Enterprise Bank Risk Management Platform - Complete Calculation Guide

1. CREDIT RISK METRICS

1.1 Non-Performing Loans (NPL) Ratio

```
NPL Ratio = (Non-Performing Loans / Total Loan Portfolio) × 100

Example Calculation:
NPL Amount = $1,035 million
Total Loans = $45,000 million
NPL Ratio = ($1,035 / $45,000) × 100 = 2.3%

Industry Benchmarks:
- Good: < 3%
- Medium: 3-5%
- High: > 5%
```

1.2 Provision Coverage Ratio

```
Provision Coverage = (Loan Loss Provisions / Non-Performing Loans) × 100

Example Calculation:
Provisions = $709 million
NPL Amount = $1,035 million
Coverage Ratio = ($709 / $1,035) × 100 = 68.5%

Regulatory Standards:
- Minimum: 60%
- Good: 70-80%
- Strong: > 80%
```

1.3 Cost of Risk (Expected Credit Loss Rate)

```
Cost of Risk = (Expected Credit Loss / Average Total Loans) × 100

Example Calculation:
ECL = $850 million
Average Loans = $45,000 million
Cost of Risk = ($850 / $45,000) × 100 = 1.89%

Benchmarks:
- Low: < 1%
- Medium: 1-2%
- High: > 2%
```

1.4 IFRS 9 Staging Ratios

```
Stage 1 Ratio = (Stage 1 Assets / Total Loans) × 100
Stage 2 Ratio = (Stage 2 Assets / Total Loans) × 100
Stage 3 Ratio = (Stage 3 Assets / Total Loans) × 100

Example Calculations:
Stage 1 = $40,765 million (calculated as Total - Stage 2 - Stage 3)
Stage 2 = $3,200 million
Stage 3 = $1,035 million
Total = $45,000 million

Stage 1 Ratio = ($40,765 / $45,000) × 100 = 90.6%
Stage 2 Ratio = ($3,200 / $45,000) × 100 = 7.1%
Stage 3 Ratio = ($1,035 / $45,000) × 100 = 2.3%

Healthy Portfolio Distribution:
- Stage 1: > 85%
- Stage 2: < 10%
- Stage 3: < 5%
```

2. LIQUIDITY RISK METRICS (BASEL III)

2.1 Liquidity Coverage Ratio (LCR)

```
LCR = (High Quality Liquid Assets / Total Net Cash Outflows over 30 days) × 100

Example Calculation:
HQLA = $8,500 million
Net Cash Outflows = $7,400 million
LCR = ($8,500 / $7,400) × 100 = 115%

Basel III Requirements:
- Minimum: 100%
- Buffer: 105-110%
- Strong: > 120%
```

2.2 Net Stable Funding Ratio (NSFR)

```
NSFR = (Available Stable Funding / Required Stable Funding) × 100

Example Calculation:
ASF = $42,000 million
RSF = $38,900 million
NSFR = ($42,000 / $38,900) × 100 = 108%

Basel III Requirements:
- Minimum: 100%
- Adequate: 105-115%
- Strong: > 115%
```

2.3 Deposit Concentration Ratio

```
Deposit Ratio = (Customer Deposits / Total Funding) × 100

Example Calculation:
Customer Deposits = $45,000 million
Wholesale Funding = $12,000 million
Total Funding = $45,000 + $12,000 = $57,000 million
Deposit Ratio = ($45,000 / $57,000) × 100 = 78.9%

Risk Thresholds:
- Strong: > 75%
- Adequate: 60-75%
- Weak: < 60%
```

2.4 Liquidity Buffer

```
Liquidity Buffer = ((HQLA - Required Cash Outflows) / HQLA) × 100

Example Calculation:
HQLA = $8,500 million
Required Outflows = $7,400 million
Buffer = (($8,500 - $7,400) / $8,500) × 100 = 12.9%

Management Targets:
- Minimum: 5%
- Target: 10-15%
- Conservative: > 20%
```

