

**RISK MANAGEMENT OF CREDIT ASSETS:
THE NEXT GREAT FINANCIAL
CHALLENGE IN THE NEW MILLENIUM**

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Managing Credit Risk: The Challenge in the New Millennium

Edward I. Altman
(Seminar Outline)

Subject Area

- Credit Risk: A Global Challenge in High and Low Risk Regions
- The New BIS Guidelines on Capital Allocation
- Credit Risk Management Issues - Credit Culture Importance
 - Caveats, Importance and Recommendations
- The Pricing of Credit Risk Assets
- Credit Scoring and Rating Systems
- Traditional and Non-Traditional Credit Scoring Systems
 - Approaches and Tests for Implementation
 - Predicting Financial Distress (Z and ZETA Models)
 - Models based on Stock Price - KMV, etc.
 - Neural Networks and Rating Replication Models

(Seminar Outline Continued)

- A Model for Emerging Market Credits
 - Country Risk Issues
- CreditMetrics® and Other Portfolio Frameworks
- Default Rates, Recoveries, Mortality Rates and Losses
 - Capital Market Experience, 1971-2000
 - Default Recovery Rates on Bonds and Bank Loans
 - Correlation Between Default and Recovery Rates
 - Mortality Rate Concept and Results
 - Valuation of Fixed Income Securities
 - Credit Rating Migration Analysis
- Collateralized Bond/Loan Obligations - Structured Finance
- Understanding and Using Credit Derivatives
- Corporate Bond and Commercial Loan Portfolio Analysis

CREDIT RISK MANAGEMENT ISSUES

Credit Risk: A Global Challenge

In Low Credit Risk Regions (1998 - No Longer in 2001)

- New Emphasis on Sophisticated Risk Management and the Changing Regulatory Environment for Banks
- Refinements of Credit Scoring Techniques
- Large Credible Databases - Defaults, Migration
- Loans as Securities
- Portfolio Strategies
- Offensive Credit Risk Products
 - Derivatives, Credit Insurance, Securitizations

Credit Risk: A Global Challenge

(Continued)

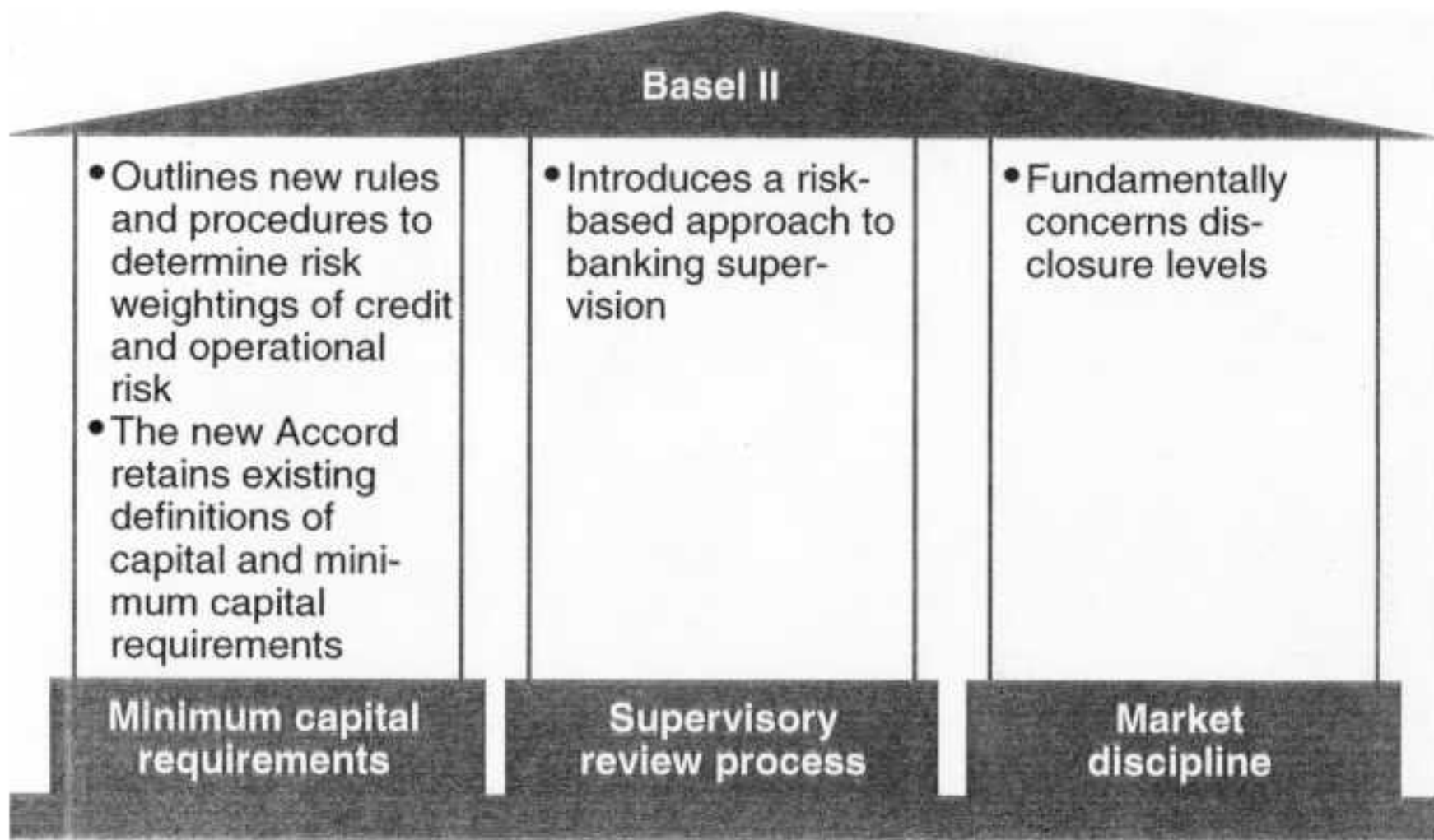
In High Credit Risk Regions

- Lack of Credit Culture (e.g., Asia, Latin America), U.S. in 1996 - 1998?
- Losses from Credit Assets Threaten Financial System
- Many Banks and Investment Firms Have Become Insolvent
- Austerity Programs Dampen Demand - Good?
- Banks Lose the Will to Lend to “Good Firms” - Economy Stagnates

Changing Regulatory Environment

- 1988 Regulators recognized need for risk-based Capital for Credit Risk (Basel Accord)
- 1995 Capital Regulations for Market Risk Published
- 1996-98 Capital Regulations for Credit Derivatives
- 1997 Discussion of using credit risk models for selected portfolios in the banking books
- 1999 New Credit Risk Recommendations
- Bucket Approach - External and Possibly Internal Ratings
 - Expected Final Recommendations by Fall 2001
 - Postpone Internal Models (Portfolio Approach)
- 2001 Revised Basel Guidelines
- Revised Buckets - Still Same Problems
 - Foundation and Advanced Internal Models
 - Final Guidelines Expected in Fall 2001 - Implemented by 2004

THREE PILLARS OF BASEL II



Although Basel II will be fully implemented no sooner than **2007, banks and the market may/should act now**

TIME LINE OF BASEL II



Banks

- Have sophisticated risk controlling system in place in order to satisfy requirements on data history by 2004/07
- Take action in order to shift asset mix
- Take action in loan pricing
- Take action in the respect to long term funding

Market

- May already consider Basel II in same transactions given maturities (e.g., MBS)
- May push banks to comply with Basel II ("Quality Standard")

Basel II may prove to be an incentive to make the credit pipeline more established ...

BASEL II AND THE CREDIT PIPELINE

New capital framework

Closer alignment of regulatory and economic capital

More sophisticated risk management systems

Instruments and process for advanced credit risk management is necessary in any case

Better external communication

Improvements on disclosure levels

Unbundling the Value Chain: The Credit Pipeline Concept



Two new mechanisms are introduced to calculate credit risk

APPROACHES TO CREDIT RISK CAPITAL CALCULATION

Standardized approach

- Use of external credit ratings in assigning risk weightings
- All the major agencies are recommended for use in this approach
- Where there are two ratings, the lowest should be taken
- Possibly, will be used by those banks whose internal models do not satisfy the minimum criteria for the Internal Ratings Based (IRB) approach

Internal Ratings Based approach

- The IRB approach provides a similar framework for measuring corporate, bank and sovereign exposures and a separate structure for retail, project finance* and equity exposures
- IRB consists of two potential approaches
 - Foundation approach**: Bank's own assessment of the probability of default
 - Advanced Approach: Banks will also use their own Loss-Given Defaults (LGD).
- The BIS intends all internationally active banks to use the IRB approach, but notes that it should be accessible to all institutions

* Not defined yet

** For the first two years post implementation the BIS is proposing that capital requirements determined under the advanced IRB approach should be at least 90% of the foundation IRB approach

Capital Adequacy Risk Weights from Various BIS Accords

(Corporate Assets Only)

Original 1988 Accord

All Ratings

100% of Minimum Capital (e.g. 8%)

1999 (June) Consultative BIS Proposal

Rating/Weight

AAA to AA-
20%

A+ to B-
100%

Below B-
150%

Unrated
100%

2001 (January) Consultative BIS Proposal

AAA to AA-
20%

A+ to A-
50%

BBB+ to BB-
100%

Below BB-
150%

Unrated
100%

Altman/Saunders Proposal (2000,2001)

AAA to AA-
10%

A+ to BBB-
30%

BB+ to B-
100%

Below B-
150%

Unrated
Internally
Based
Approach

Basic Architecture of an Internal Ratings-Based (IRB) Approach to Capital

- In order to become eligible for the IRB approach, a bank would first need to demonstrate that its internal rating system and processes are in accordance with the minimum standards and sound practice guidelines which will be set forward by the Basel Committee.
- The bank would furthermore need to provide to supervisors exposure amounts and estimates of some or all of the key loss statistics associated with these exposures, such as Probability of Default (PD), by internal rating grade (Foundation Approach).
- Based on the bank's estimate of the probability of default, as well as the estimates of the loss given default (LGD) and maturity of loan, a bank's exposures would be assigned to capital "buckets" (Advanced Approach). Each bucket would have an associated risk weight that incorporates the expected (up to 1.25%) and unexpected loss associated with estimates of PD and LGD, and possibly other risk characteristics.

