



**Edhec-Risk**  
Asset Management Research

# Edhec Hedge Fund Days 2006

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## Hedge Fund Defaults: Quantitative Approach

Stéphane Daul,  
Senior Quant Analyst, EIM  
Research Associate with Edhec-Risk  
[sdaulegger@eim.ch](mailto:sdaulegger@eim.ch)

# Overview

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- Definition
- Database
- Stochastic Model and Naive Diversification
- Causal Model and Intelligent Diversification
- Conclusion

# Definition

## Hedge Fund Default

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- A fund defaults when it ends its activity due to a large loss
- Defaults are different from dissolutions
- Defaults are widely publicized
- Non-disclosed defaults mainly ended in an arrangement with few losses
- *Poor operational implementation of a strategy is not part of this study*

# Database Defaults

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- Used public information
- Found 109 defaults between 1994 and 2005
- Cross-checked our data with various reports
- Gathered information:
  - name
  - default year, inception year
  - loss amount, assets under management
  - investment style, complexity of instruments
  - location of management company
  - reason
  - ...

# Database Defaults

- Sample

Name	Style	Collapse year	Inception year	Location	Loss (\$)	AUM(\$)	Reason of default
Ballybunion Capital Partners, LLC	Long/Short Equity	2000	1998	US	6,900,000	7,600,000	Wrong calls, misrepresentation. No details of investments available.
Paramount		2001	2000	US	15,000,000	15,000,000	Ponzi Scheme, No legitimate Hedge Fund
Strategic Income Fund / ETJ Partners		1998	1994		21,000,000	24,800,000	Market losses, reporting of false performance figures. Fraudulent misrepresentation of assets
MKP Master Fund	FI Arbitrage	1998		Cayman Island	50,000,000	111,000,000	Market Losses. Margin Calls.
PinnFund USA	FI Arbitrage	2001	1996	US	202,000,000	330,000,000	Ponzi Scheme, Misappropriation
Long Term Capital Management	FI Arbitrage	1998	1994	US	3,500,000,000	4,800,000,000	Market losses. Excess leverage.

# Database Universe

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- Aggregation of six commercial sources and the EIM proprietary database
  - Discard indices, FoF
  - Aggregated classes
- Algorithm
  - Cleaned name
  - Distance and correlation between tracks
- From *41'663* we get *7'269* distinct hedge funds

# Database Universe

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	<b>TASS</b>	<b>HFR98</b>	<b>MSCI Hedge</b>	<b>Eureka Hedge</b>	<b>Hedgefund .net</b>	<b>Barclay CTA</b>	<b>EIM</b>
<b>Number of distinct HF</b>	2354	3029	2034	3421	2911	763	1927
<b>Number of unique distinct HF</b>	333	667	520	820	367	507	751
<b>Ratio (%)</b>	14%	22%	26%	24%	13%	66%	39%

# Database Frequency

	Number of Defaults	Number of HF in that year	Frequency of Defaults
1994	3	751	0.40%
1995	2	972	0.21%
1996	3	1250	0.24%
1997	4	1560	0.26%
1998	10	1917	0.52%
1999	2	2430	0.08%
2000	13	2969	0.44%
2001	18	3635	0.50%
2002	13	4381	0.30%
2003	12	5068	0.24%
2004	12	5563	0.22%
Weighted Average			0.30%

# Stochastic Model

## Frequency

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- Default indicator
  - 1: default
  - 0: no default
- Bernoulli random variable

$$B = \begin{cases} 1 & \text{probability } p \\ 0 & \text{probability } 1-p \end{cases}$$

