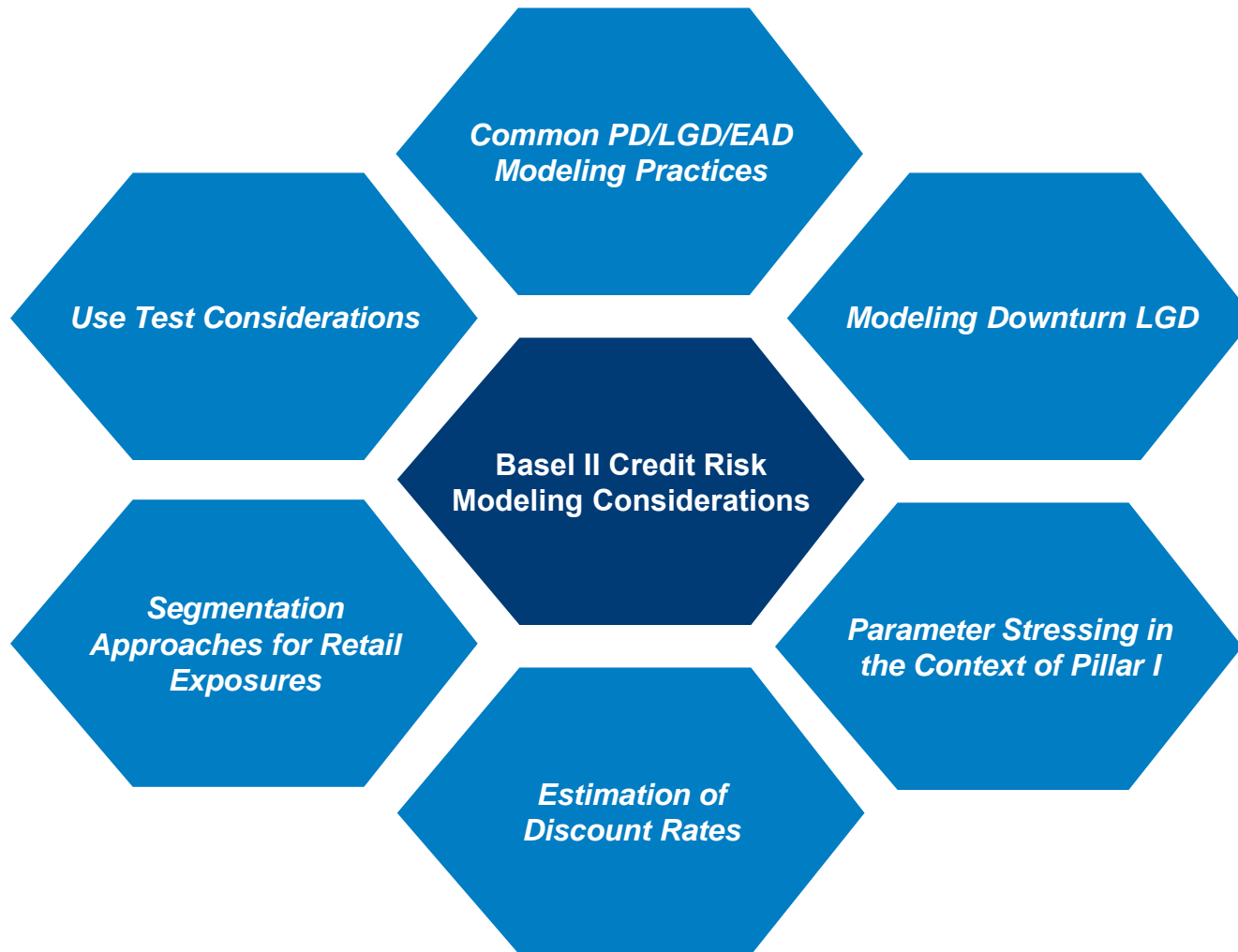


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Key Considerations For Credit Risk Modeling