Recent (2001) Basel Credit Risk Management Recommendations

- May establish two-tier system for banks for use of internal rating systems to set regulatory capital. Ones that can set loss given default estimates, [OR]
- Banks that can only calculate default probability may do so and have loss (recovery) probability estimates provided by regulators.
- Revised plan (January 2001) provides substantial guidance for banks and regulators on what Basel Committee considers as a strong, best practice risk rating system.
- Preliminary indications are that a large number of banks will attempt to have their internal rating system accepted.
- Basel Committee working to develop capital charge for operational risk. May not complete this work in time for revised capital rules.
- Next round of recommendations to take effect in 2004.

Risk Weights for Sovereign and Banks (Based on January 2001 BIS Proposal)

Sovereigns

Credit Assessment of Sovereign	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below B-	Unrated
Sovereign risk weights	0%	20%	50%	100%	150%	100%
Risk weights of banks	20%	50%	100%	100%	150%	100%

Suggestions (Altman): * Add a BB+ to BB- Category = 75%

* Eliminate Unrated Category and Use Internal Ratings

Risk Weights for Sovereign and Banks (Based on January 2001 BIS Proposal) (continued)

Banks

Credit Assessment of Banks	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below B-	Unrated
Risk weights	20%	50%	50%	100%	150%	50%
Risk weights for short-term claims	20%	20%	20%	50%	150%	20%

Minimum BIS Conditions for Collateral Transactions to be Eligible for Credit Mitigation

- **Legal Certainty**
- **Low Correlation with Exposure**
- **Robust Risk Management Process**
- **Focus on Underlying Credit**
- **Continuous and Conservative Valuation of Tranches**
- **Policies and Procedures**
- **Systems for Maintenance of Criteria**
- **Concentration Risk Consideration**
- **Roll-off Risks**
- **External Factors**
- **Disclosure**

Methodologies for Proposed Treatments of Collateralized Transactions

- **Comprehensive** - Focuses on the Cash Value of the Collateral taking into consideration its price volatility. Conservative valuation and partial collateralization haircuts possible based on volatility of exposure [OR]
- **Simple** - Maintains the substitution approach of the present Accord -- Collateral issuer's risk weight is substituted for the underlying obligor.

Note: Banks will be permitted to use either the comprehensive or simple alternatives provided they use the chosen one consistently and for the entire portfolio.

Opportunities and Responsibilities for Regulators of Credit Risk

- Assumes Acceptance of Revised BIS Guidelines
 - Bucket Approach
 - 2004 Application
- Sanctioning of Internal Rating Systems of Banks
 - Comprehensiveness of Data
 - Integrity of Data
 - Statistical Validity of Scoring Systems
 - Linkage of Scoring System to Ratings (Mapping)

Opportunities and Responsibilities for Regulators of Credit Risk (continued)

- Linkage of Rating System to Probability of Default (PD) Estimation
 - Mapping of Internal Ratings with Local Companies' External Ratings
 - Mapping of External Ratings of Local Company with International Experience (e.g. S&P)
- Loss Given Default (LGD) Estimation
 - Need for a Centralized Data Base on Recoveries by Asset Type and Collateral and Capital Structure
 - Crucial Role of Central Banks as Coordinator and Sanctioner
 - Similar Roles in Other Countries, i.e. Italy, U.S., Brazil, by Various Organizations, e.g. Bank Consortium, Trade Association or Central Banks.

The Importance of Credit Ratings

- For Risk Management in General
- Greater Understanding Between Borrowers and Lenders
- Linkage Between Internal Credit Scoring Models and Bond Ratings
- Databases - Defaults and Migration
 - Statistics Based on Original (Altman-Mortality) and Cumulative (Static-Pool - S&P), Cohorts (Moody's) Ratings
- BIS Standards on Capital Adequacy
 - 8% Rule Now Regardless of Risk - Until 2004
 - Bucket Approach Based on External (Possibly Internal) Ratings
 - Model Approach - Linked to Ratings and Portfolio Risk (Postponed)
- Credit Derivatives
 - Price Linked to Current Rating, Default and Recovery Rates
- Bond Insurance Companies'
 - Rating (AAA) of these Firms
 - Rating of Pools that are Enhanced and Asset-Backed Securities (ABS)

Rating Systems

- Bond Rating Agency Systems
 - US (3) - Moody's, S&P (20+ Notches), Fitch/IBCA
- Bank Rating Systems
 - 1 → 9, A → F, Ratings since 1995 (Moody's and S&P)
- Office of Controller of Currency System
 - Pass (0%), Substandard (20%), Doubtful (50%), Loss (100%)
- NAIC (Insurance Agency)
 - 1 → 6
- Local Rating Systems
 - Three (Japan)
 - SERASA (Brazil)
 - RAM (Malaysia)
 - New Zealand (NEW)
 - etc.

Debt Ratings

<u>Moody's</u>		<u>S&P</u>
Aaa		AAA
Aa1		AA+
Aa2		AA
Aa3		AA-
A1		A+
A2		A
A3		A-
Baa1		BBB+
Baa2	Investment	BBB
Baa3	Grade	BBB-
Ba1	High Yield	BB+
Ba2		BB
Ba3		BB-
B1		B+
B2		B
B3		B-
Caa1		CCC+
Caa		CCC
Caa3		CCC-
Ca		CC
C		C
		D

Scoring Systems

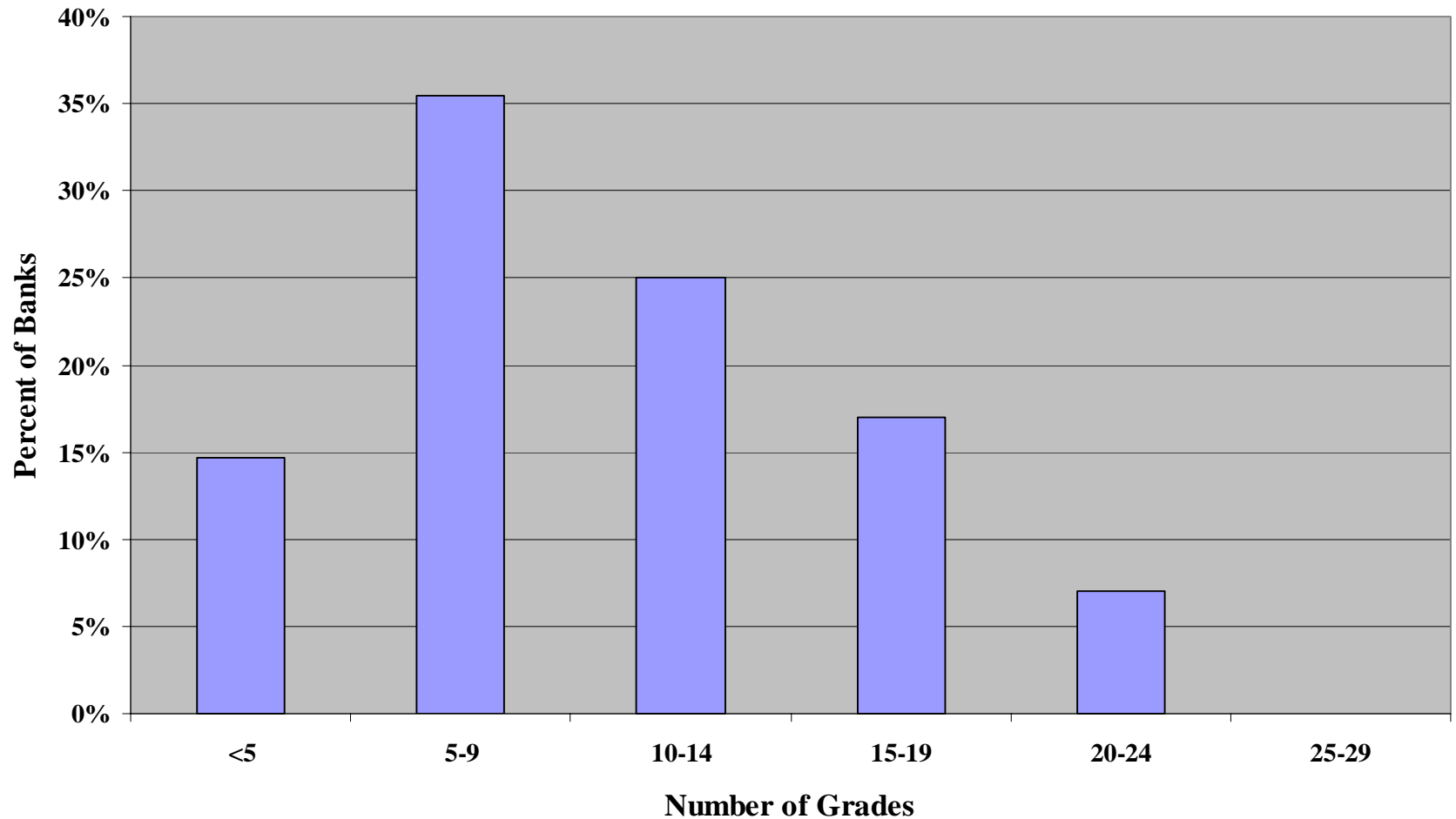
- Qualitative (Subjective)
- Univariate (Accounting/Market Measures)
- Multivariate (Accounting/Market Measures)
 - Discriminant, Logit, Probit Models (Linear, Quadratic)
 - Non-Linear Models (e.g., RPA, NN)
- Discriminant and Logit Models in Use
 - Consumer Models - Fair Isaacs
 - Z-Score (5) - Manufacturing
 - ZETA Score (7) - Industrials
 - Private Firm Models (eg. Risk Calc (Moody's), Z'' Score)
 - EM Score (4) - Emerging Markets, Industrial
 - Other - Bank Specialized Systems