# Stochastic Model Severity

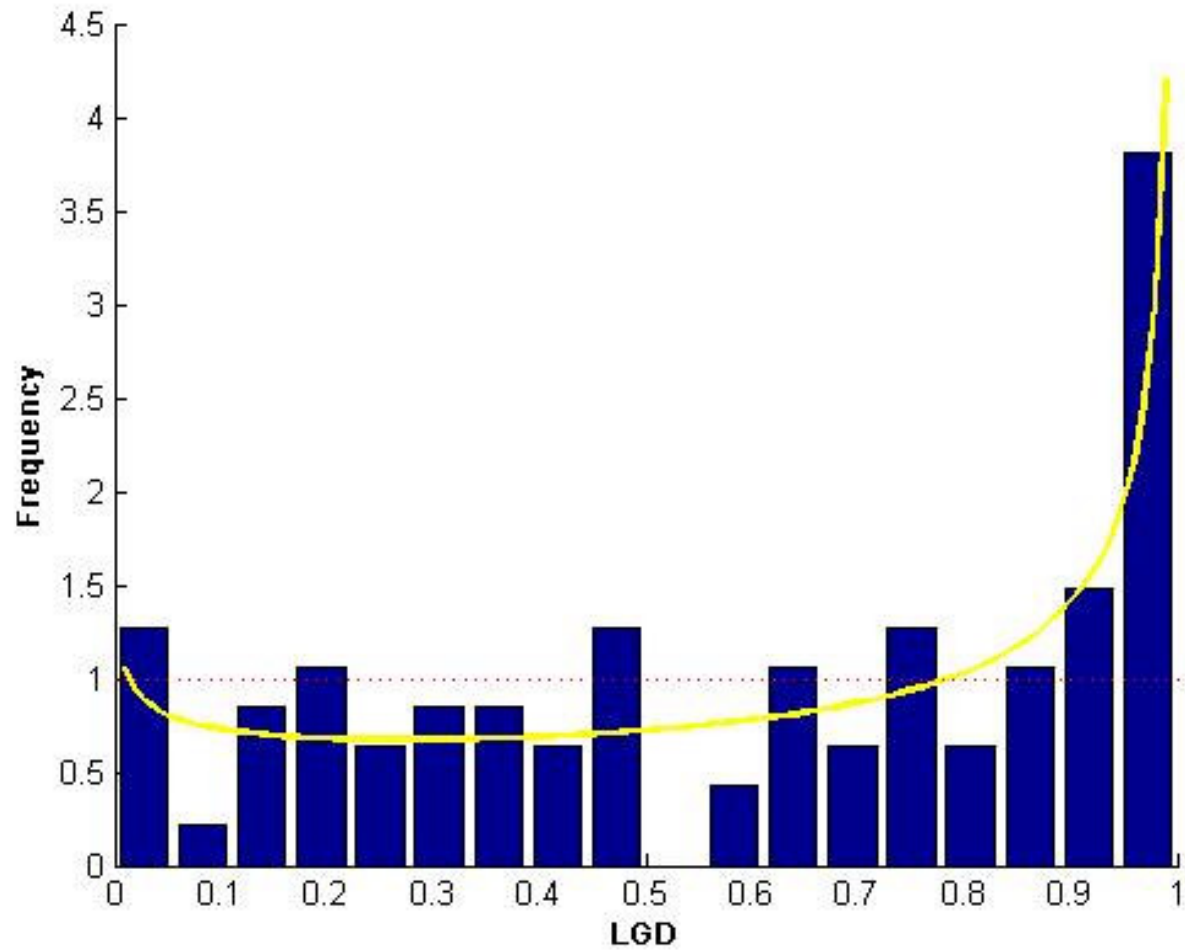
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- Loss Given Default

$$LGD = \frac{L}{AUM}$$

- Where
  - L: Loss
  - AUM: Asset Under Management
- LGD ~ Beta Distribution
  - Parameters  $a = 0.82$ ,  $b = 0.52$

# Stochastic Model Severity



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# Naive Diversification

## Stochastic Model

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- Diversification by dilution
- Equally weighted portfolio of  $N$  hedge funds
- Weight

