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CREDIT RISK ISSUES IN CAPITAL EVALUATION

PAUL N. ELLINGER

Regional Research Project NC-221 Conference
“Financing Agriculture and Rural America: Issues of Policy, Structure and Technical Change”
McLean, Virginia
October 1-2, 2001

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Credit Risk Issues in Capital Evaluation

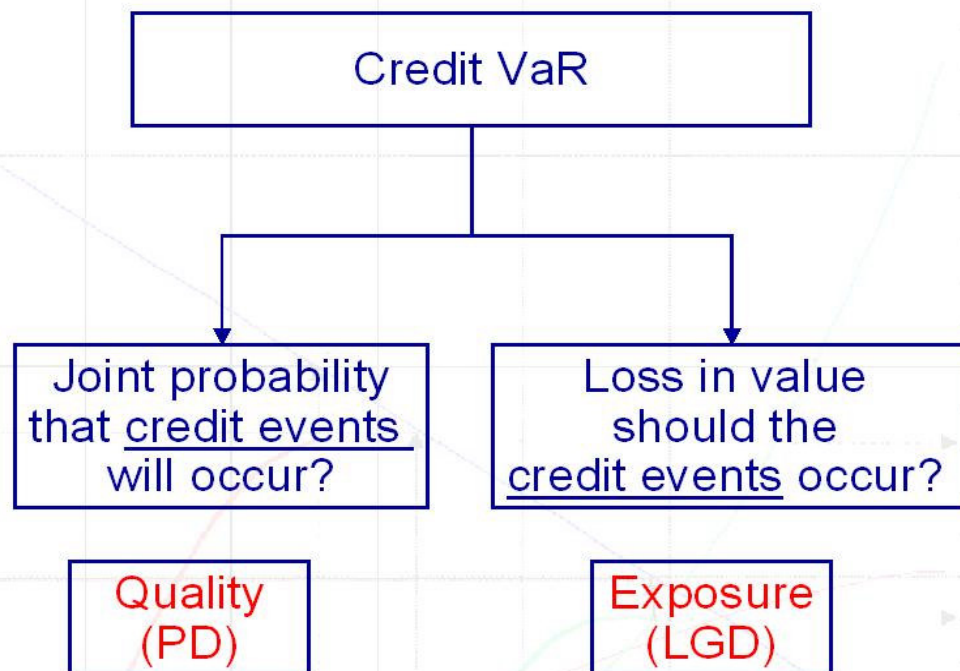
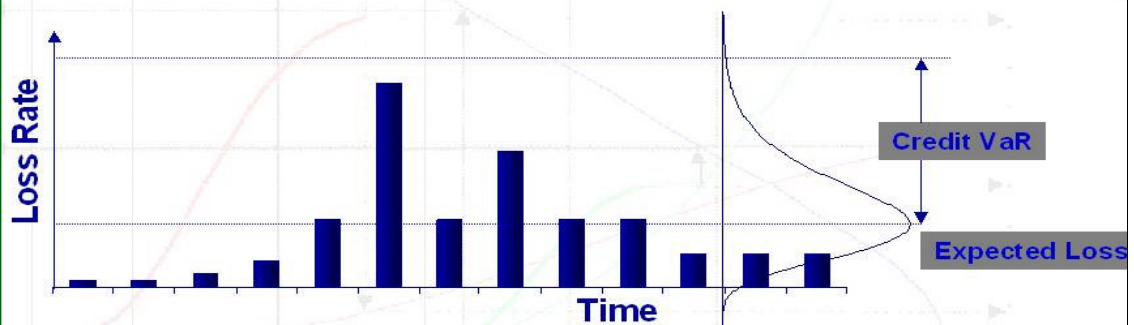
by: Paul Ellinger
University of Illinois

Goals

- Credit Risk concepts in the financial industry
- Current techniques used in estimating Credit Risk
- Credit Risk issues related to agricultural finance
- Proposed estimation application

Credit Risk

- Industry converging on two statistics:
 - Expected losses
 - Critical value on a loss distribution
(Credit VaR or Credit Risk Capital, Unexpected loss)



Modeling Credit Event Distributions

Modeling **Credit Quality**
probability of default

Modeling **Default Correlations**
across borrowers or
borrower classes

Modeling **Cyclical Behavior**
of
defaults over time

Measuring Exposure

Loan Equivalent **Exposure**
Two Distinct Elements

Current Exposure

Potential Exposure

- Exposure to a particular borrower

- Basel Committee add-on
- Expected potential exposure
- Maximum potential exposure