Scoring Systems

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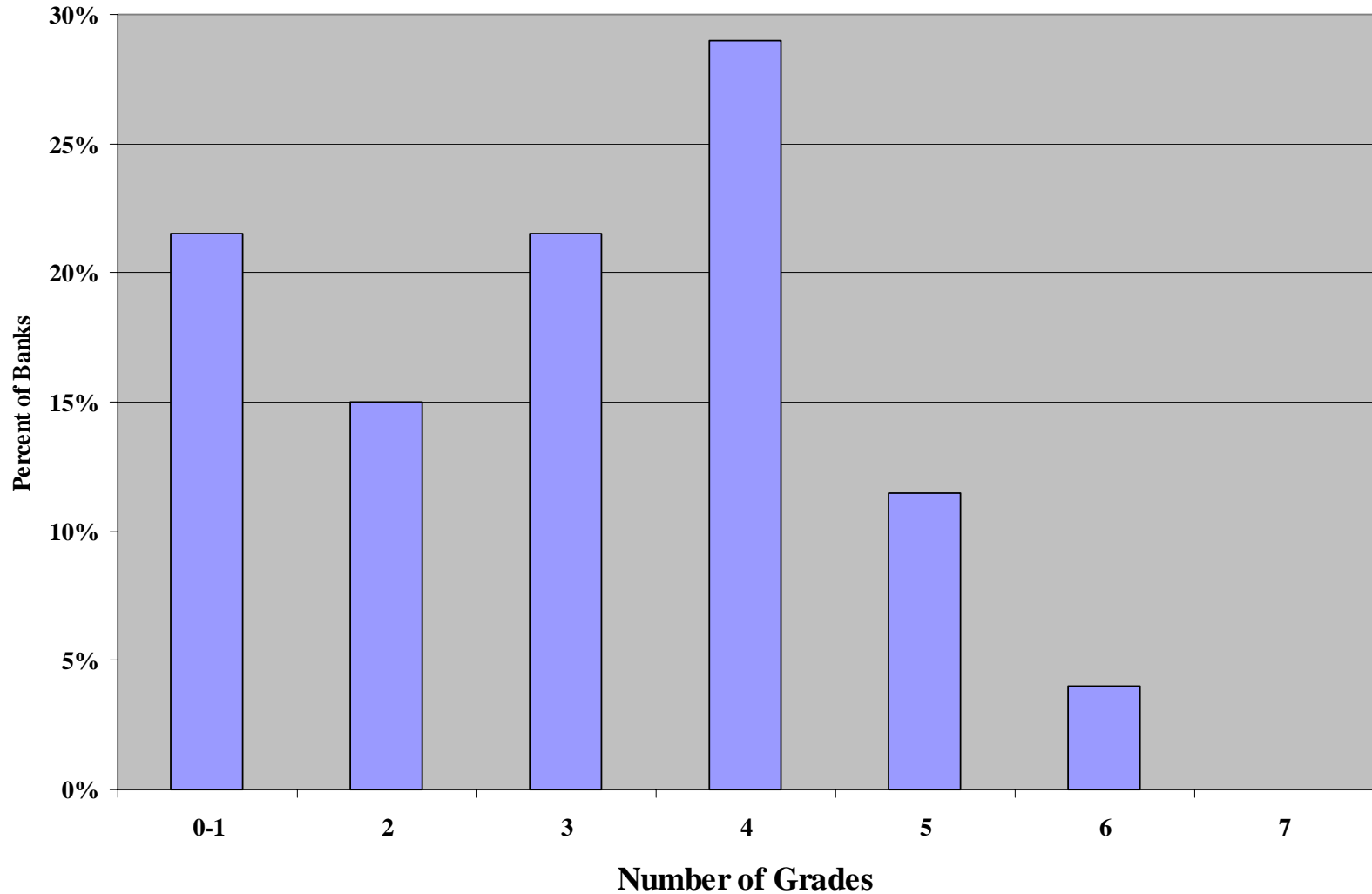
- Artificial Intelligence Systems
 - Expert Systems
 - Neural Networks (eg. Credit Model (S&P), CBI (Italy))
- Option/Contingent Models
 - Risk of Ruin
 - KMV Credit Monitor Model

Number of Non-Impaired Grades



Source: "Range of Practice in Banks' Internal Rating Systems," Discussion Paper, Basel Committee on Banking Supervision, January 2000.

Number of Impaired Grades



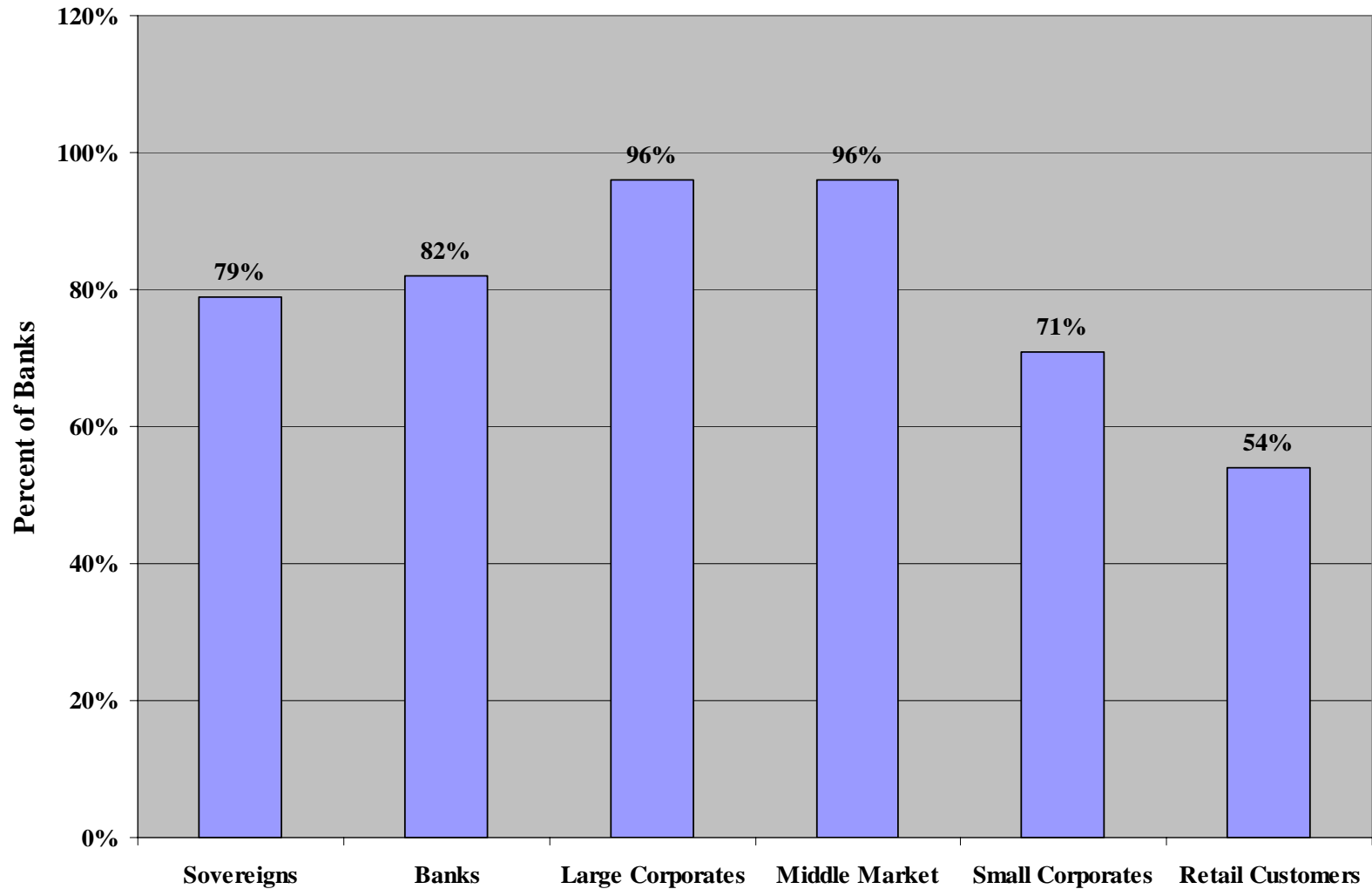
Source: "Range of Practice in Banks' Internal Rating Systems," Discussion Paper, Basel Committee on Banking Supervision, January 2000.