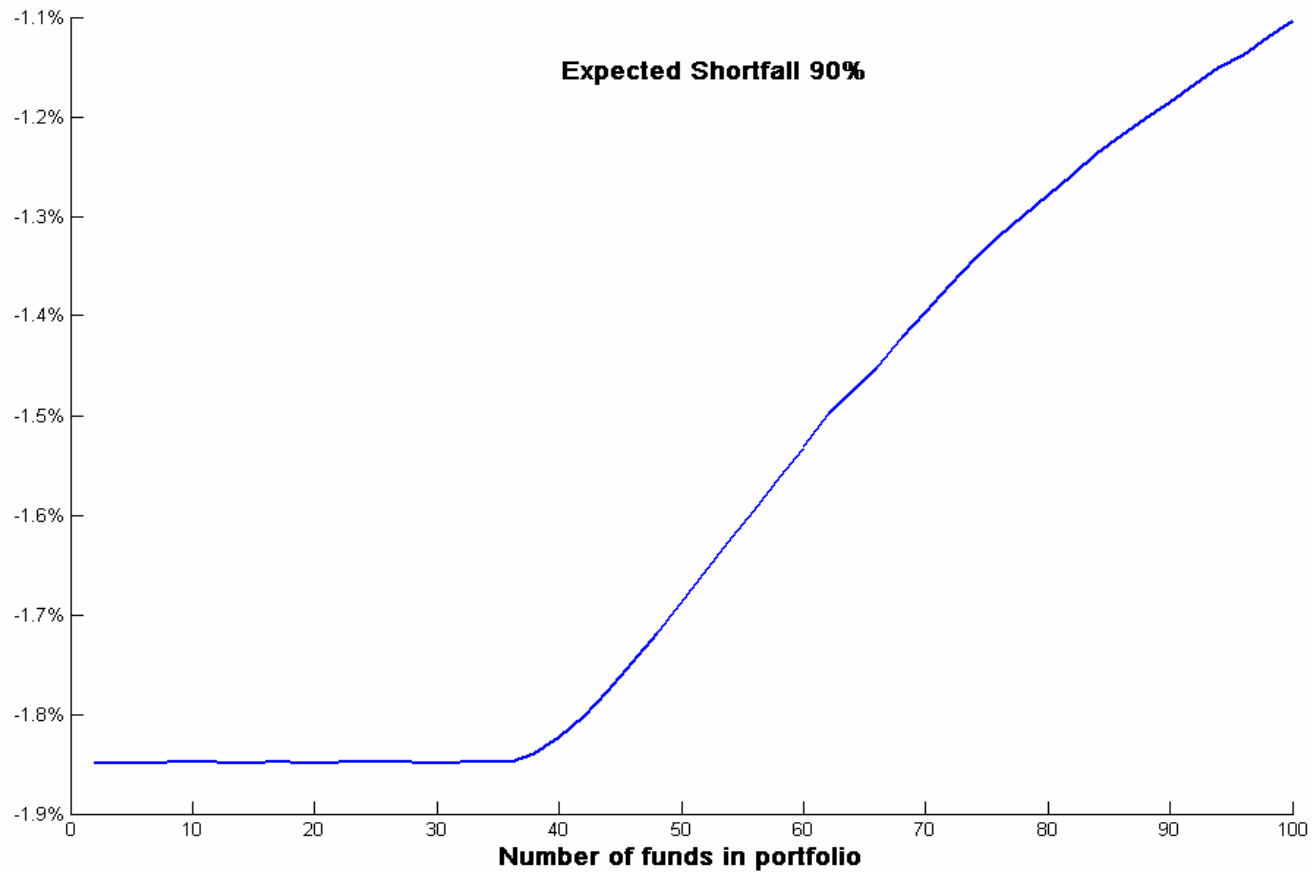
$$w_i = \frac{1}{N}$$

- Default loss distribution of the portfolio

$$DL = \sum_{i=1}^N w_i B_i LGD_i$$

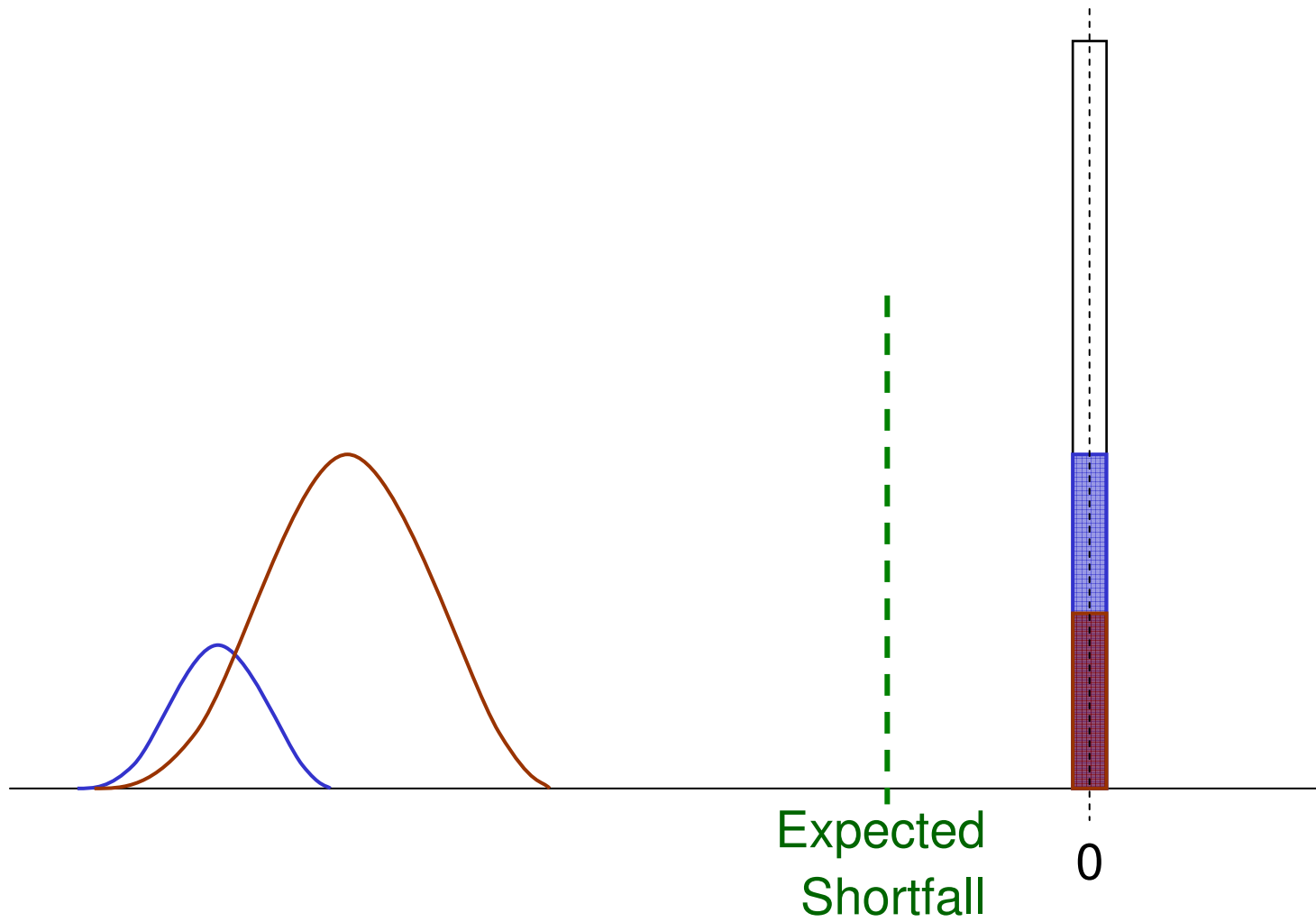
