# Modern Portfolio Credit Risk Modeling

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Skora & Company Inc. is a new credit risk management advisory firm which offers numerous products and services to successfully manage, trade, sell, model and structure credit risk. It has the expertise and experience to support its clients at every stage of their business development.

Skora & Company has already helped financial and non-financial institutions set up profitable credit derivatives trading desks, build cutting edge portfolio credit risk management systems, and design efficient credit risk/return performance analytics.

Richard K. Skora is the founder of Skora & Company. He worked in the credit risk management since 1992. He also traded various exotic credit derivatives including default swaps, default options, and basket swaps.

Mr. Skora received a B.S. in mathematics from The University of Illinois in Champaign-Urbana and a Ph.D. in mathematics from The University of Texas in Austin. He held academic positions at The Institute for Advanced Study in Princeton and Columbia University in New York.

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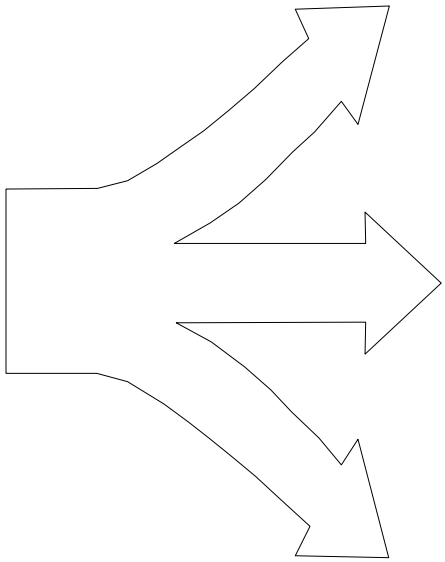
# Changing environment

- New Markets
- New Products
- Competitive

# The result

- Frequent debacles
- Divergent Capital
  - Domestic regulatory capital
  - International regulatory capital
  - Economic capital
- Wasted energy



# Modern Portfolio Credit Risk Modeling

- Determines how the individual fits into the portfolio
- Active / Dynamic - binary credit decision is inefficient
- Uses new tools, e.g. credit derivatives