Basel Accord

Additional Credit Risk Concepts

Recommendations/Statements

Criteria on Risk Assessment

Basel: At minimum, methods and data should account for:

- Historical and projected cash flow repayment ability
- Capital structure
- Quality of earnings
- Quality of information
- Operating leverage: *financial efficiency*
- Financial flexibility: *liquidity*
- Management quality
- Position in industry: peer group
- Risk characteristics of the country

Estimation Requirements

- Population closely represents borrowers
- Underwriting standards are comparable to those used by institution
- Economic conditions relevant to current and foreseeable conditions
- Number of loans in sample and data provide strong grounding in historical experience
- Calibrated to new information
- Minimum length of underlying data period: 5 years

Validation System

- Validate input data
- Periodic monitoring
- Identify relationships that are no longer appropriate

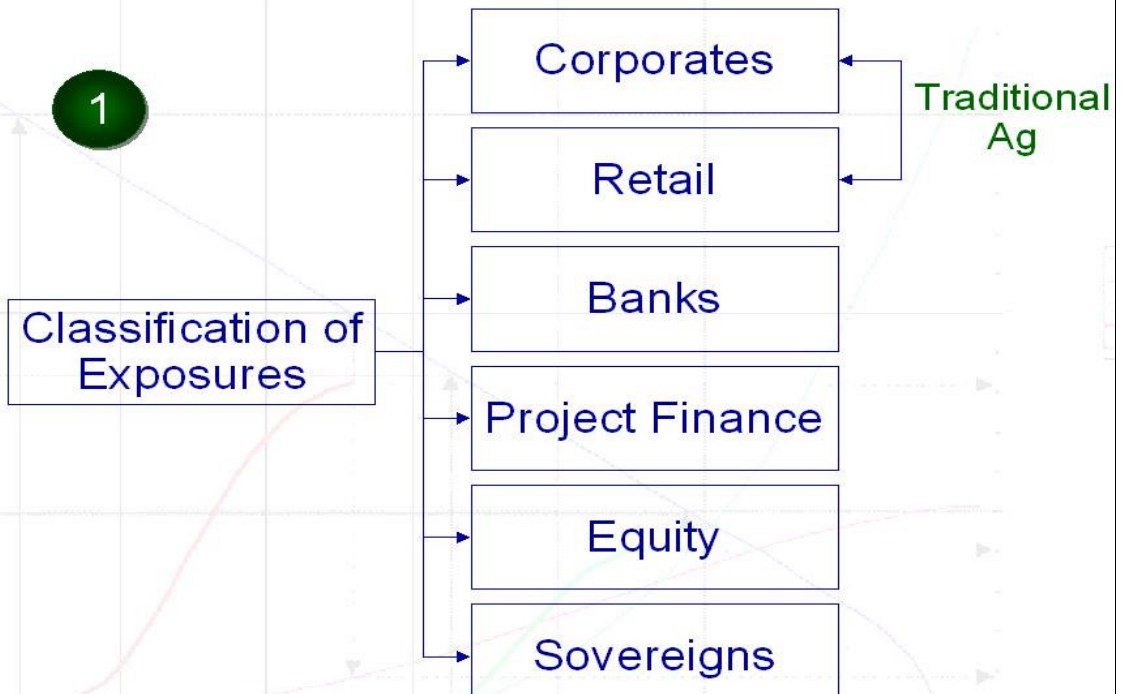
Stress Tests

- **Identification of events**
 - **Economic or Industry Events**
 - **Market Risk Events**
 - **Liquidity Conditions**
- **Assess the migration of exposures to lower grades**
- **Suggest tests be conducted by an independent unit**