Basel II Credit Risk Modeling: Some Key Considerations



The Basel II Capital Formula: A Quick Recap



- The Basel II capital formula (for wholesale credit) is expressed as:

$$\text{Risk Weighted Assets} = 12.5 \times \text{EAD} \times \left[\text{LGD} \times N \left(\frac{G(\text{PD}) + (R \times 0.5) + G(0.999)}{(1 - R)^{0.5}} \right) - (\text{PD} \times \text{LGD}) \right], \text{ where}$$

PD – Probability of Default, LGD - Loss Given Default, EAD – Exposure At Default, R – Correlation Factor, N – Cumulative Distribution Function for a Standard Random Normal Variable, G – Inverse Cumulative Distribution Function for a Standard Random Normal Variable

- Under the advanced approach, which is mandatory for US banks, PDs, LGDs, and EADs need to be estimated based on internal loss experiences (focus of our discussion today). The correlation factor (R) is specified by supervisors
- The formula was first proposed by Vasicek and is based upon Merton's distance-to-default framework. Vasicek extended the Merton framework using the Gordy model, thereby incorporating asset value correlations
- Unlike internal models (e.g., economic capital models, loan loss models, credit portfolio models), Basel II PD/LGD/EAD models are relatively simple and relies upon well-established approaches. This simplicity is intentional, and facilitates regulatory communications and approval

Basel II PD Models: Common Industry Practices



- Retail Credit: Logistic regression is the de-facto industry standard for modeling PD for retail exposures. In fact, in some banks, modeling policies prohibit using any other modeling approach
- Wholesale Credit: Historically, qualitative scorecards have been used to assign ratings to wholesale obligors
 - » Scorecards typically combine various firm, industry and macroeconomic variables to derive a rating – the rating is subsequently mapped to a master scale to derive PDs
 - » In some firms, scorecard outputs are combined with outputs from a logistic regression using various weighting algorithms
- Apart from logistic regressions, probit is the other common approach for modeling PD. However, unlike logistic regressions, probits make assumptions regarding the underlying distribution (i.e., normal) and hence are less flexible

PD Modeling for Low Default Portfolios: A Simplified Approach



Some portfolios have little or no history of defaults (sovereign investments, new products, etc.), making the modeling process particularly challenging. A review of the literature provides many approaches for addressing such situations, including the “duration method” of estimating PDs by means of migration matrices and Bayesian approaches. Below, we provide a simple approach for modeling low-default portfolios

	Approach & Rationale	Calculation
Model fitting	<ul style="list-style-type: none"> • In case of very low default, estimator focuses on predicting non-default • To address this issue, default and non-default cases may be weighted equally in the sample • By changing weights, model tries to better predict “default”, improving economic performance of the model 	<ul style="list-style-type: none"> • Assign different weights to default and non-default cases in order to achieve 50:50 weight ratio • For example, if the default rate is 2% in a sample of 10,000 loan accounts, then <ul style="list-style-type: none"> –Weight for 200 default cases = 9800/200=49 –Weight for 9800 non-default cases = 1
Model calibration	<ul style="list-style-type: none"> • The average PD in the modeling sample would be 50%, given the sample weighting • Recalibrate each PD value using a PD adjustment formula to reflect the actual default rate 	<p>Sample PD recalibration formula:</p> $\text{Recalibrated PD} = \frac{\frac{p_p}{p_s}}{\frac{p_p}{p_s} P + \frac{1-p_p}{1-p_s} (1-P)}$ <p>Where p_s is default rate post-weighting (50% in this case); p_p is the default rate pre-weighting (2% in this case); P is the predicted PD per exposure</p>

Basel II LGD/EAD¹ Models: Common Industry Practices



Unlike PD, LGD/EAD are often modeled using multiple approaches, and the most appropriate approach selected depending upon model performance. Four such approaches are highlighted below:

Historical Averages	<ul style="list-style-type: none"> • Segmented historical averages is widely used for estimating LGDs/EADs • Strengths – simplicity and often superior model performance, weakness – does not reflect portfolio changes over time
Linear Regressions	<ul style="list-style-type: none"> • EAD: Instead of directly modeling EAD, underlying components are often modeled separately (e.g., balance, fees, interest) • LGD: Recovery costs are often not modeled (particularly indirect costs), estimated outside the model
Generalized Linear Models	<ul style="list-style-type: none"> • Used when the response variable follows a distribution from the exponential family of distributions • For LGD/EAD, response variables are typically modeled as Beta, Gamma or Negative-Binomial
External Estimates	<ul style="list-style-type: none"> • For many wholesale portfolios, default data is sparse and LGD is difficult to estimate using statistical methods • In such situations, industry studies and/or rating agency recovery rates are used (e.g., the Citibank study spanning between 1970 and 1993)