Rating System: An Example

PRIORITY: Map Internal Ratings to Public Rating Agencies

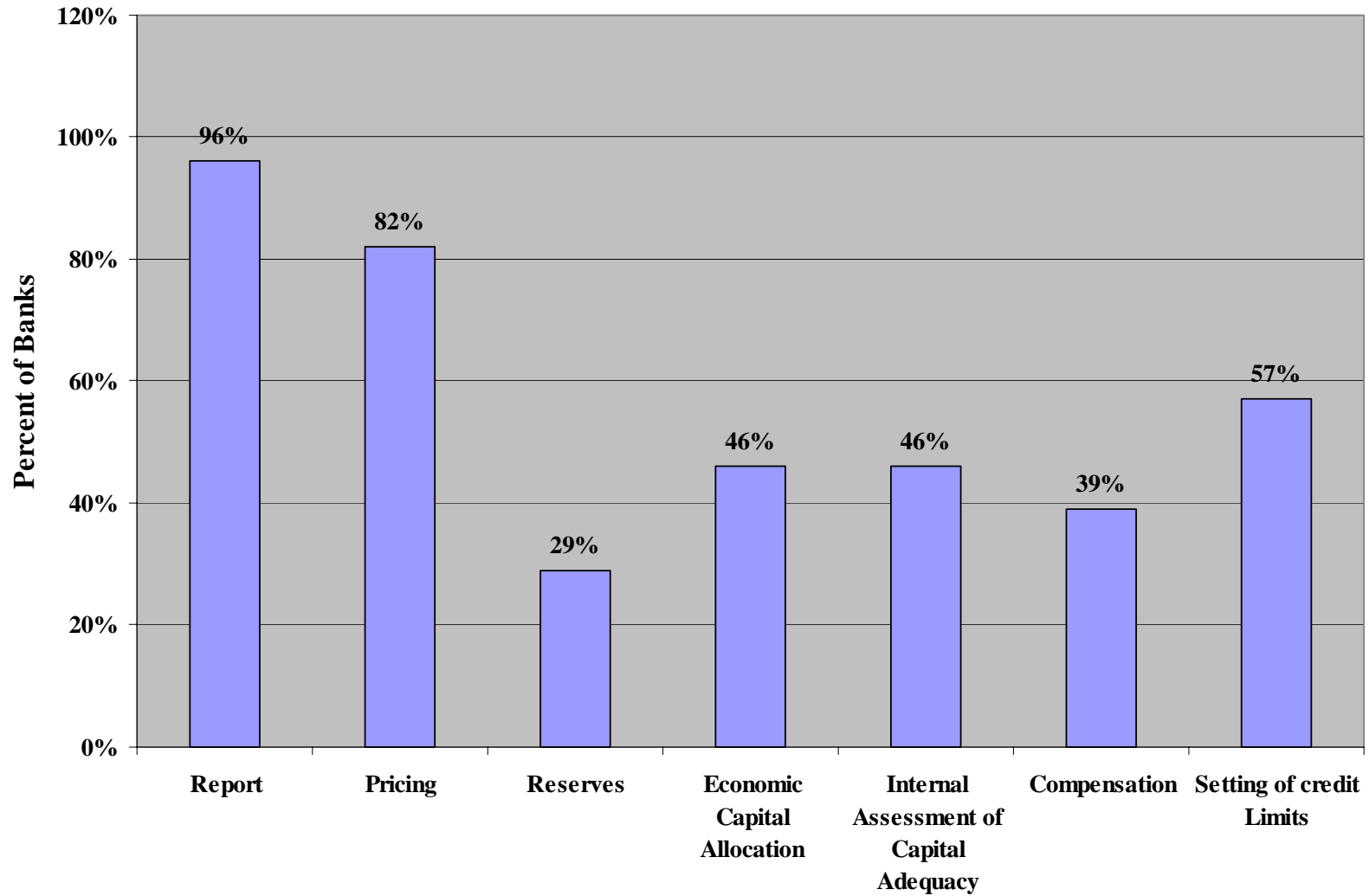
Internal Credit Ratings	Code	Meaning	Corresponding Moody's
1	A	Exceptional	Aaa
2	B	Excellent	Aa1
3	C	Strong	Aa2/Aa3
4	D	Good	A1/A2/A3
5	E	Satisfactory	Baa1/Baa2/Baa3
6	F	Adequate	Ba1
7	G	Watch List	Ba2/Ba3
8	H	Weak	B1
9	I	Substandard	B2/B3
10	L	Doubtful	Caa - O
	N	In Elimination	
	S	In Consolidation	
	Z	Pending Classification	

Rating Coverage



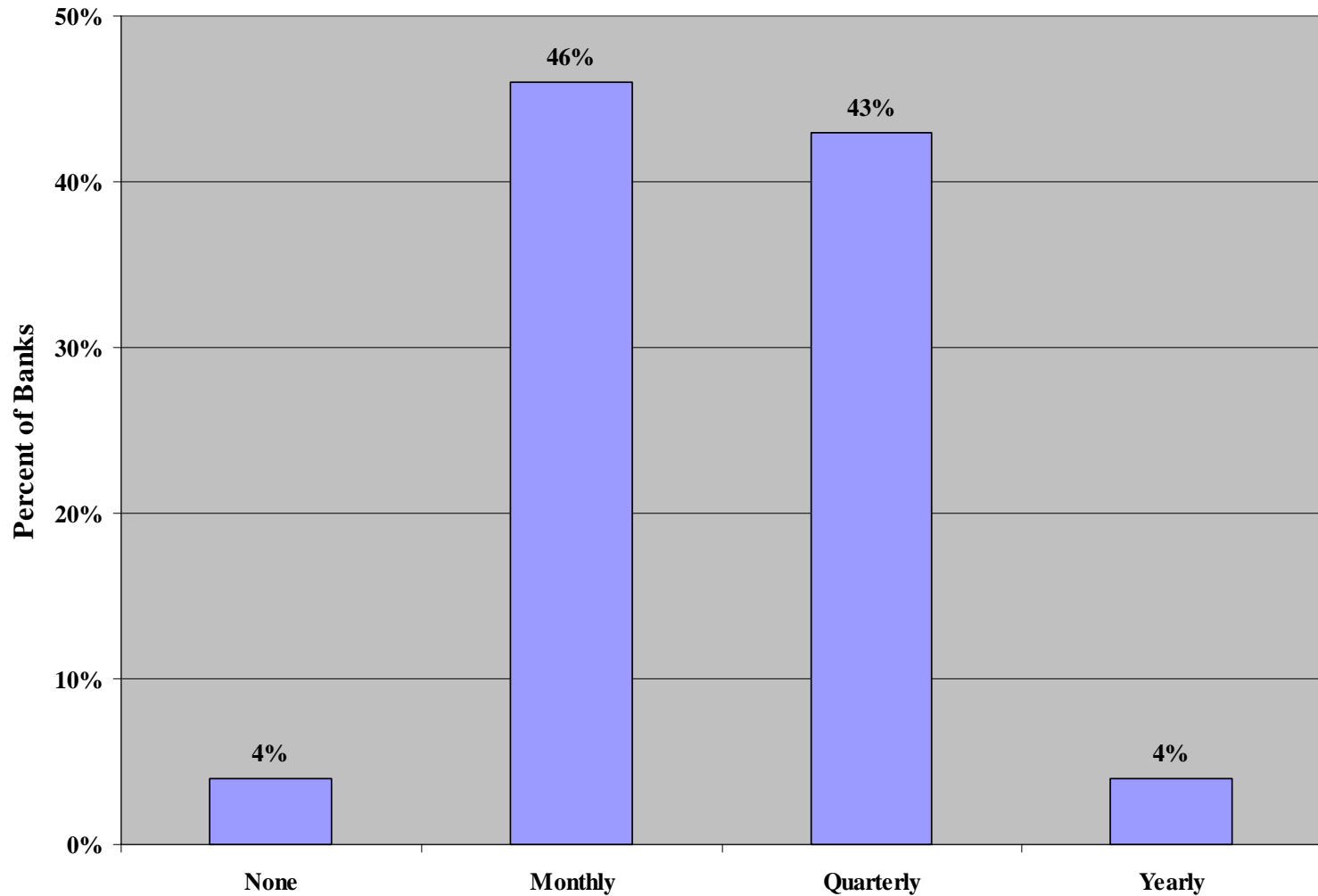
Source: "Range of Practice in Banks' Internal Rating Systems," Discussion Paper, Basel Committee on Banking Supervision, January 2000.

Rating Usage



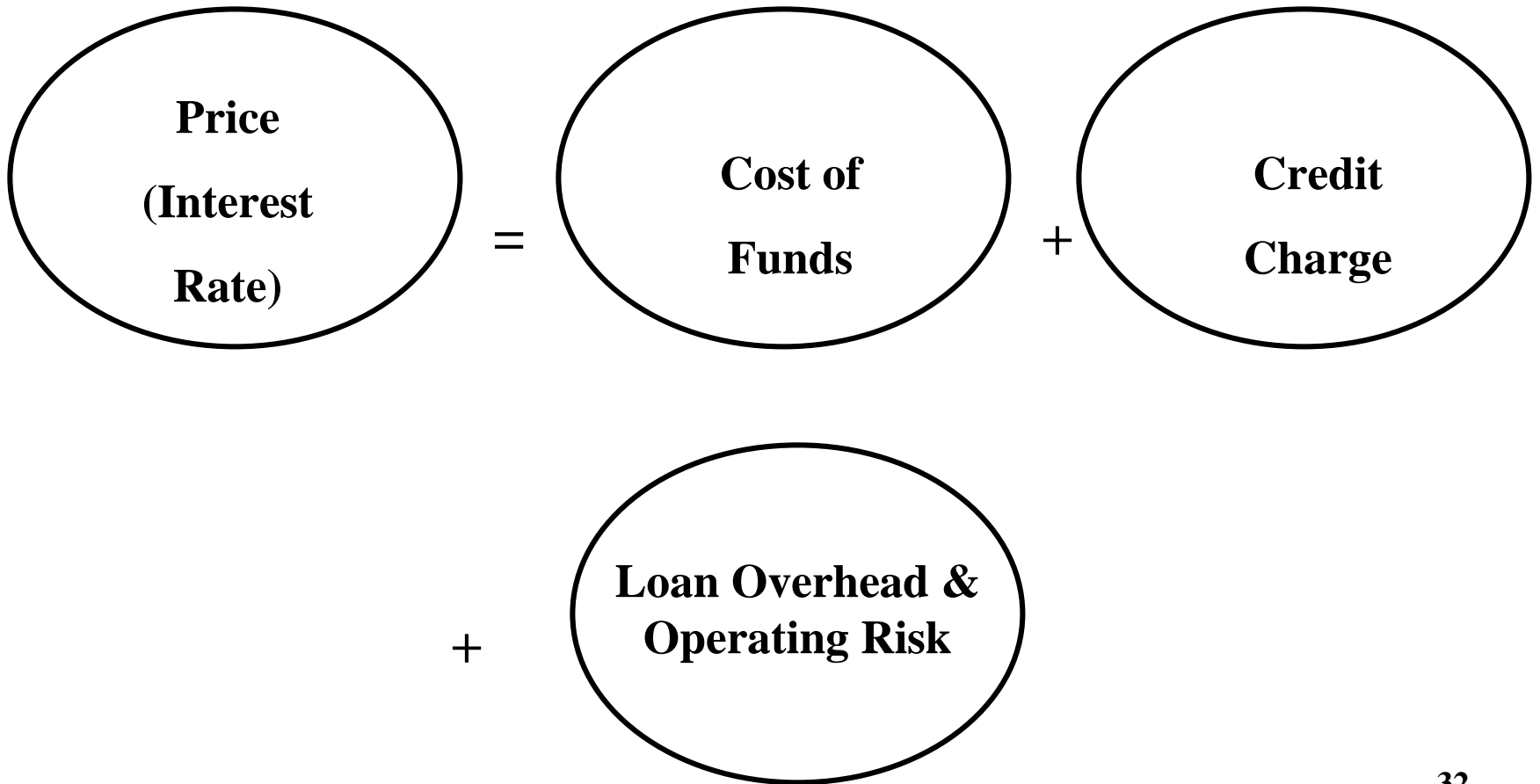
Source: "Range of Practice in Banks' Internal Rating Systems," Discussion Paper, Basel Committee on Banking Supervision, January 2000.