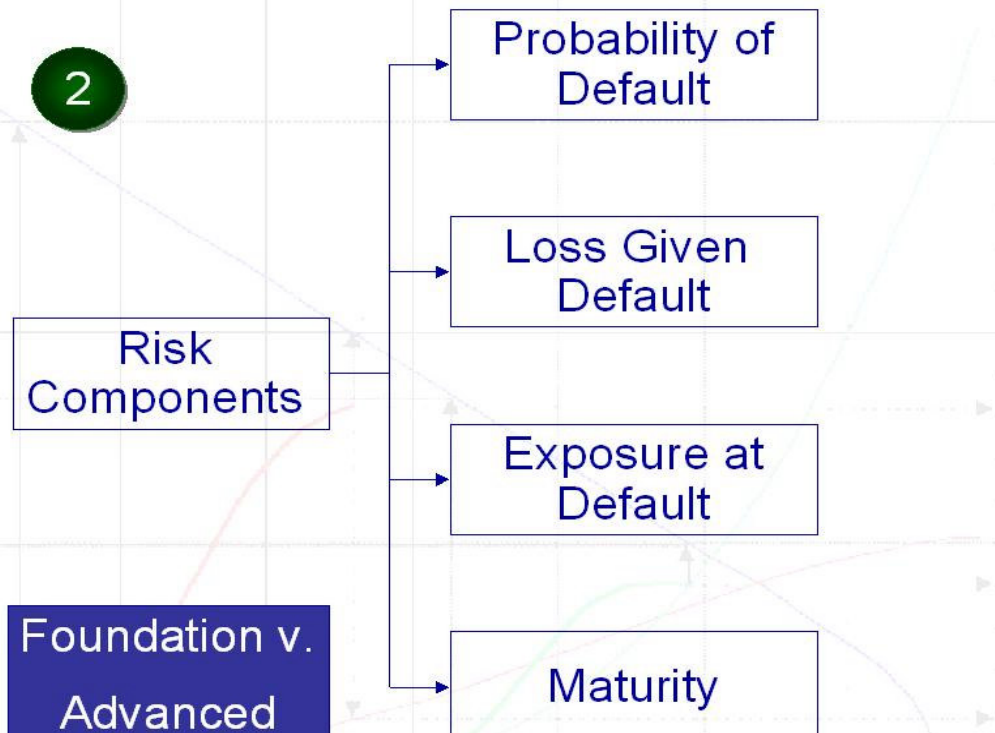
Main Methods

- **Credit Metrics™**
- **KMV Corporation**
- **CreditRisk +™**
- **Credit Portfolio View™**

IRB Approach: Key Elements



IRB Approach: Key Elements



IRB Approach: Key Elements

3 Risk weight function

4 Minimum requirements

5 Supervisor review and compliance

Corporate Exposures Two Steps:

- **Baseline levels**
Estimates of PD, LGD & EAD
- **Granularity adjustments**
 - **Specific borrower**
 - **Specific borrower class**

Suggested Granularity Estimation

Express portfolio as a function of four risk drivers

- PD
- LGD
- Systemic risk sensitivity index
- *Effective number of loans*

Issues: Retail Exposures

Two general families of risk components

- Separate estimates of PD and LGD
- Estimate of Expected Loss
($EL = LD \times LGD$)

Issues in Agricultural Finance

- How to measure frequency and severity?
- High borrower concentrations (large loans)
- Heavy industry (commodity) concentrations
 - positive correlations among borrowers:
granularity
- Stress test w/economic events of the 1980s and other economic events
 - cyclical nature of agricultural losses

Issues in Agricultural Finance

- Value of collateral highly related to income producing capability of industry
- Limited data: quality and quantity
 - loan level (one point in time)
 - aggregate data (S&P ratings)