1. In this context, EAD and CCF are used interchangeably. In reality, CCF is modeled; EAD is a function of the CCF, the on-balance sheet component of the exposure, and the off-balance-sheet component of the exposure

Modeling Downturn LGD: Introduction



Motivation & Objective

- The unexpected loss (UL) which is directly related to capital requirements is given by:

$$UL = (PD_{\text{conditional}} - PD_{\text{unconditional}}) * LGD * EAD$$

where PD = Probability of Default; LGD = Loss Given Default; EAD = Exposure at Default

- Evidence shows that LGD rises during economic downturns. The above formula does not take this correlation between PD and LGD into account, thereby **underestimating capital requirements**
- The goal of downturn modeling is to incorporate the effects of downturn scenarios on LGD and ensure that banks are sufficiently capitalized to withstand such scenarios

Basel Requirements

- From the US Final Rule : Default, loss severity, and exposure data must include periods of economic downturn conditions, or the [bank] must adjust its estimates of risk parameters to compensate for the lack of data from periods of economic downturn conditions.
- Basel provides a principle-based approach where banks need to identify appropriate downturn conditions and the adverse dependencies between default rates and LGD. There is a lack of consensus amongst industry participants on exact modeling approaches

Modeling Downturn LGD: Common Approaches



The Basel guidelines for downturn LGD modeling are flexible enough to allow for a range of practices. Some of the more common approaches are listed below:

Qualitative add-ons	<ul style="list-style-type: none"> • Many banks use qualitative add-ons to incorporate downturn risk, particularly for their first-generation models • Typical add-ons range between 2.5% to 5%
LGD at stressed points	<ul style="list-style-type: none"> • Identify stress points based on historical default rates and/or macroeconomic indicators • Compute weighted average LGD across these stress points and compare them with average LGD over the cycle. Use the higher of the two for capital calculation purposes
Stressed LGD model	<ul style="list-style-type: none"> • Identify stress points based on historical default rates and/or macroeconomic indicators, estimate default rates during these stressed conditions • Plug these default rates into a stressed LGD model • Compare stressed LGD with their long run averages and derive a scaling factor to reflect downturn risk

For firms that do not have sufficient data to estimate downturn LGD, a supervisory mapping function can be used: $LGD = 0.08 + 0.92 * \text{Expected LGD}$

Parameter Stressing & Pillar I Capital



- Under Pillar 1, Basel II does mention of stress testing; however, the mechanics of incorporating stress tests within RWA calculations is not very prescriptive. According to the US Final Rule:

The [bank] must periodically stress test its advanced systems. The stress testing must include a consideration of how economic cycles, especially downturns, affect risk-based capital requirements (including migration across rating grades and segments and the credit risk mitigation benefits of double default treatment)
- Stressing risk parameters (PD/LGD/EAD) and using stressed parameters for capital calculation may be an effective way of incorporating conservatism into Pillar I capital estimates
 - » Using a range of outputs, as opposed to a point estimate, can provide a more meaningful expression of uncertainty
 - » Banks may use stressed parameters that correspond to different downturn conditions (e.g., mild recession, severe recession, etc.) and compare the capital requirements against their current capital level
 - » PDs may be the most likely candidate for stressing (The IRB formula already incorporates stressed LGDs, EADs are less susceptible to cyclical factors)
- To reduce cyclicity, regulators are already exploring the use of downturn PDs for Pillar I capital calculation purposes. For example, the UK Financial Services Authority (FSA) has proposed an approach to scale long run average PDs to better reflect tail risks¹

1. Source: *Basel III: A global regulatory framework for more resilient banks and banking systems, December 2010, Paragraph 22*