Calculation of Internal Capital Estimates

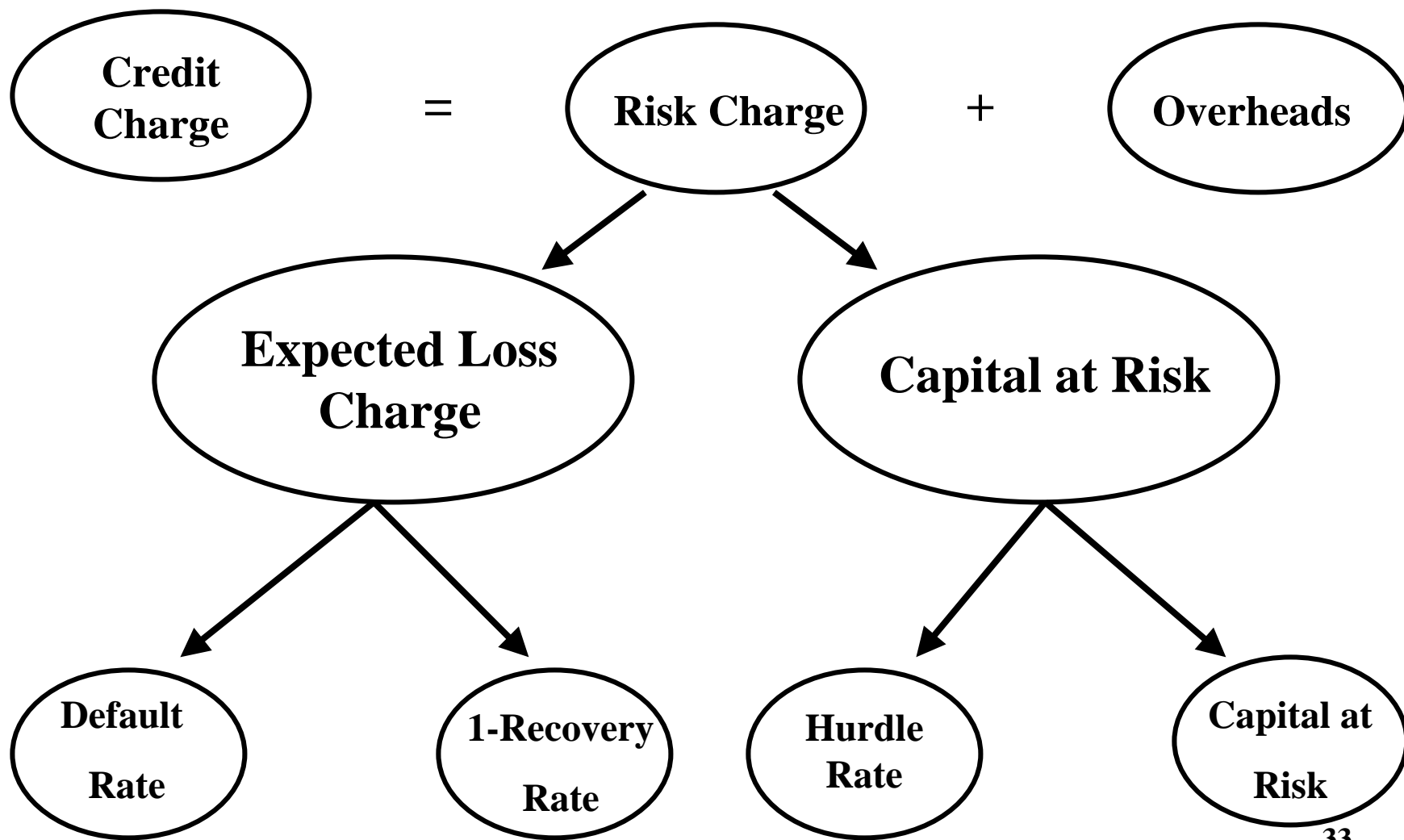


Source: "Range of Practice in Banks' Internal Rating Systems," Discussion Paper, Basel Committee on Banking Supervision, January 2000.

Risk Based Pricing Framework



Proposed Credit Risk Pricing Model



An Alternative Structure For Estimating Expected Loss

$$EL(\$) = P_{D,R}\% \times [(Exp(\$) - CRV(\$)) \times (1-UNREC(\%))]$$

where:

$P_{D,R}$ = Probability of Default in Credit Rating Class R

EXP = Exposure of Loan Facility

CRV = Collateral Recovery Value on Loan Facility

UNREC = Expected Recovery Rate on Unsecured Facilities

Risk Based Pricing: An Example

Given: 5-Year Senior Unsecured Loan

Risk Rating = BBB

Expected Default Rate = 0.3% per year (30 b.p.)

Expected Recovery Rate = 70%

Unexpected Loss (σ) 50 b.p. per year

BIS capital Allocation = 8%

Cost of Equity Capital = 15%

Overhead + Operations Risk Charge = 40 b.p. per year

Cost of Funds = 6%

Loan

$$\text{Price}_{(1)} = 6.0\% + (0.3\% \times [1-.7]) + (6 [0.5\%] \times 15\%) + 0.4\% = 6.94\%$$

Or

Loan

$$\text{Price}_{(2)} = 6.0\% + (0.3\% \times [1-.7]) + (8.0\% \times 15\%) + 0.4\% = 7.69\%$$

(1) Internal Model for Capital Allocation

(2) BIS Capital Allocation method

Bank Loans Vs. Bonds*

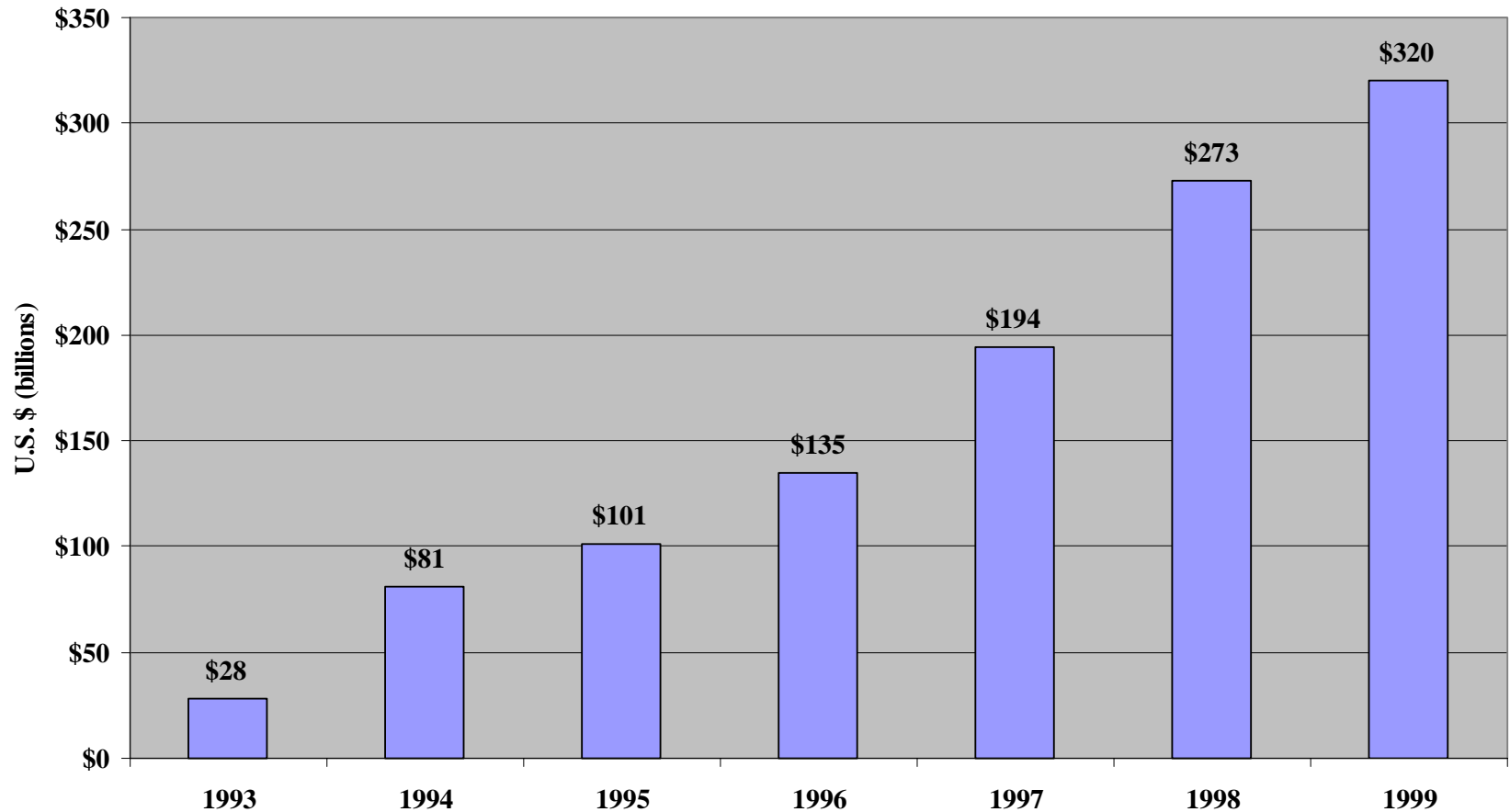
Although many corporations issue both bank loans and bonds, there are several distinguishing features which could make bank loans attractive to investors.