# Naive Diversification

## Extreme risk of portfolio



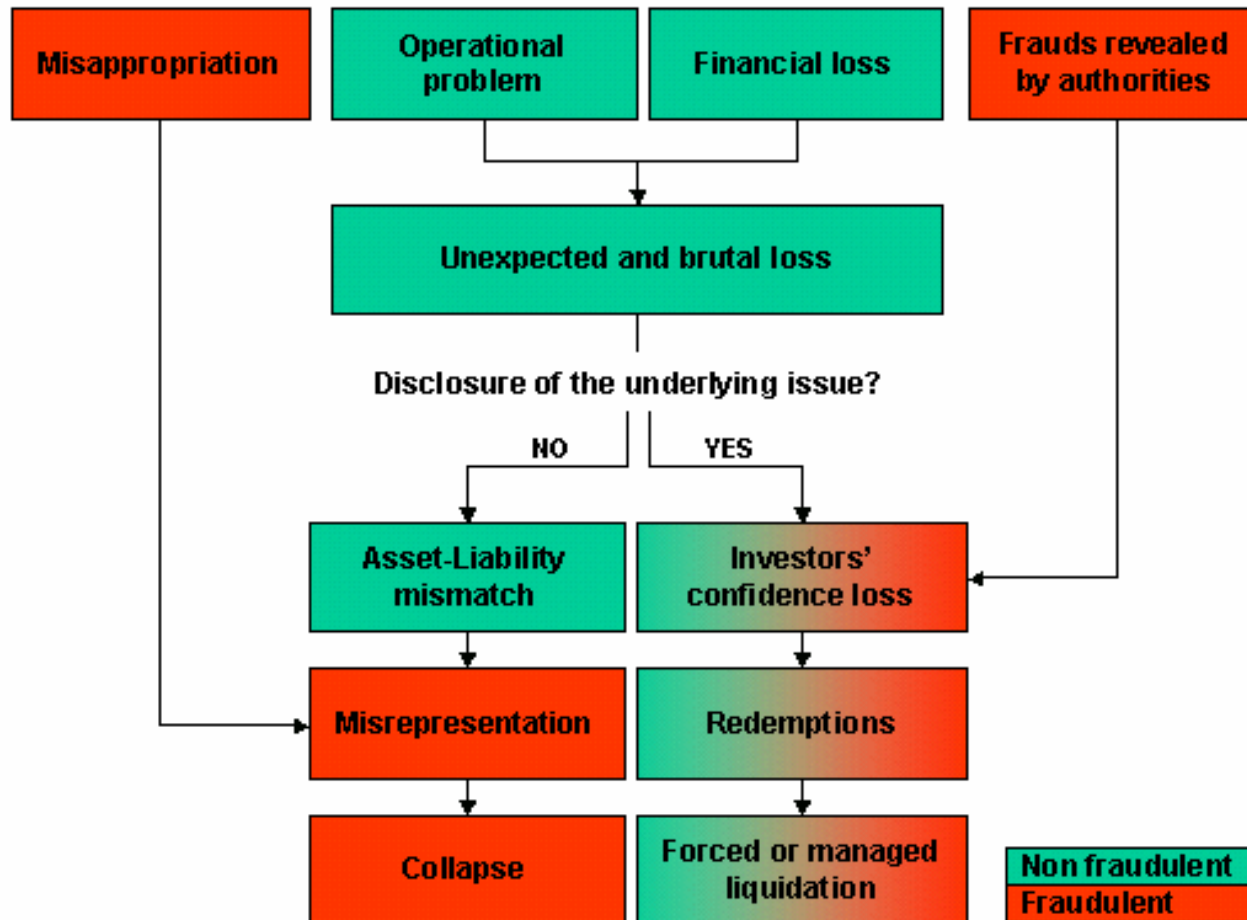
# Naive Diversification

## Extreme risk of portfolio



# Causal Model