Parameter Stressing: Potential Approaches



The following two approaches are commonly used in the industry for estimating stressed parameters:

Adding conservative “add-ons” to unconditional parameters

- Flat increase of PD, say by x bps. The increase is typically calibrated by industries, countries, regions, etc.
- Add-on usually based on either: a) expert judgment, or b) distribution of the parameter (e.g., add 1 standard deviation to the PD)

Explicitly modeling stressed parameters

- Usually done by modeling risk parameters as a function of stressed macroeconomic variables (e.g., GDP, unemployment rate, etc.), sometimes industry/firm specific factors are also used
- Approaches can range from simple to relatively complex. Two examples are provided in the next page

Explicitly Modeling Stressed PD: Two Examples



A simple approach

- Stressed PDs are modeled as a function of stressed macroeconomic variables such as GDP, unemployment rate, CPI, industrial production, housing price index, etc.
- Functional forms are usually very simple and typically linear in nature. For example,
 - » Stressed PD = $\beta_1 \times \text{GDP} + \beta_2 \times \text{unemployment rate} + e$

A More Complex Approach

- The “Miu and Ozdemir” model may be used to produce stressed PDs. This approach is based on the Merton – Vasicek framework, and incorporates both systematic and idiosyncratic risks. The systematic default risk may be modeled using macroeconomic as well as industry variables. For a detailed explanation of the approach, please refer to the paper “Stress-Testing Probability of Default and Migration Rate with respect to Basel II Requirements”.
- The model is given by: $\Phi \{ [DP - (RPD \times f(x_{1t}, x_{2t}, \dots, x_{nt}))] / [(1 - R_{2PD} - \delta_{2e} R_{2PD}) / 2] \}$, where:
 - » Φ – Cumulative normal distribution function
 - » DP – Constant default point, derived from the unconditional PD
 - » $f(x_{1t}, x_{2t}, \dots, x_{nt})$ – Function describing the relationship between systematic default risk and explanatory variables
 - » R_{2PD} – Pair-wise correlation between asset values
 - » δ_{2e} – Variance associated with the residual

Discount Rate in LGD Modeling



Discount Rate in the Context of LGD Modeling

- Discount Rate is a key input in Loss Given Default (LGD) calculations
- The discount rate is used to calculate the present value (PV) of cash flows associated with defaulted exposures
- The Discount rate used in the estimation of LGD should reflect the costs of holding the defaulted asset over the period, including an appropriate risk premium required by the asset holders.

$$\text{LGD} = \frac{\text{Economic Loss}}{\text{Exposure at Default}} = \frac{\text{Exposure at Default} - \text{PV}^*(\text{Recoveries}) + \text{PV}^*(\text{Costs})}{\text{Exposure at Default}}$$

* where PV is a function of Discount Rate

Approaches for Discount Rate Determination

- Banks typically use the following approaches for estimating discount rates. These approaches are explained in greater detail in the next page
 - Weighted average cost of capital
 - Market Implied Discount Rate
 - Opportunity cost of funds/ Investment hurdle rate
 - Yield on other High Risk Assets

Commonly Used Discount Rate Methodologies



Opportunity Cost of Funds/Investment Hurdle Rate	<p>Description:</p> <ul style="list-style-type: none"> • Reflects the required internal rate of return on equity invested to undertake new projects <p>Highlights:</p> <ul style="list-style-type: none"> • Captures the “opportunity cost” of allocating funds to other investments within the company • Is not directly driven by market data and hence is less volatile
Market Implied Discount Rate (sale of defaulted assets)	<p>Description:</p> <ul style="list-style-type: none"> • Implied discount rate on recovery cash flows computed by comparing the market price of defaulted loans/bonds sold 30 days after default to their eventual recovery value and making assumptions on recovery timing <p>Highlights:</p> <ul style="list-style-type: none"> • Rate reflects investors’ view on expected recovery and volatility of defaulted assets • Based on corporate debt instruments, might be less relevant to specific FIs depending on their exposures
Yield on other High Risk Assets (non-defaulted)	<p>Description:</p> <ul style="list-style-type: none"> • Defaulted assets may be considered high risk and hence the appropriate discount rate could be estimated using returns on other high risk assets <p>Highlights:</p> <ul style="list-style-type: none"> • Rate reflects investors’ view on expected recovery and volatility of defaulted assets • Based on corporate debt instruments, might be less relevant to specific FIs depending on their exposures
Weighted Average Cost of Capital	<p>Description:</p> <ul style="list-style-type: none"> • WACC is the overall cost of funding based on the capital structure of the firm and considers the cost and weight of both equity and debt financing <p>Highlights:</p> <ul style="list-style-type: none"> • Varies over time with the bank’s leverage, risk premium, and credit condition, as well as market conditions • Reflects the composite cost of funding rather than volatility of recovery rates