	Bank Loans	Bonds
Claim on Assets	Senior	Subordinated
Collateral	Secured	Mostly Unsecured
Rate	Floating	Fixed
Principal Repayment	Amortizing	At Call or Maturity
Covenant Package	Restrictive	Less Restrictive
Mandatory Prepayments	In Most Cases	Some Cases

* *Typical Structures*

New-Issue Leveraged Loan Volume in US Dollars*

U.S. Senior Secured Bank Loans New Issues*



Source: Merrill Lynch, Loan Pricing Corporation

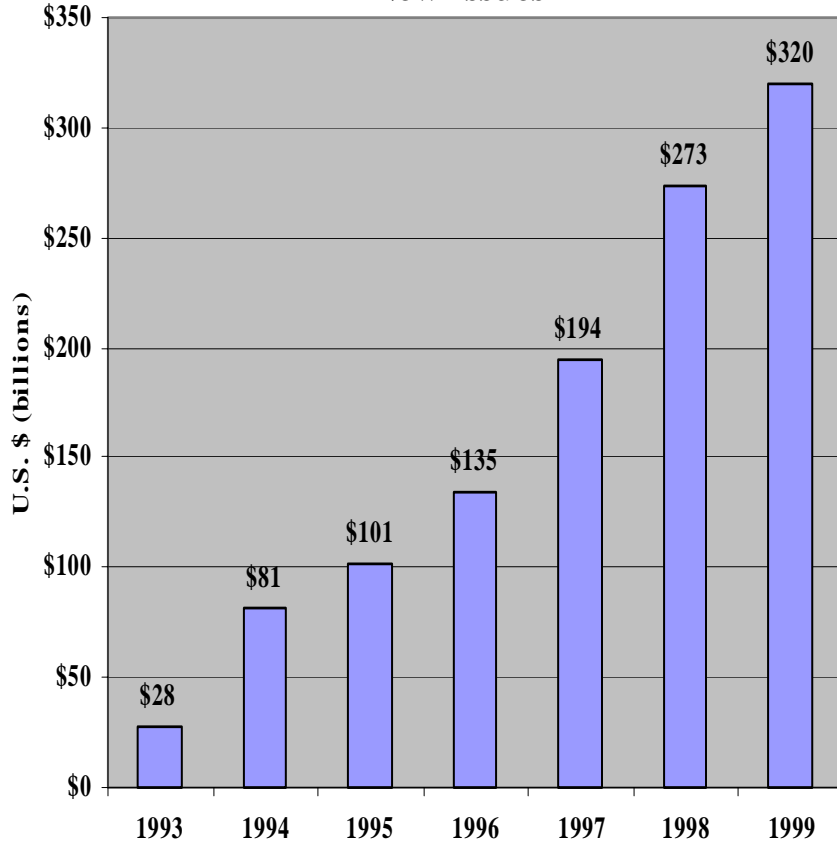
*Commercial loans with spreads of LIBOR + 150 bps or more

Exponential Growth of Market

The increasing number of new issues provides portfolio managers with greater selection options. The volume of trading in the secondary market offers portfolio managers greater liquidity to trade in and out of positions

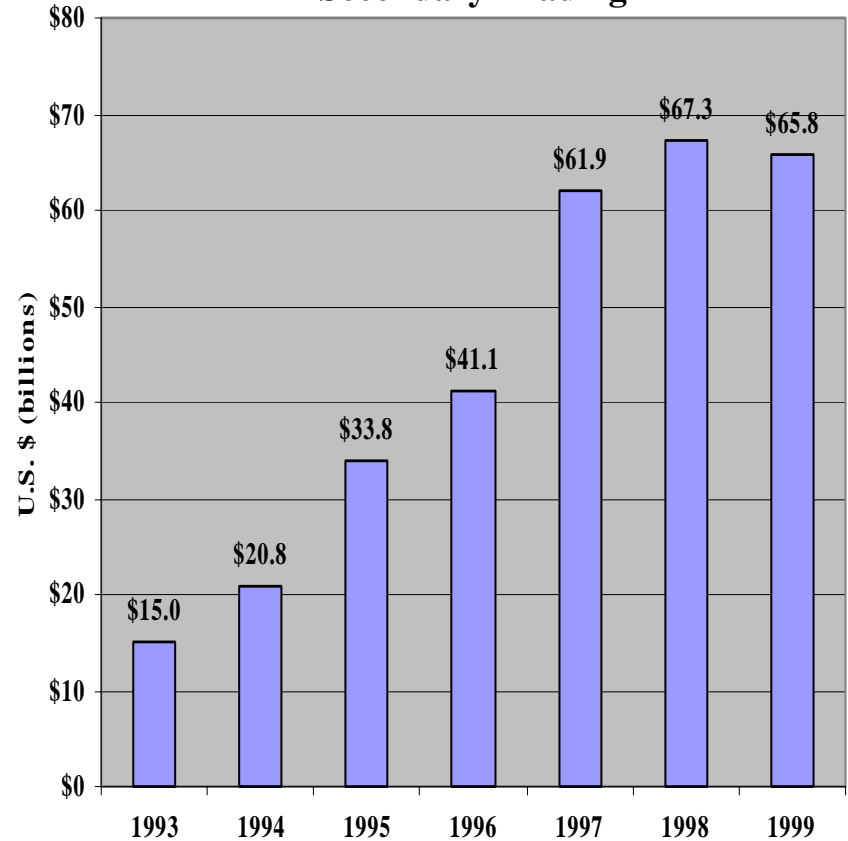
U.S. Senior Secured Bank Loans

New Issues



U.S. Loans

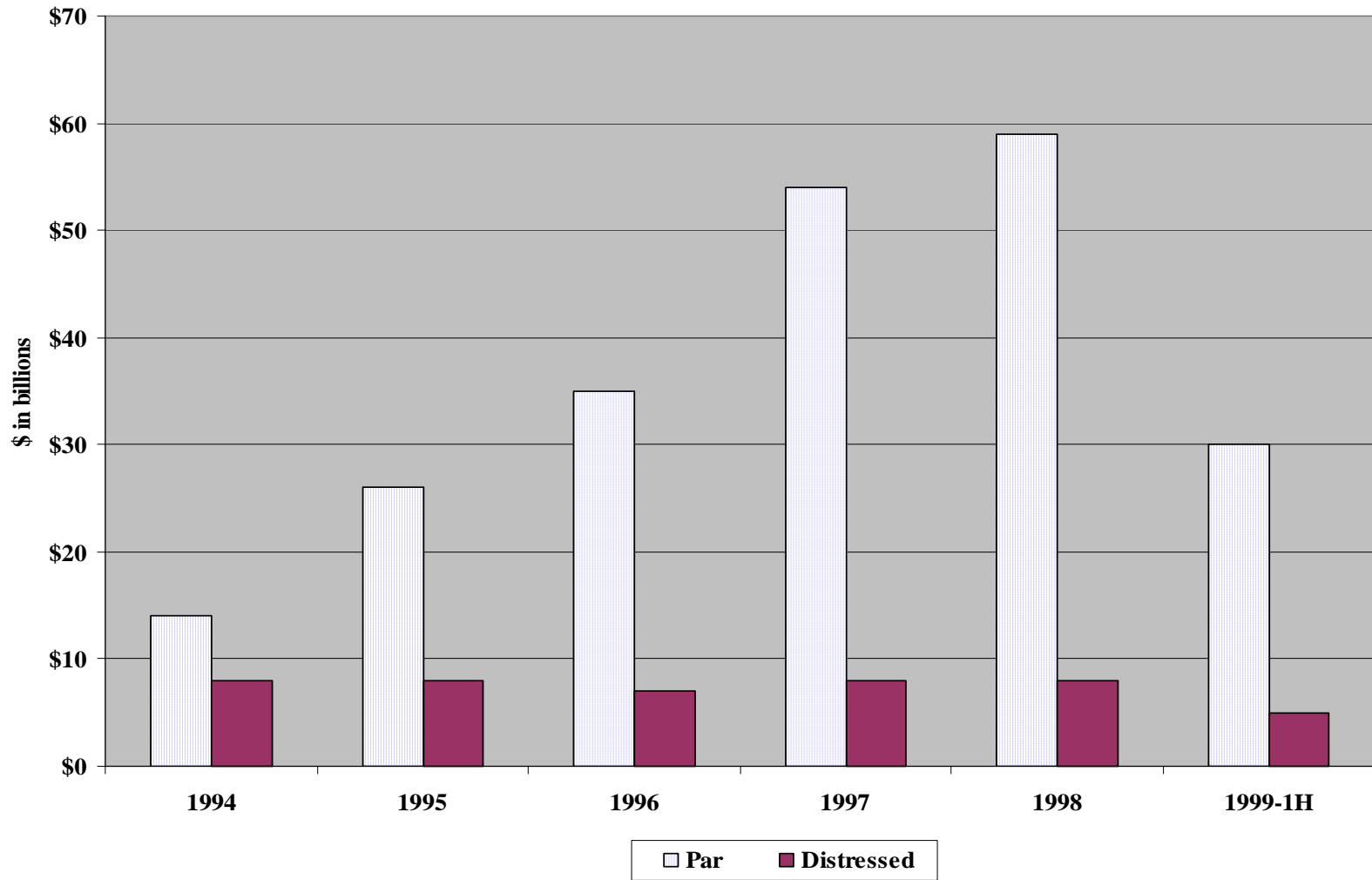
Secondary Trading



Source: Merrill Lynch, Loan Pricing Corporation

*Commercial loans with spreads of LIBOR + 150 bps or more

Secondary Loan Trading Volume - Par Vs. Distressed



Source: Loan Pricing Corp.