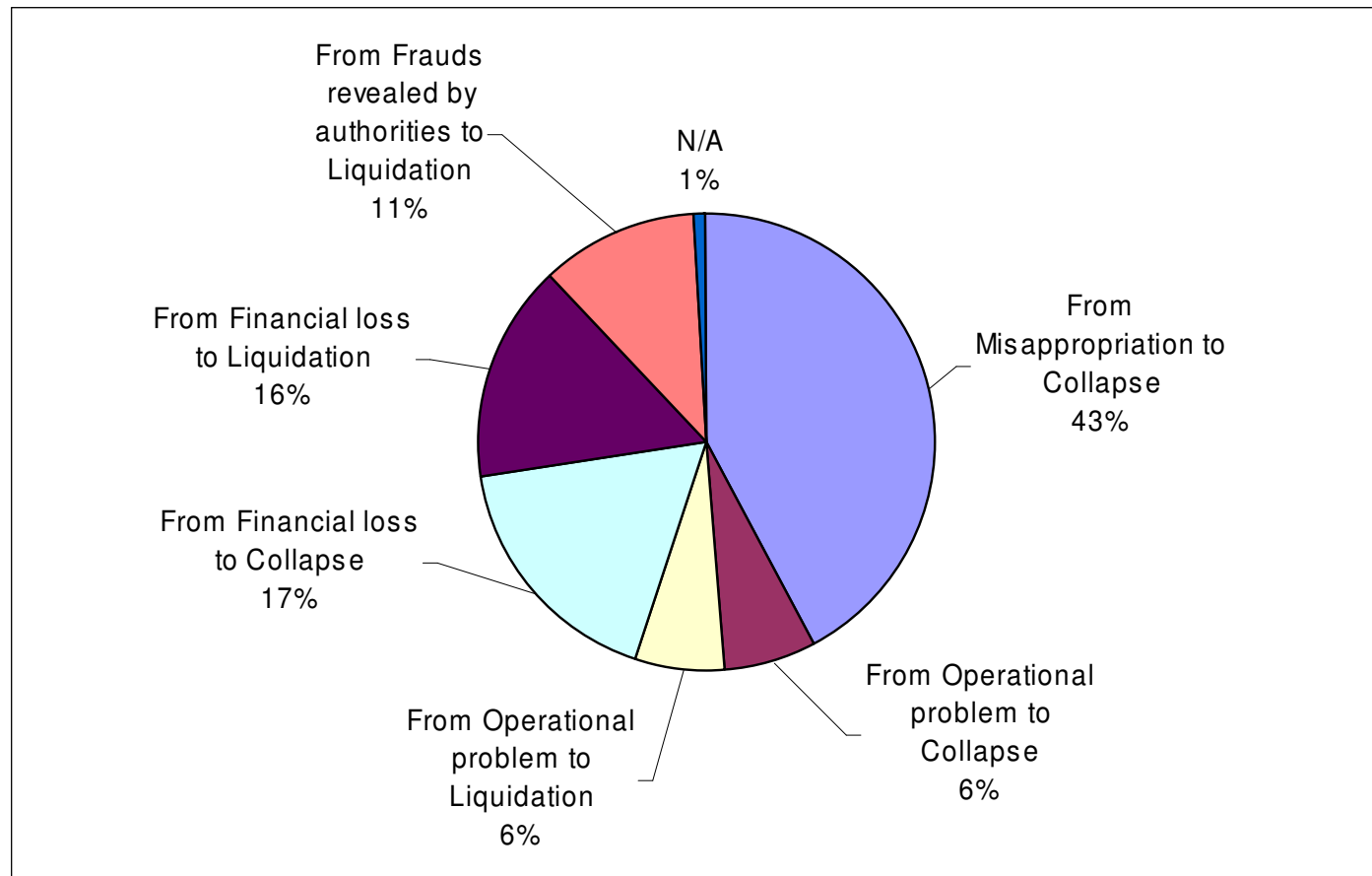
## Dynamics of Default



# Causal Model

## Dynamics of Default

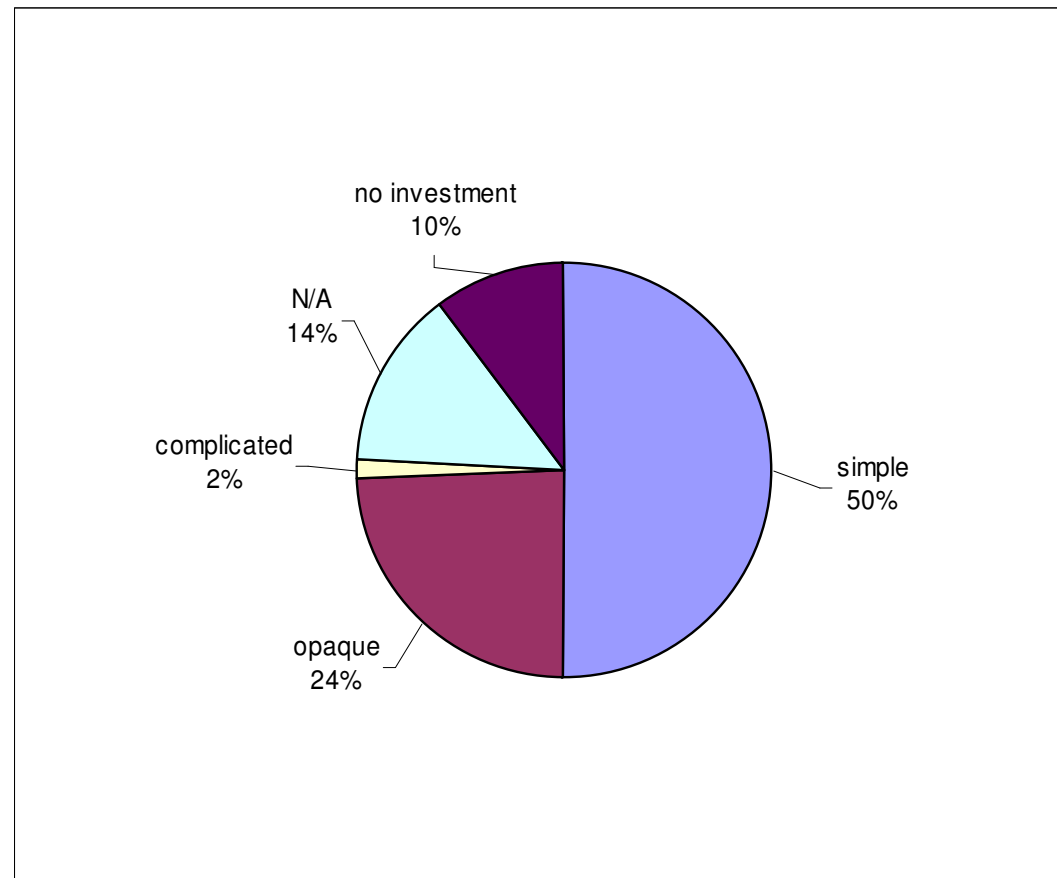
- Distribution of default path