3. MARKET RISK METRICS

3.1 Value at Risk (VaR) - Parametric Method

```
VaR = Portfolio Value × Z-Score × Volatility × √Time Horizon

Risk Factor VaR Calculations:

Interest Rate VaR:
IR_VaR = $15,000M × 2.326 × 0.008 × √1 = $279.1M

FX VaR:
FX_VaR = $800M × 2.326 × 0.12 × √1 = $22.3M

Equity VaR:
Equity_VaR = $500M × 2.326 × 0.25 × √1 = $29.1M

Credit Spread VaR:
CS_VaR = $1,200M × 2.326 × 0.15 × √1 = $41.9M

Commodity VaR:
Commodity_VaR = $200M × 2.326 × 0.30 × √1 = $13.9M

Portfolio VaR (with 85% diversification):
Total_VaR = (279.1 + 22.3 + 29.1 + 41.9 + 13.9) × 0.85 = $328.6M

Scaled Daily VaR = $328.6M × 0.038 = $12.5M

Where:
- Z-Score (99%): 2.326
- Portfolio volatility: 2.5%
- Time horizon: 1 day
- Diversification benefit: 15%
```

3.2 Stressed VaR

```
Stressed VaR = Regular VaR × Stress Multiplier

Example Calculation:
Regular VaR = $12.5M
Stress Multiplier = 1.5 (based on historical stress periods)
Stressed VaR = $12.5M × 1.5 = $18.8M

Regulatory Requirements:
- Must use stressed market conditions
- Typically 1.5-3x regular VaR
- Updates quarterly
```

3.3 VaR Utilization Rate

```
Utilization Rate = (Current VaR / VaR Limit) × 100

Example Calculation:
Current VaR = $12.5M
VaR Limit = $15.0M
Utilization = ($12.5 / $15.0) × 100 = 83.3%

Risk Management Levels:
- Green Zone: < 70%
- Yellow Zone: 70-90%
- Red Zone: > 90%
```

4. CAPITAL ADEQUACY METRICS (BASEL III)

4.1 Common Equity Tier 1 (CET1) Ratio

```
CET1 Ratio = (CET1 Capital / Risk Weighted Assets) × 100

Example Calculation:
CET1 Capital = $17,750M
RWA = $125,000M
CET1 Ratio = ($17,750 / $125,000) × 100 = 14.2%

Basel III Requirements:
- Minimum: 4.5%
- Capital Conservation Buffer: 2.5% (Total: 7.0%)
- Systemic Buffer: 1-3.5%
- Well Capitalized: > 12%
```

4.2 Tier 1 Capital Ratio

```
Tier 1 Ratio = (Tier 1 Capital / Risk Weighted Assets) × 100

Example Calculation:
Tier 1 Capital = $17,750M (same as CET1 for this bank)
RWA = $125,000M
Tier 1 Ratio = ($17,750 / $125,000) × 100 = 14.2%

Basel III Requirements:
- Minimum: 6.0%
- With Buffers: 8.5%
- Strong: > 12%
```

4.3 Total Capital Ratio

```
Total Capital Ratio = (Total Capital / Risk Weighted Assets) × 100

Example Calculation:
Tier 1 Capital = $17,750M
Tier 2 Capital = $3,500M
Total Capital = $21,250M
RWA = $125,000M
Total Ratio = ($21,250 / $125,000) × 100 = 17.0%

Basel III Requirements:
- Minimum: 8.0%
- With Buffers: 10.5%
- Strong: > 15%
```

5. OPERATIONAL RISK METRICS

5.1 Operational Loss Rate

```
Annual Loss Rate = (YTD Operational Losses / Average Revenue) × 100

Example Calculation:
YTD Losses = $2.3M
Average Revenue = $1,200M (assumed)
Loss Rate = ($2.3 / $1,200) × 100 = 0.19%

Industry Benchmarks:
- Low: < 0.2%
- Medium: 0.2-0.5%
- High: > 0.5%
```

5.2 Key Risk Indicator (KRI) Coverage

```
KRI Coverage = (Active KRIs / Total Risk Areas) × 100

Example:
Active KRIs = 147
Total Risk Areas = 156
Coverage = (147 / 156) × 100 = 94.2%

Target Levels:
- Minimum: 85%
- Good: 90-95%
- Comprehensive: > 95%
```

5.3 Control Effectiveness Score

```
Control Effectiveness = Σ(Control Rating × Weight) / Total Possible Score × 100

Example Calculation:
- Process Controls: 95% × 0.3 = 28.5
- Technology Controls: 92% × 0.25 = 23.0
- People Controls: 94% × 0.25 = 23.5
- Governance Controls: 96% × 0.2 = 19.2
Total Score = 94.2%

Rating Scale:
- Excellent: > 95%
- Good: 85-95%
- Adequate: 75-85%
- Needs Improvement: < 75%
```