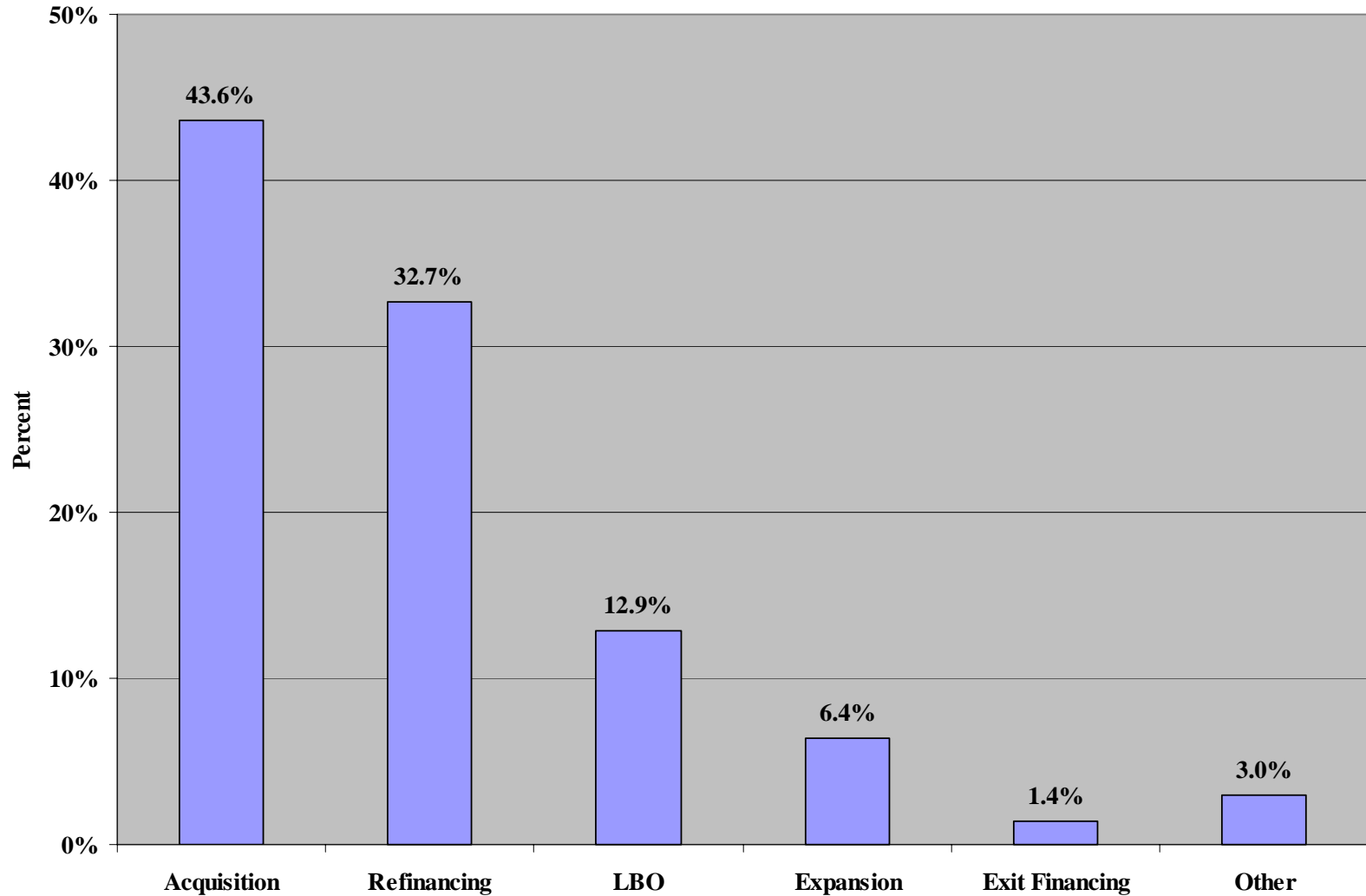
High Return for Level of Risk (July 1992 - June 2000)

Attractive returns and lower volatility suggest superior risk-adjusted returns compared to traditional asset classes, as measures by a higher Sharpe Ratio.

	Investment Grade							
	High Yield Loans	High Yield Bonds	Corporate Bonds	U.S. Treasuries	3-month T-Bills	Large U.S. Stocks	Small U.S. Stocks	World Stocks
Compound Annualized Return	8.37%	8.50%	7.02%	6.79%	4.86%	19.74%	15.08%	15.84%
Annualized Standard Deviation	1.97%	4.25%	4.94%	4.20%	0.30%	12.96%	17.13%	12.44%
Sharpe Ratio	1.78	0.86	0.44	0.46	N/A	1.15	0.6	0.88