# Causal Model

## Fraud Origin

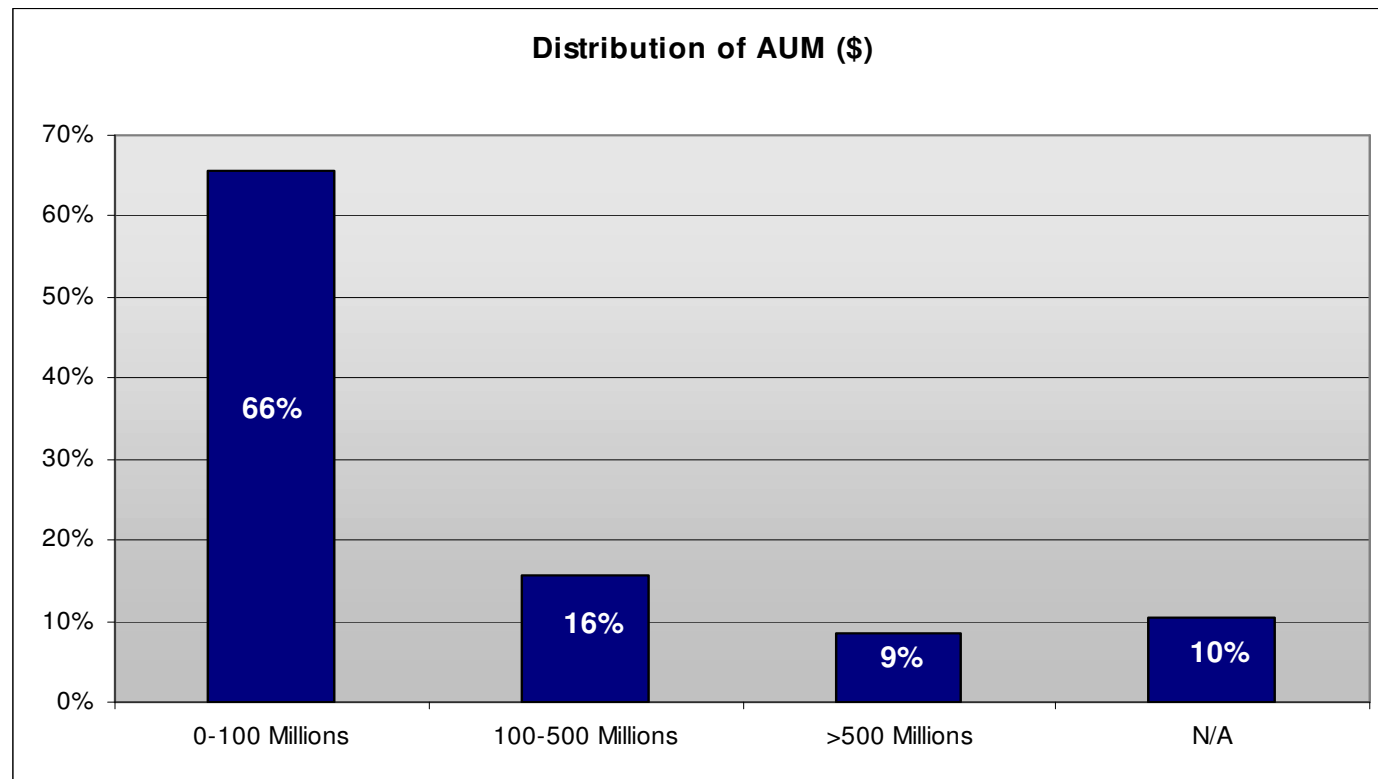
- Complexity of instruments



# Causal Model

## Fraud Origin

- AUM

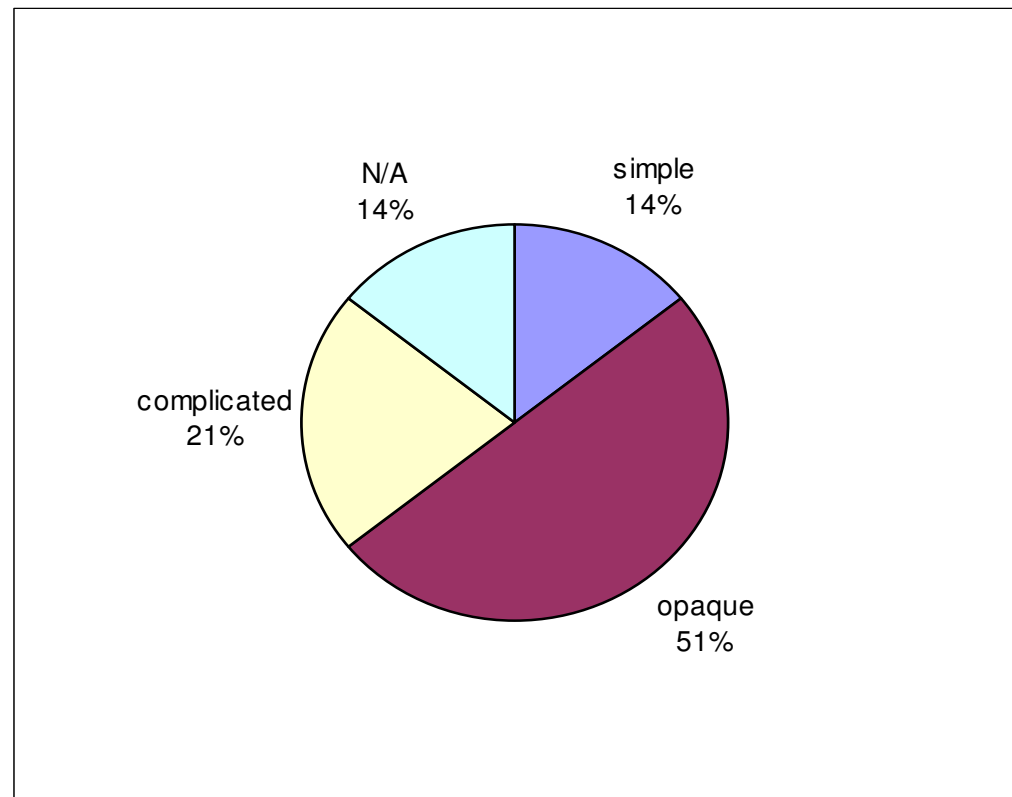