Example – Estimating WACC (Weighted Average Cost of Capital)



The Formula for WACC

- The weighted average cost of capital, WACC, is the minimum rate of return allowable and still meet financing obligations.

$$WACC = W_d(K_d)(1-t) + W_{pfd}(K_{pfd}) + (W_e)(K_e)$$

Where W_d = The proportion of the financing provided by debt

W_{pfd} = The proportion of the financing provided by preferred stock

W_e = The proportion of the financing provided by equity

K_d = The cost of debt

t = Corporate tax rate

K_{pfd} = dividend/ share price

The K_e = Risk free rate (r_f) + Beta (β) * Market risk premium ($r_m - r_f$)

An Example

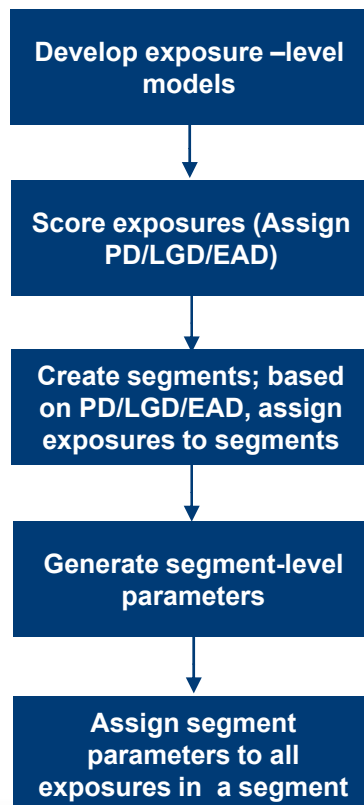
	Liability/Equity (\$)	Proportion (W)	Inputs for Cost of Capital	Effective Cost of Capital	WACC
Debt	\$250,000	$W_d = 0.25$	$K_d = 8\%$, $t = 30\%$	$K_d(1-t) = 5.6\%$	$W_d K_d(1-t) = 1.4\%$
Preferred Equity	\$250,000	$W_{pfd} = 0.25$	$K_{pfd} = 6\%$	$K_{pfd} = 6.0\%$	$W_{pfd}(K_{pfd}) = 1.5\%$
Common Equity	\$500,000	$W_e = 0.50$	$r_f = 4.4\%$, $\beta = 0.85$ $r_m - r_f = 6.6\%$	$K_e = R_f + \beta (r_m - r_f)$ $= 10.01\%$	$W_e K_e = 5.0\%$
	\$1,000,000	1.00			7.9%

Segmentation Systems: An Introduction

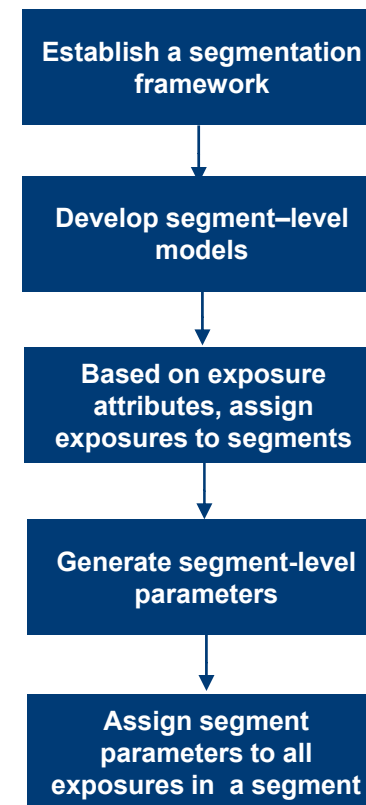


For retail exposures, Basel II requires Banks to assign risk parameters (for the purposes of risk-weighted asset calculation) at the segment level. Banks typically choose from one of the two approaches listed below to develop retail segments