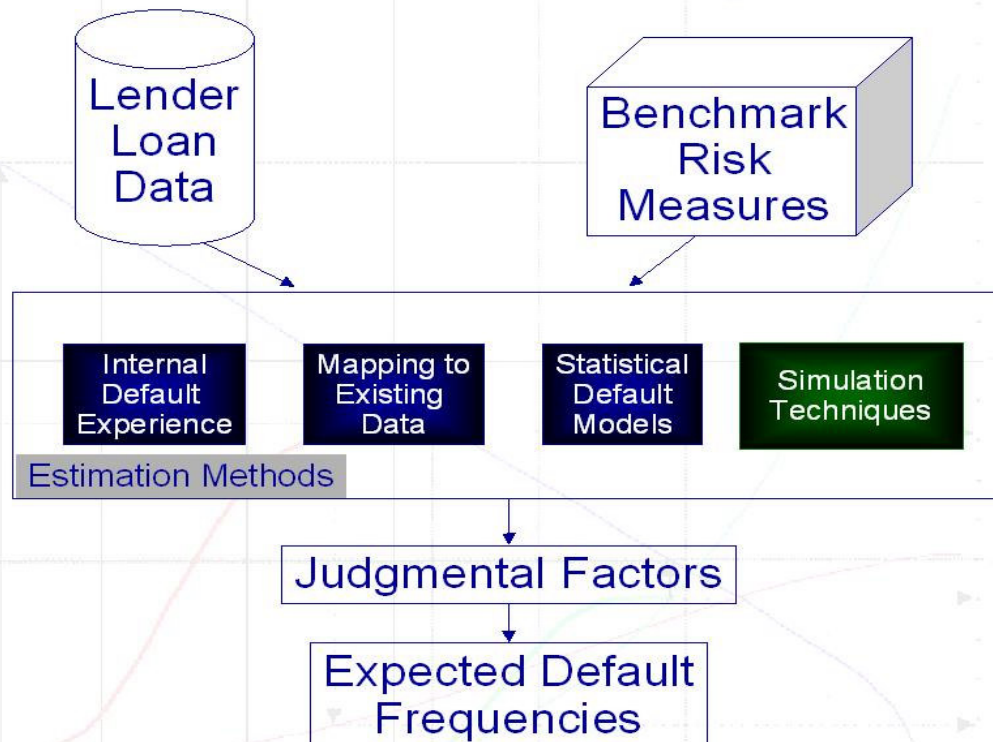
Issues in Agricultural Finance Desired Data Components

- underwriting variables at origination and subsequent periods
- data encompass desired underwriting standards
- information on collateral quality and value at origination and subsequent periods
- loan repayment history
- measure of default and amount of loss PD (frequency) and LGD (severity)
- measures of commitments (EAD)
- farm level observations from the 1980s

Challenges in Estimation in Agriculture

- Data systems being revised/developed
 - FCS migration
 - FCA adapting their LARS system
 - FMAC developing data series
 - Larger commercial banks developing histories
- Length and economic events spanned w/data

Estimation Techniques



Simulation Approach

Estimate PD

Advantages

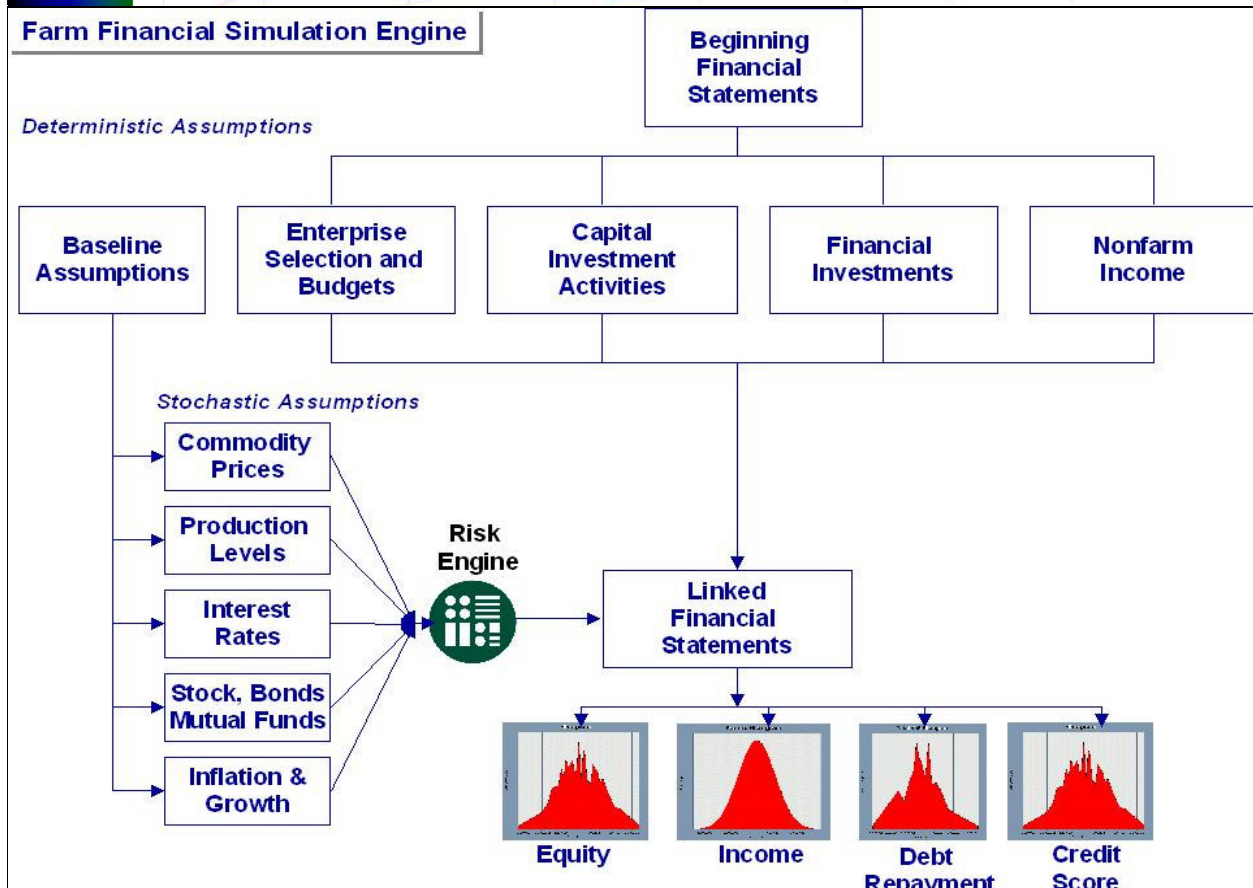
- Control economic environment
 - Replicate history
 - Model economic and stress scenarios
- Control firm-characteristics and collect desired underwriting variables
- Evaluate performance over time: migration tables
- Probabilistic estimates