# Advantages

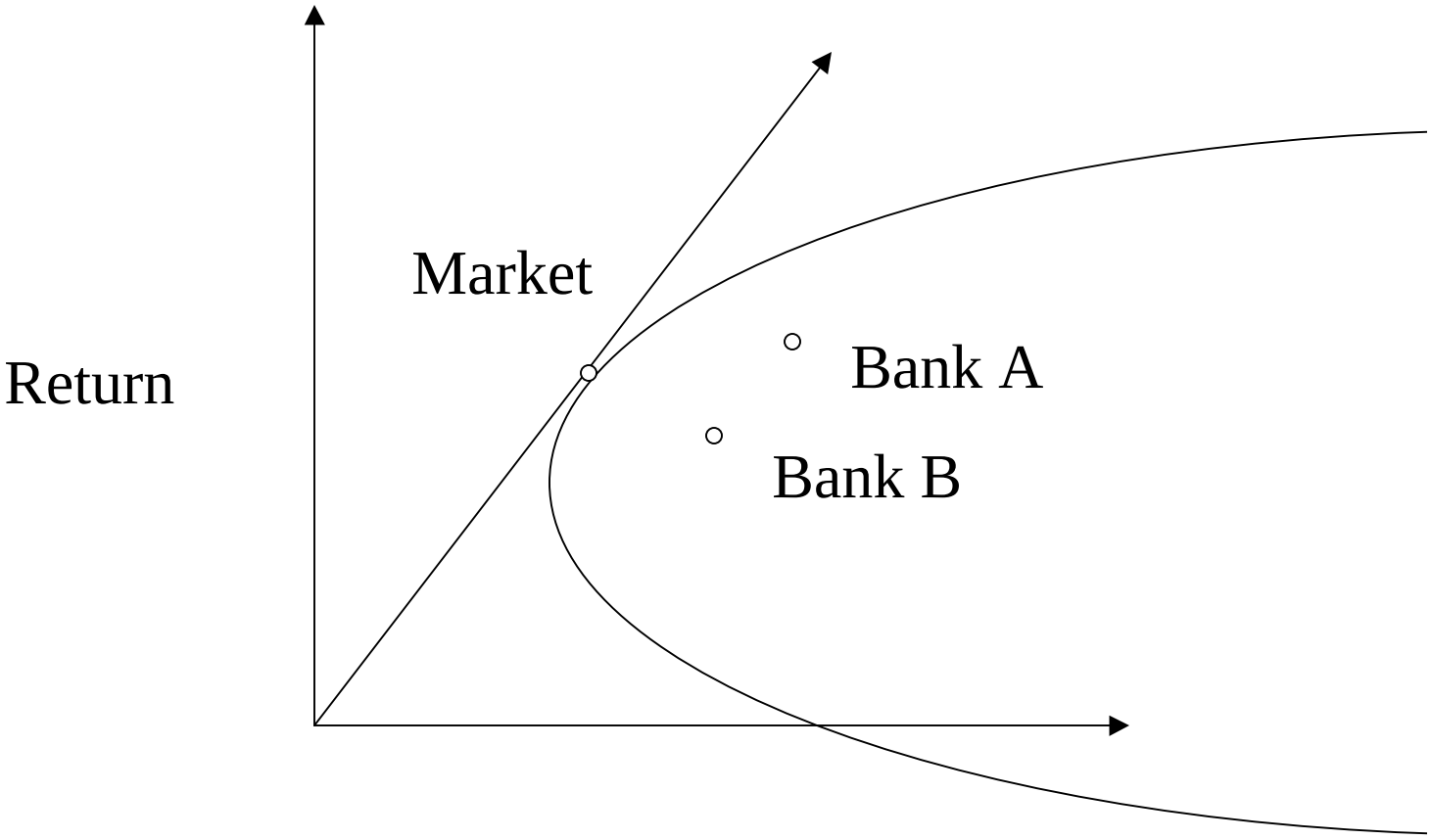
- Transparency in risk
- Efficient use of scarce resource and capital
- Performance review
- Compute economic capital
- Business decisions
- Assist with risk management