Sources: Various Securities Firms' Indexes, LPC, PMD

New-Issue Loan Volume by Deal Purpose*



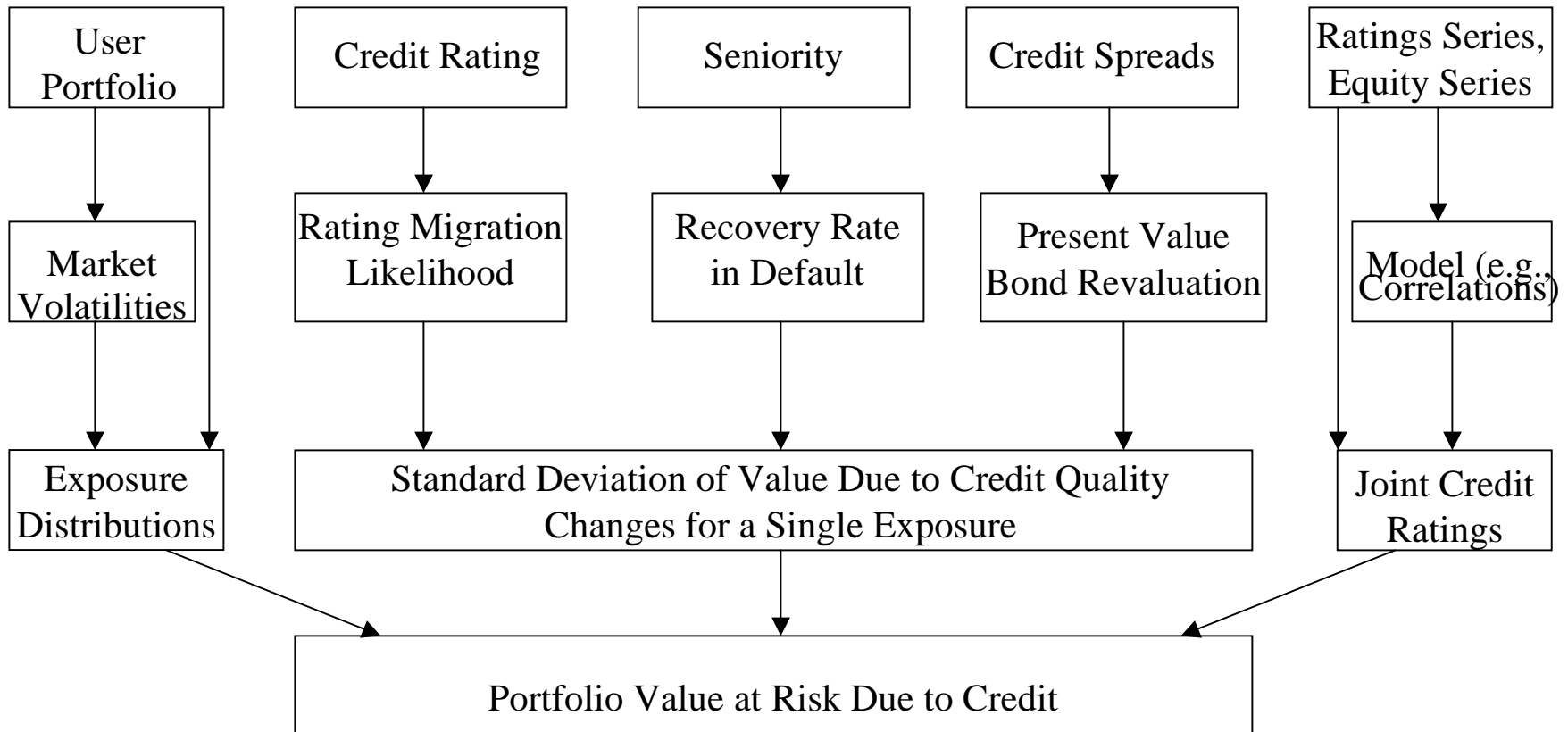
*As of June 30, 2000

CreditMetrics™ Framework

Exposures

Value At Risk Due To Credit

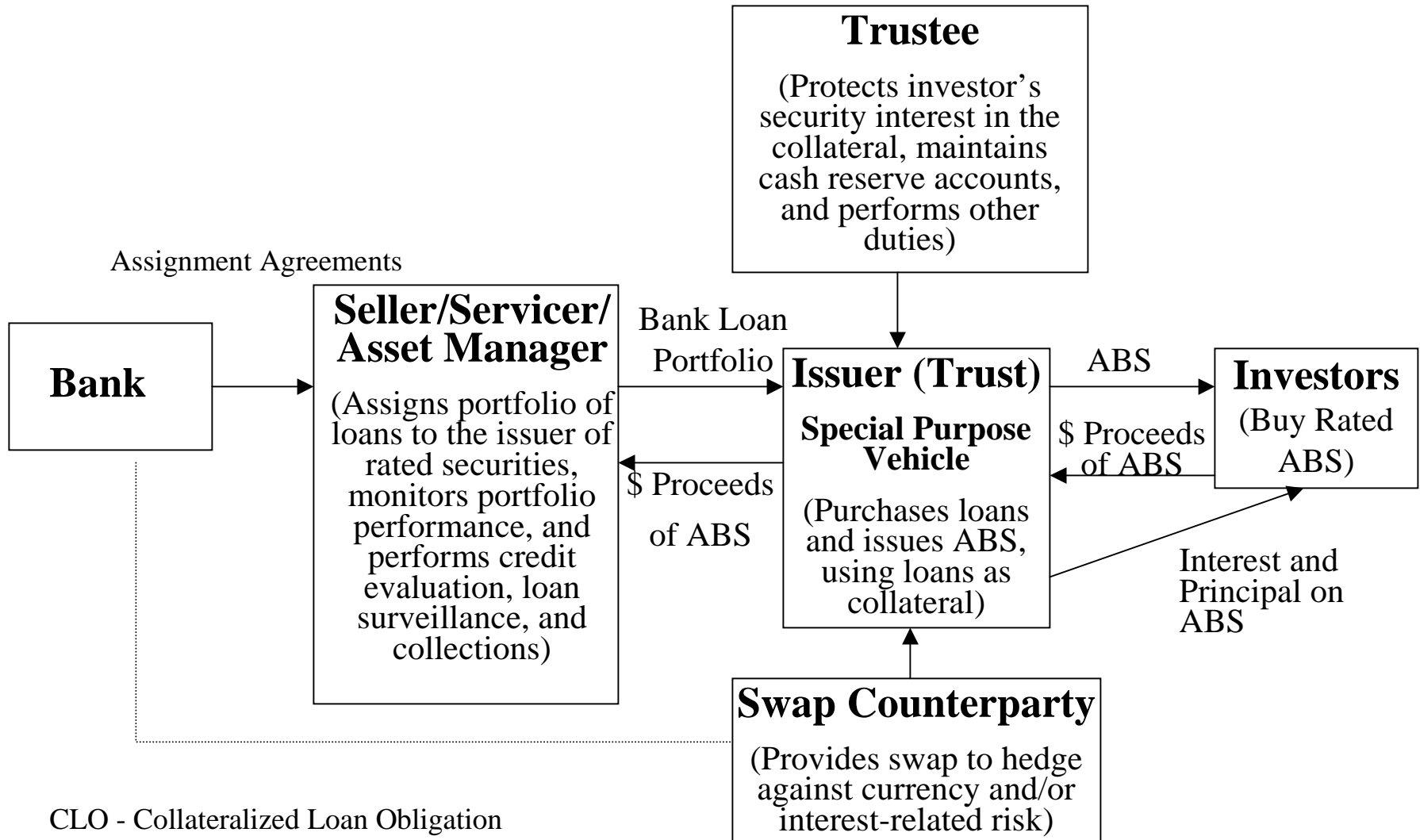
Correlations



Credit Risk Measurement Tools

- JP Morgan's CreditMetrics™
- CSFP's CreditRisk+™
- KMV's Credit Monitor™
- McKinsey's CreditPortfolio View™
- Others: Algorithmics, Kamakura, Consulting Companies

Sample CLO Transaction Structure



CLO - Collateralized Loan Obligation

ABS - Asset-backed Securities

Credit Derivative Products

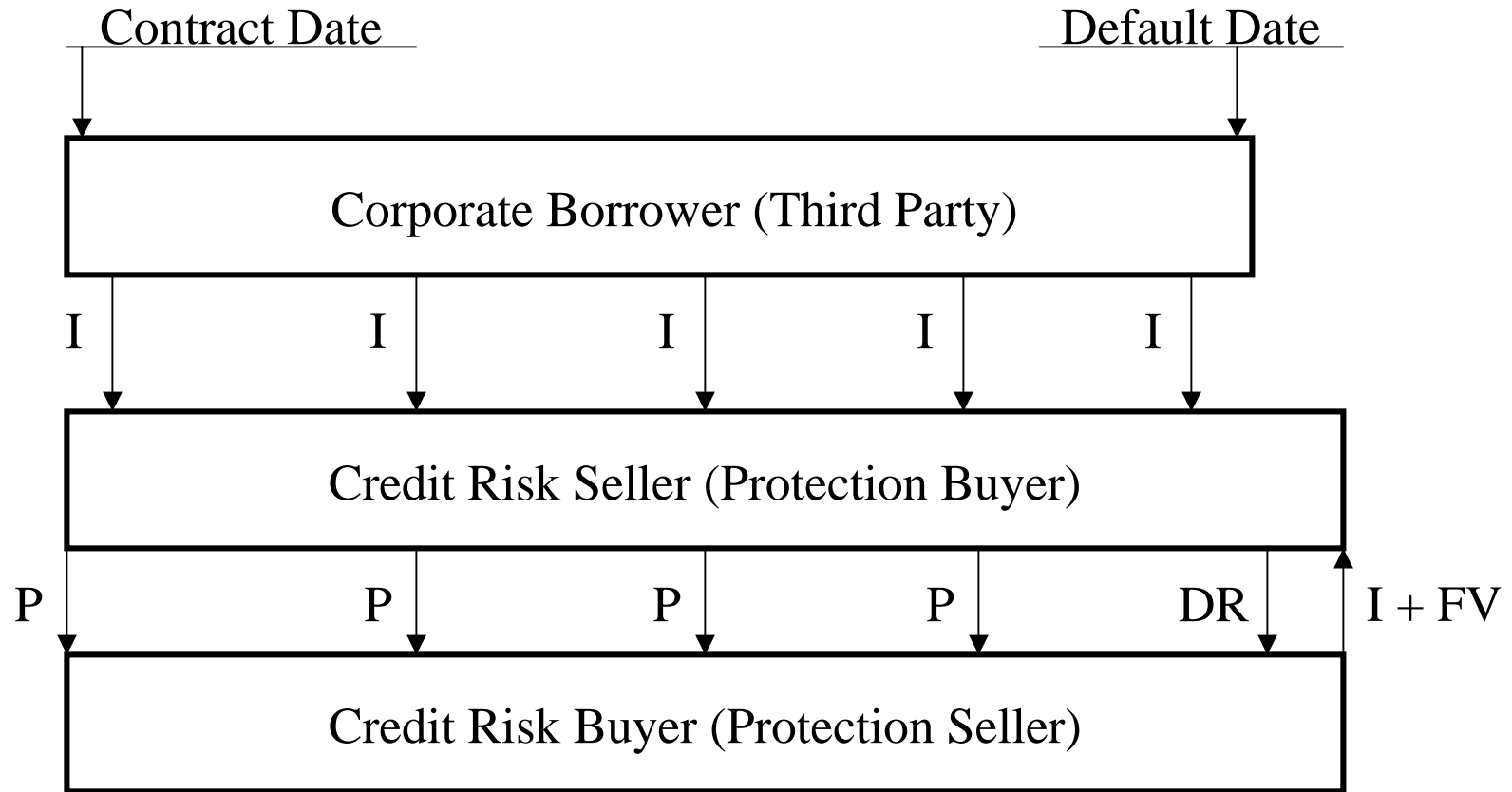
Structures

- Total Return Swap
 - Default Contingent Forward
 - Credit Swap
 - Credit Linked Note
 - Spread Forward
 - Spread Option
-

Underlying Assets

- Corporate Loans
- Corporate Bonds
- Sovereign Bonds/Loans
- Specified Loans or Bonds
- Portfolio of Loans or Bonds

Credit Risk Derivative Contract Time Line



I = Interest (fixed or floating rate) on underlying asset, e.g. bond

P = Premium on credit derivative contract

DR = Default recovery - either sale proceeds or delivery of underlying asset

FV = Face value at maturity of underlying asset

Recommendations for Credit Risk Management

A. Making Risks Visible, Measurable, and Manageable

- Meaningful Credit Culture Throughout
- Consistent and Comprehensive Scoring System
- From Scoring to Ratings
- Expected Risk (Migration, Loss) and Returns - Market and/or Bank Data Bases
- Individual Asset and Concentration Risk Measurements
- Reflect Risks in Pricing - NPV, Portfolio, RAROC Approaches
- Marking to Market
- Measure Credit Risk Off-Balance Sheet - Netting
 - Futures, Options, Swaps

Recommendations for Credit Risk Management

(continued)

B. Organizational Strategic Issues

- Centralized vs. Decentralized
- Specialized Credit and Underwriting Skills vs. Local Knowledge
- Establishing an Independent Workout Function
- Managing Good vs. Bad Loans
- To Loan Sale or Not
- Credit Derivatives
- Credit Risk of Derivatives