General Model Characteristics

- Earlier version of the model used to assist in the development a proprietary credit scoring model
- 10-year model
- Stochastic components

- **Commodity prices**
- **Production levels**
- **Interest rates**
- **Financial asset returns**
- **Input cost growth rates**
- **Capital asset growth rates**

Covariance Relationships

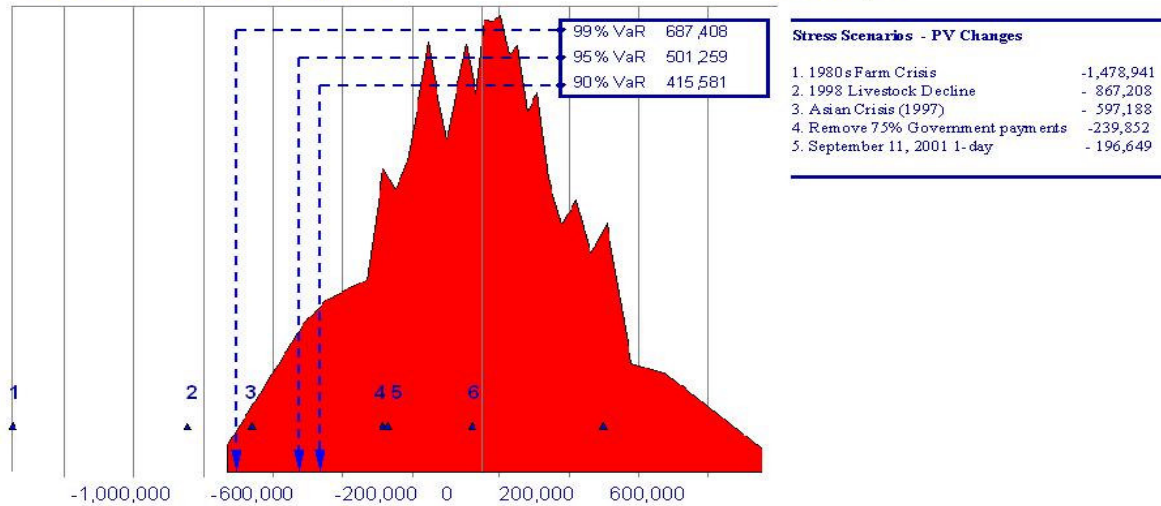


Firm-level *Stress Test*

- Combine VaR with Stress Testing

Picture of Risk Report

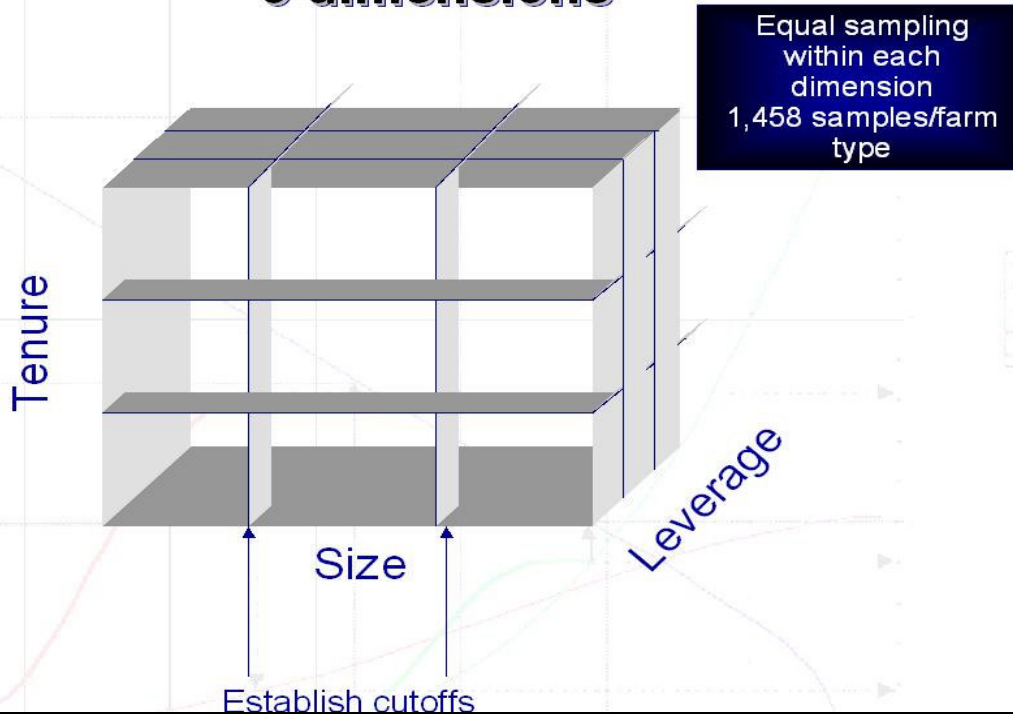
October 1, 2001



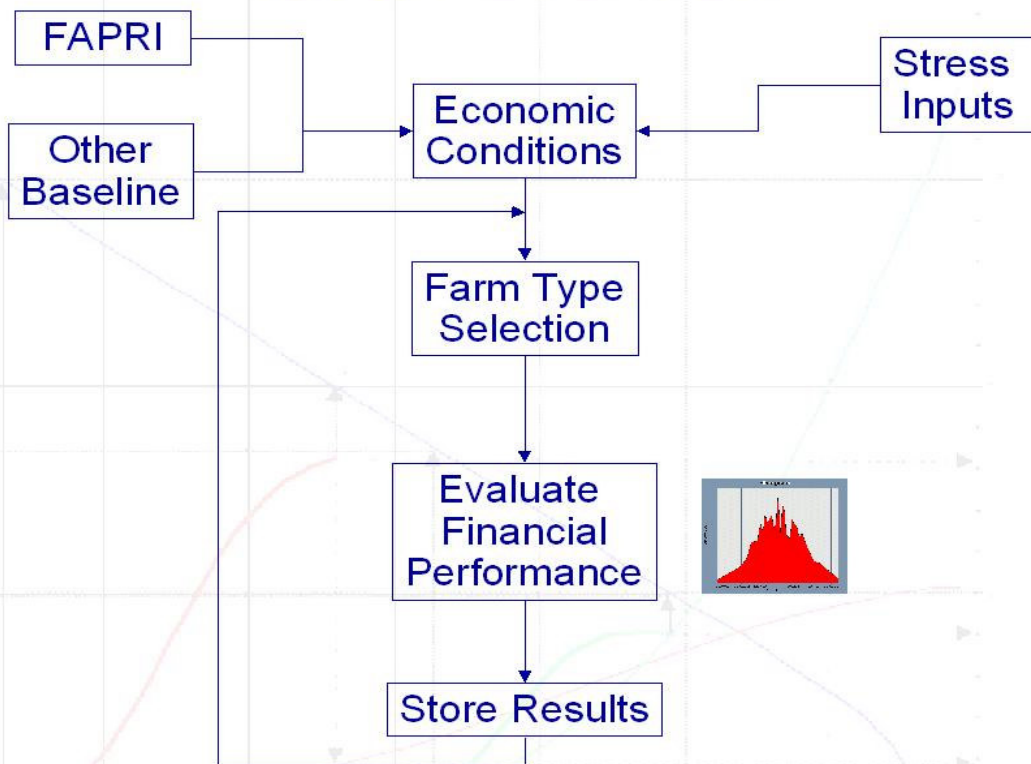
Manage Multiple Farms-Types?