6. REGULATORY COMPLIANCE METRICS

6.1 Basel III Compliance Score

```
Compliance Score = (Met Requirements / Total Requirements) × 100

Capital Requirements:
- CET1 > 4.5%: ✓ (14.2%)
- Tier 1 > 6.0%: ✓ (14.2%)
- Total > 8.0%: ✓ (17.0%)
- Conservation Buffer: ✓
Score: 100%

Liquidity Requirements:
- LCR > 100%: ✓ (115%)
- NSFR > 100%: ✓ (108%)
Score: 100%
```

6.2 IFRS 9 Implementation Score

```
Implementation Areas:
- Model Development: 100%
- Data Quality: 95%
- System Integration: 100%
- Governance: 98%
- Validation: 100%

Overall Score = (100 + 95 + 100 + 98 + 100) / 5 = 98.6%
```

7. STRESS TESTING CALCULATIONS

7.1 Severely Adverse Scenario Impact

```
Capital Depletion Calculation:

Base CET1 Ratio: 14.2%
Stress Scenario Impacts:
- Credit Losses: -1.8% (from increased NPLs)
- Trading Losses: -0.3% (market volatility)
- Operational Losses: -0.2% (elevated risks)
Total Impact: -2.3%

Stressed CET1 = 14.2% - 2.3% = 11.9%

Pass/Fail: PASS (above 7% minimum)
```

7.2 Liquidity Stress Testing

```
Stress Scenario Cash Outflows:

Normal Conditions:
- Retail Deposits: 5% runoff
- Wholesale: 25% runoff
- Committed Facilities: 10% drawdown

Severe Stress:
- Retail Deposits: 15% runoff
- Wholesale: 75% runoff
- Committed Facilities: 50% drawdown

Stressed LCR Calculation:
HQLA = $8,500M (unchanged)
Stressed Outflows = $8,947M
Stressed LCR = ($8,500 / $8,947) × 100 = 95%

Result: FAIL (below 100% minimum)
```

8. PORTFOLIO ANALYTICS

8.1 Risk-Adjusted Return on Capital (RAROC)

```
RAROC = (Net Income - Expected Loss) / Economic Capital × 100

Example by Business Line:
Retail Banking:
- Net Income: $450M
- Expected Loss: $120M
- Economic Capital: $2,200M
- RAROC = ($450 - $120) / $2,200 × 100 = 15.0%

Corporate Banking:
- Net Income: $280M
- Expected Loss: $85M
- Economic Capital: $1,800M
- RAROC = ($280 - $85) / $1,800 × 100 = 10.8%
```

8.2 Economic Capital Allocation

```
Economic Capital = VaR × Multiplier × √(Time Horizon)

Credit Risk EC = $850M × 3.0 × √1 = $2,550M
Market Risk EC = $12.5M × 3.0 × √252 = $595M
Operational Risk EC = $180M × 3.0 × √1 = $540M

Total Economic Capital = $3,685M

Capital Allocation:
- Credit Risk: 69.2%
- Market Risk: 16.1%
- Operational Risk: 14.7%
```

9. EARLY WARNING INDICATORS

9.1 Credit Migration Matrix

```
Migration Analysis (Annual):
AAA to AA: 2.5%
AA to A: 5.2%
A to BBB: 8.1%
BBB to BB: 12.4%
BB to B: 18.7%
B to CCC: 25.3%
CCC to Default: 35.6%

Unexpected Migration Alert:
If actual > expected by >20%, trigger alert
```

9.2 Concentration Risk Metrics

```
Single Name Concentration:
Top 10 Exposures / Total Portfolio = 15.8%
Limit: 20%
Status: Within limits

Sector Concentration:
Real Estate: 28.5% (Limit: 30%)
Manufacturing: 22.1% (Limit: 25%)
Technology: 18.4% (Limit: 20%)

Geographic Concentration:
Domestic: 72.4%
International: 27.6%
```

10. PERFORMANCE BENCHMARKING

10.1 Peer Group Analysis

```
Bank Performance vs Peer Average:

NPL Ratio: 2.3% vs 2.8% (Better by 0.5%)
ROE: 12.8% vs 11.2% (Better by 1.6%)
Cost/Income: 58.2% vs 62.1% (Better by 3.9%)
CET1 Ratio: 14.2% vs 12.9% (Better by 1.3%)

Percentile Ranking:
- Asset Quality: 75th percentile
- Profitability: 80th percentile
- Efficiency: 70th percentile
- Capital Strength: 85th percentile
```

This comprehensive calculation guide covers all metrics displayed in the Enterprise Bank Risk Management Platform, providing the mathematical foundation for risk assessment, regulatory compliance, and strategic decision-making in accordance with Basel III, IFRS 9, and other international banking standards.