# Factors facilitating portfolio credit risk modeling

- New models
- New computer technology
- New data

# Efficient Frontier

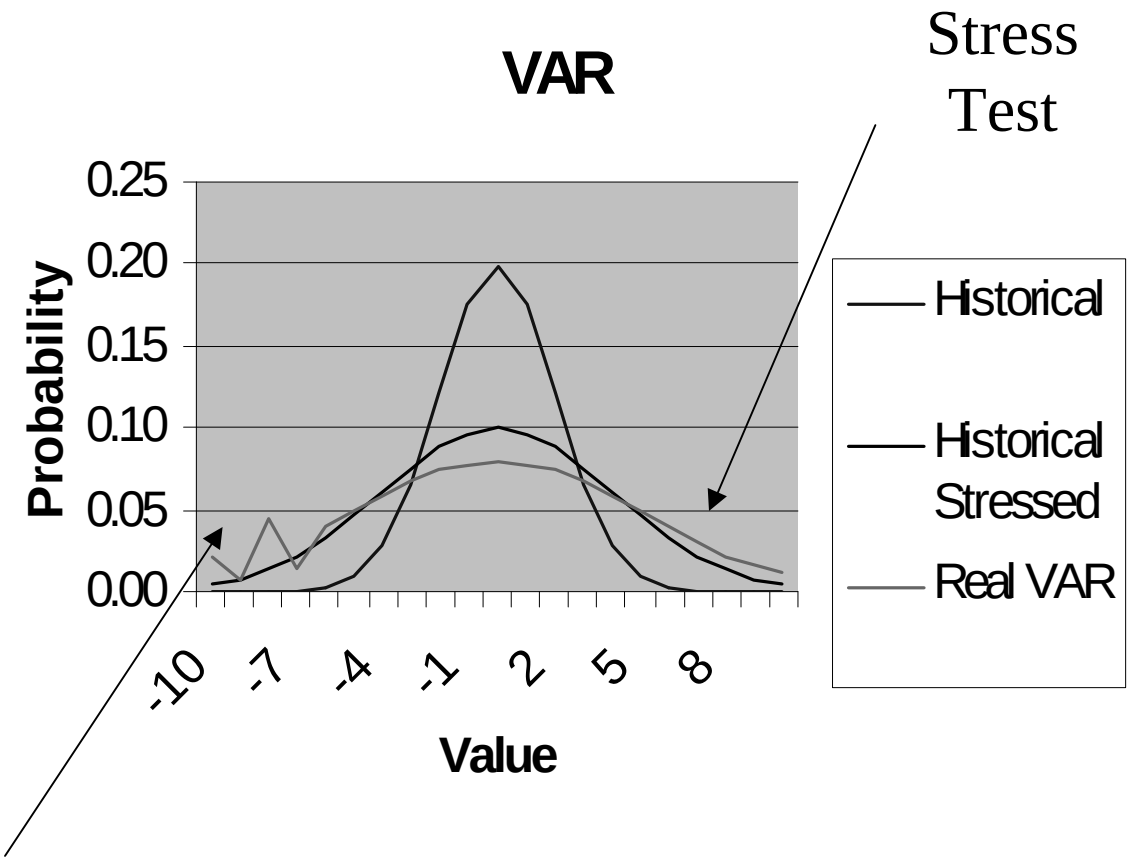
Maximize Generalized Sharpe Ratio



# Credit Risk Management

- Accountability
- Authority
- Portfolio credit risk model
  - Stress Testing
  - Scenario Analysis
  - Capital e.g. Value at Risk