# Causal Model

## Operational Loss Origin

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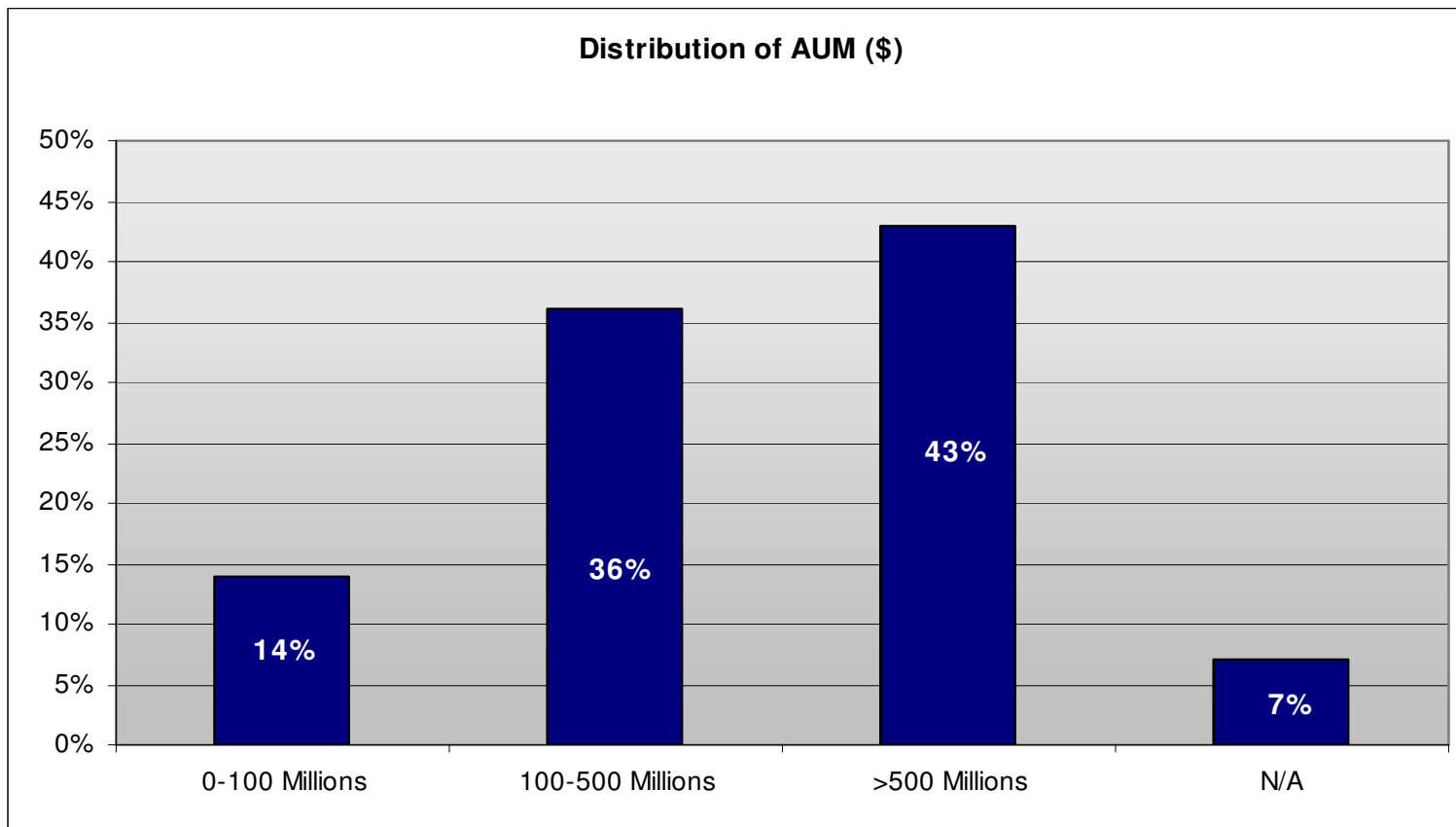
- Complexity of instruments