- Seven Dimensions
 - Farm size
 - Leverage
 - Tenure
 - Asset structure
 - Liability structure
 - Non-farm income level
 - Management
- Economies of size functions
- Production efficiency assumptions

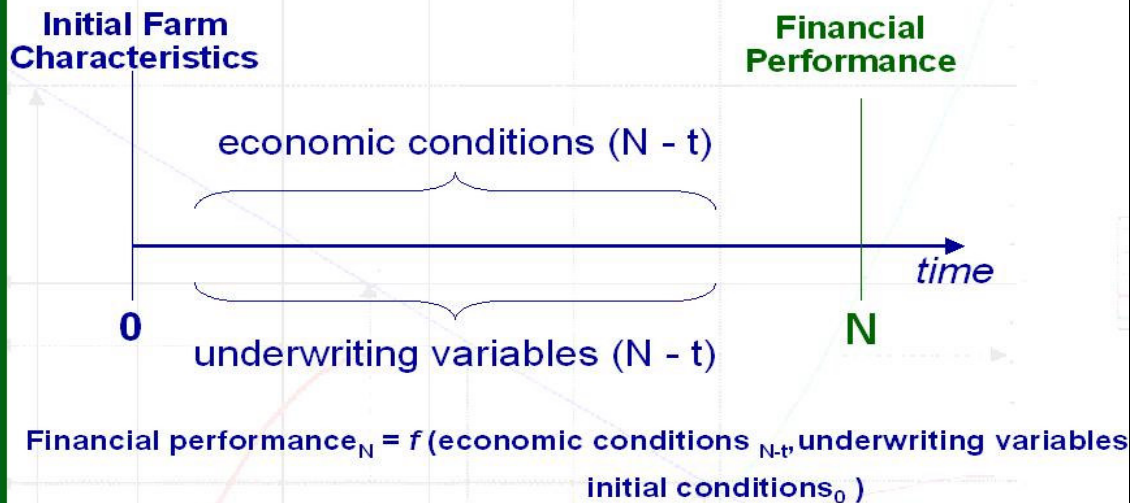
Example Sampling 3 dimensions



Model Overview



Default function

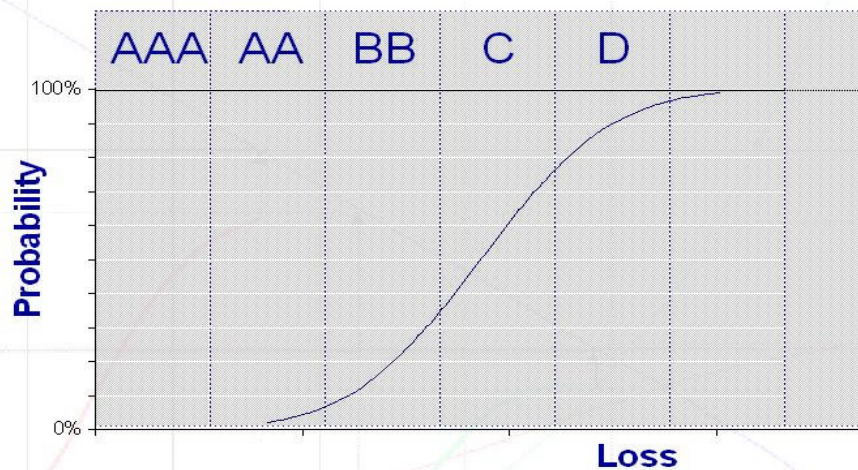


Example Output Credit Scoring Model

PD for three credit classes

- Clearly acceptable = 0.95%
- Evaluation region = 4.65%
- Clearly unacceptable = 21.06%

Simulation Model to Risk Map



Challenges w/Approach

- Creating representative farm types/budgets
- Validation
- Need for reliable data
(estimate probability distributions)
- Perception of synthetic data

Summary

- Issues related to credit risk measurement
- Elegant techniques, but data in agriculture fall short
- Introduced an alternative/flexible tool
 - develop “S&P” type Ag Finance Benchmarks
 - use w/management

Prototype Credit Risk Data Systems