Segmentation Based On Modeled Attributes (PD/LGD/EAD)



Segmentation Based On Raw Attributes (e.g., LTV)



Segmentation Systems: Key Considerations



Segmentation Based On Modeled Attributes (PD/LGD/EAD)

- This approach accounts for changes in the composition of the segment in assigning risk parameters
- This approach is operationally and computationally more complex because it requires each exposure to be scored independently

Segmentation Based On Raw Attributes (e.g., LTV)

- Does not account for changes in segment composition, has been traditionally used for risk management of retail exposures
- This approach is operationally and computationally simpler as it requires fewer scoring routines (equal to the number of segments)

Use Test: Definition & Interpretation



Regulatory Definition of Use Test

- Within the U.S. Basel II Final Rule, Banks are required to satisfy the “Use Test” requirement
- The requirement essentially mandates that Bank’s Basel II models, risk rating systems, segmentation systems, and data governance and management processes are consistent with existing risk management systems and processes

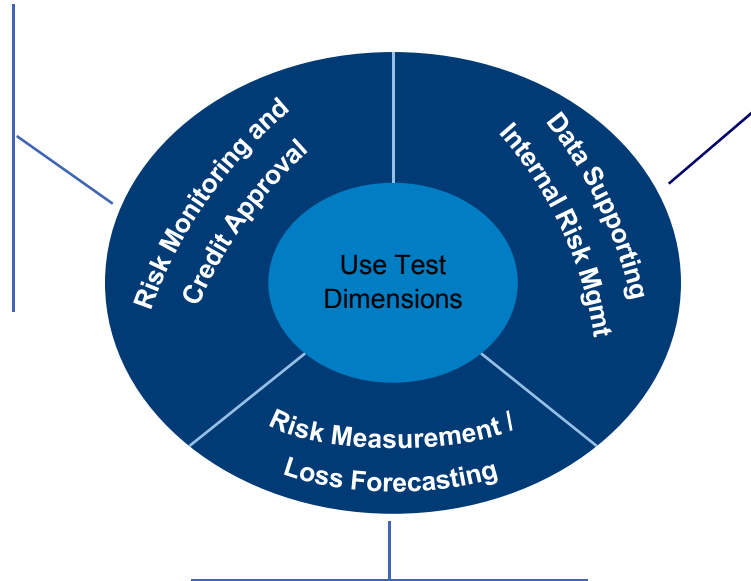
Interpretation of Use Test

- The U.S. regulatory guidance has provided Bank’s with considerable room for interpretation on the “Use Test”
 - » During a 2006 speech, Federal Reserve Chairman, Ben Bernanke said, “Under the use test, the systems and processes that a bank uses for regulatory capital purposes must be consistent with those used internally. Note that I use the word ‘consistent,’ not ‘identical.’”
 - » While this feedback did emphasize the fact that the “Use Test” did not require Bank’s to have identical regulatory and internal risk management systems, it did not provide prescriptive guidance regarding the approaches or methods which would satisfy the “Use Test”
 - » Banks have established their own approaches to satisfying the “Use Test” and establish a de-facto industry standard in the process

Dimensions for Substantiating "Use Test"



- Credit monitoring and approval processes should be aligned with the Basel II credit systems
- Example – Bank’s should use the same risk ratings across loan approval and monitoring, and Basel II capital calculations



- Historical/Current period data used for model development/ scoring should be consistent across BII and other risk processes
- Example – FICO scores used for Basel II models and other internal processes should be consistent

- While EC/ALLL and Basel II credit models may have some differences in underlying modeling approaches, key risk factors and segmentation frameworks should be aligned (differences should be well understood, documented, and explained)
- For example, the Bank should use similar modeling granularity (e.g., account level) and risk drivers (e.g., account age) for parameters across the various estimation frameworks

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