# There is more to Portfolio Credit Risk Modeling than VAR

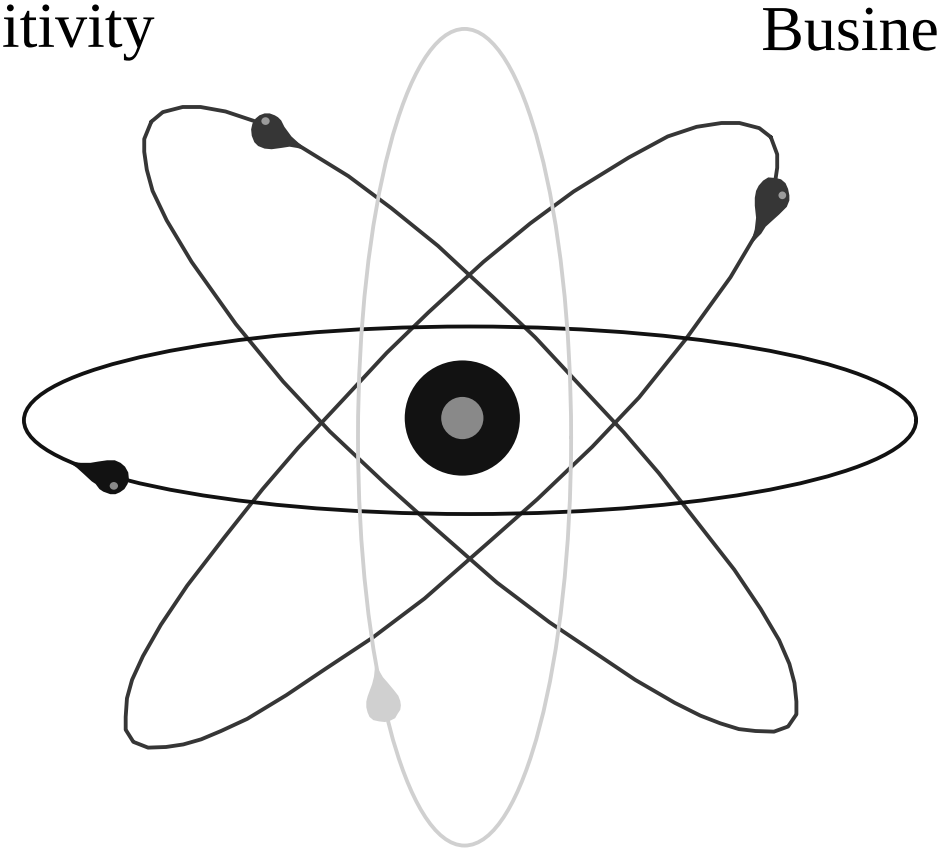



Scenario Analysis

# More than a number

Exposure
Sensitivity

Business Unit



Counterparty

SKORA & COMPANY INC.
CREDIT RISK MANAGEMENT

# Differences between Market and Credit Risk

- Credit risk is sudden
- Credit changes are large
- Credit instruments have large transactions costs or do not exist
- Can not hedge

# Portfolio credit risk model is two models in one

- Impossible to separate credit from market

- Exposure
  - Historical
  - Econometric
  - Risk neutral
- Default / Recovery
  - Historical
  - Econometric
  - Risk neutral

# A *complete* model

(Market Risk)

- Simulates dynamic market variables
- Is a multi-term model
- Handles various products: loans, securities, assets, and derivatives
- Simulates changing exposure both due to time and market variables
- Nets positions

# … and A *complete* model

(Credit Risk)

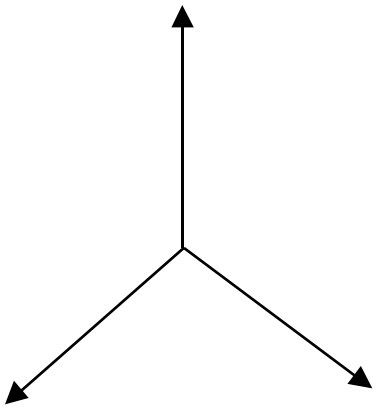
- Recognizes different liquidities
- Accounts for collateral, downgrade triggers, cancelable features, etc.
- Recognizes credit risk is non-stationary
- Measures credit event - default and recovery
- Recognizes seniority
- Computes *full* probability distribution of losses
- Reports various other statistics

# Parameters

- Rating transitions not stationary
- Default not stationary
- Recovery not stationary
- Correlation not stationary

# A Portfolio Credit Risk Model has three major components

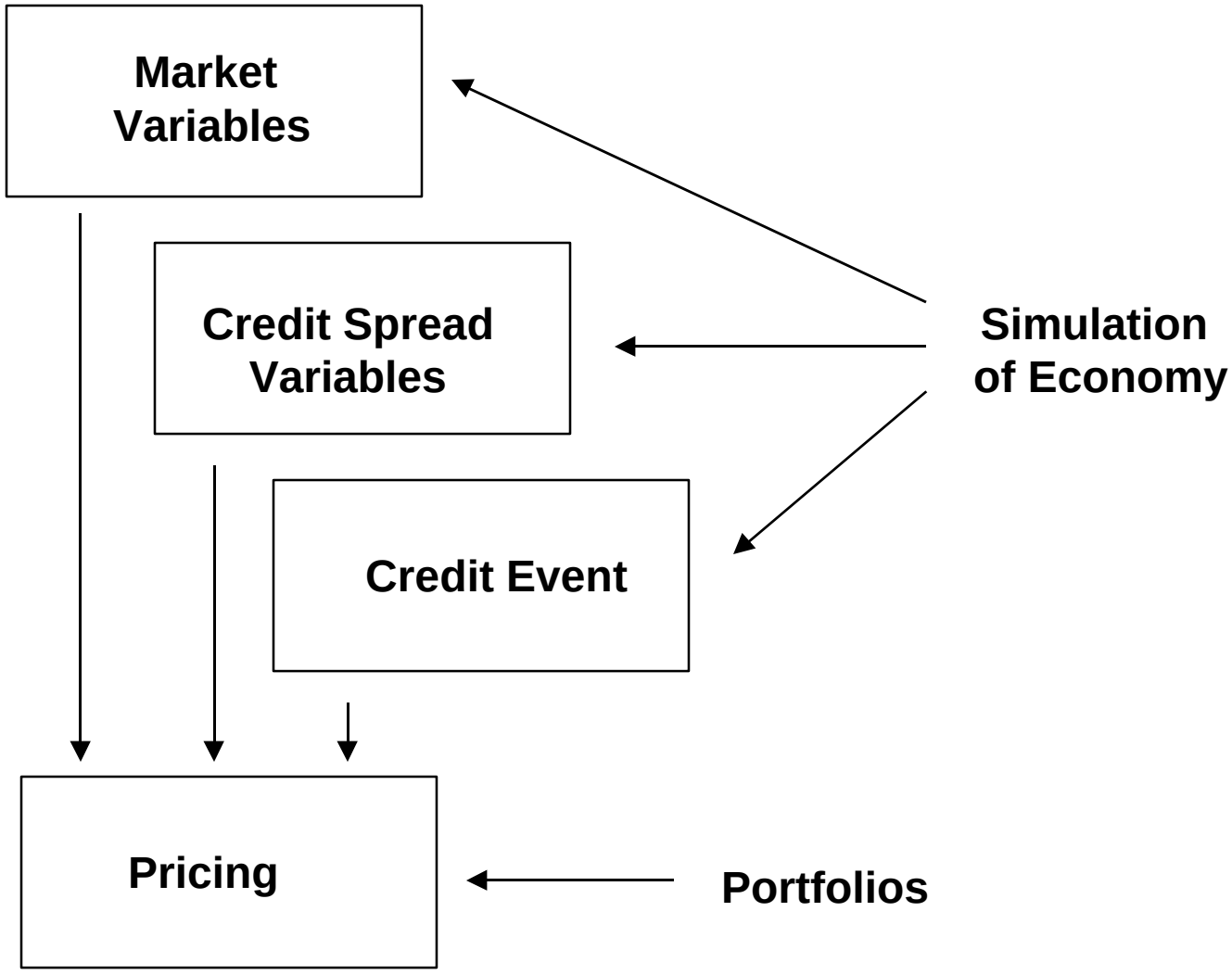
Simulating potential future economic scenarios



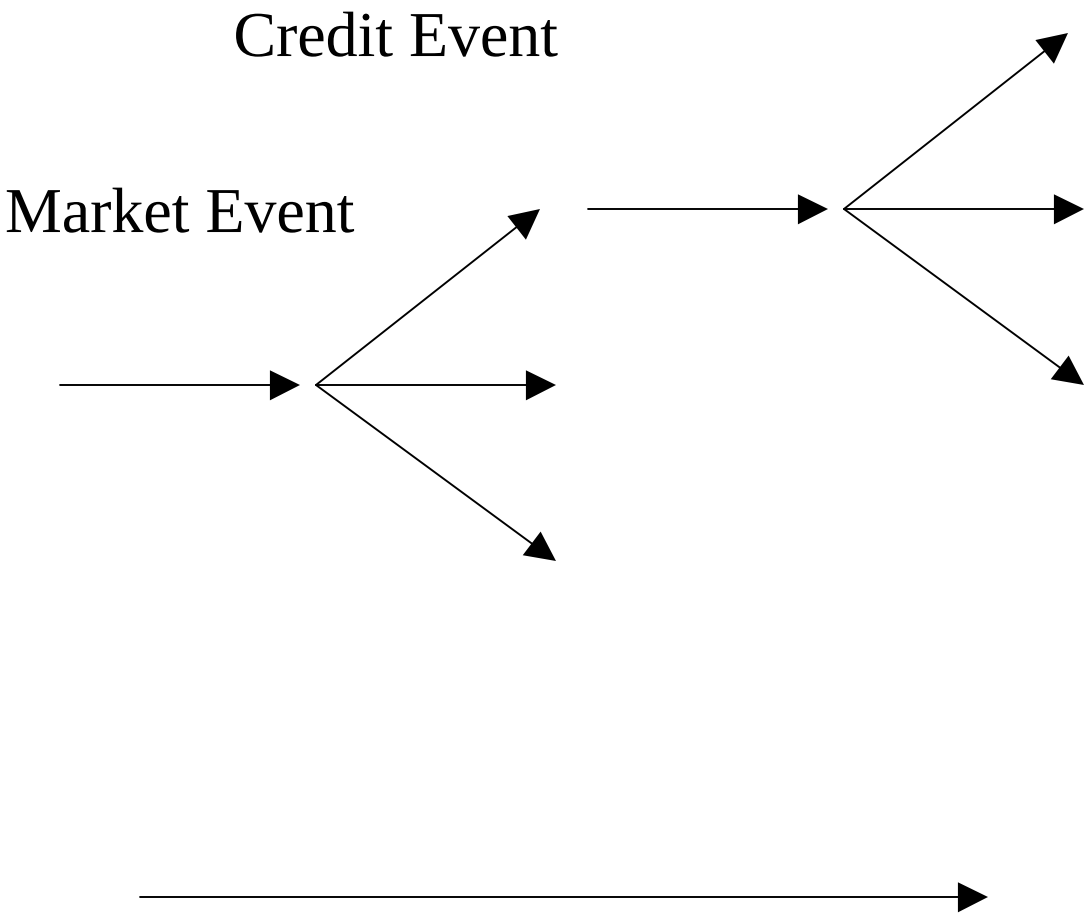
Pricing the underlying contract or portfolio of contracts

Simulating credit events -- rating changes or defaults

# The portfolio credit risk model



# Implementation



# Various portfolio credit risk models

- CSFP's *CreditRisk+*
- KMV
- McKinsey
- RiskMetrics
- Skora

# CSFP's *CreditRisk+*

- Basic model of credit event is a **dynamic** default probability
- Compute *Number of Defaults*
- Generalize to compute *Loss*
- Add dynamic default rate
  - default rates *independent*
  - default rates *perfectly correlated*
- Generalize to multi-factor sector model which includes both *independent* and *perfectly correlated cases*
- Analytical approximation of loss probability distribution

# KMV's *Expected Default Frequency* and *Portfolio Manager*

- Two products
  - Individual Credit risk
  - Portfolio Credit risk
- Individual credit risk based on Merton model, company information, and historical data
- Portfolio model infers correlation of defaults from correlation of equity

# McKinsey's *Credit Portfolio View*

- Basic model of credit event is a transition matrix
- Uses time series model ARMA(p, q) (autoregressive, moving-average) to model economic variables
- These variable in turn drive dynamic conditional credit transition and default probabilities
- Uses Monte Carlo to calculate loss probability distribution

# RiskMetrics' *CreditMetrics*

- Basic model of credit event is a transition matrix - extension of Merton Model
- Transitions between two entities may be non-independent
- Implemented through a (NxN)x(NxN) transition matrix
- Uses Monte Carlo to calculate loss probability distribution

# Skora's model

- Basic model of credit event is a transition matrix - extension of Merton Model
- Segment products: loans, derivatives, proprietary trading products, etc.
- Completely compute variable exposures to counterparties
- Transitions between two entities may be non-independent
- Analytical approximation of loss probability distribution

# Future Research

- Models are approximations - which short-cuts are appropriate?
- Is it possible to have a complete credit risk portfolio model based on econometric models?
- Which compromises are appropriate?
- Capital calculation is not the same as the pricing calculation - to what extent are they related?