# Causal Model

## Operational Loss Origin

- AUM



# Causal Model

## Conditioned Default Frequency

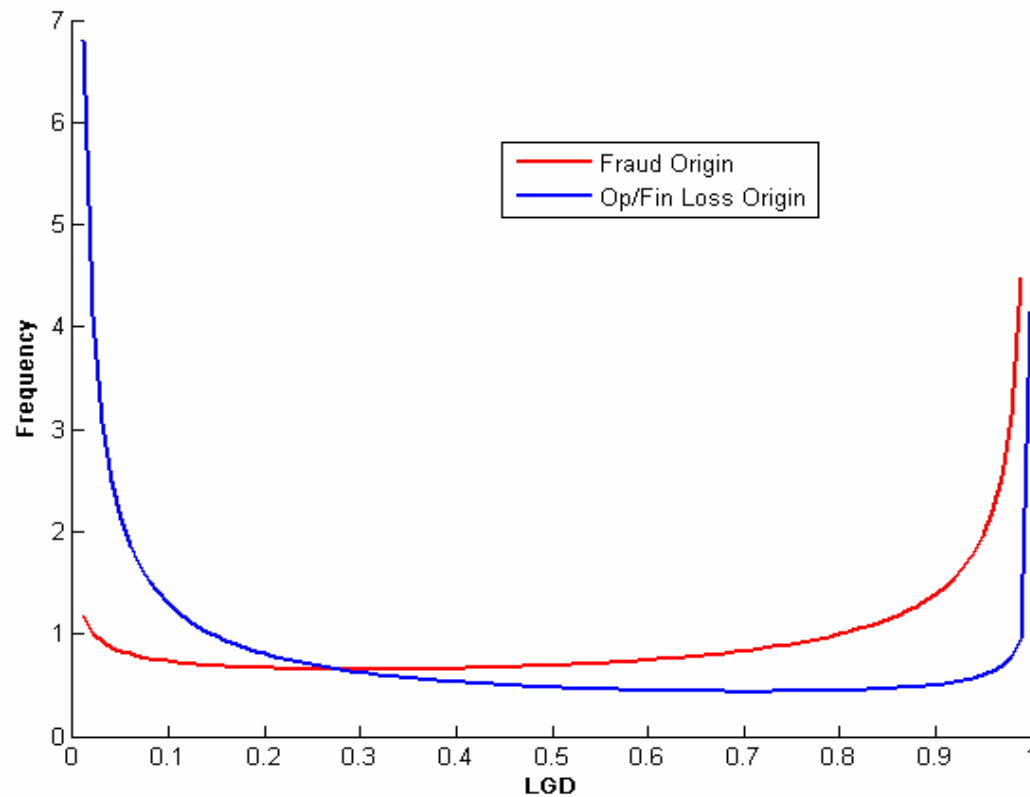
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<b>Global default probability</b>		0.302%
<b>Default probability conditioned to location of management company</b>	US	0.41%
	Non US	0.09%
<b>Default probability conditioned to complexity of instruments</b>	Simple	0.37%
	Opaque	0.68%
	Complex	0.05%
<b>Default probability conditioned to origin of default</b>	Fraud	0.154%
	Op/Fin Loss	0.148%

# Intelligent Diversification

## Frequency and Severity

Default probability conditioned to origin	Fraud	0.154%
	Op/Fin Loss	0.148%



# Intelligent Diversification

## Stochastic Model

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- Consider also HF financial performance

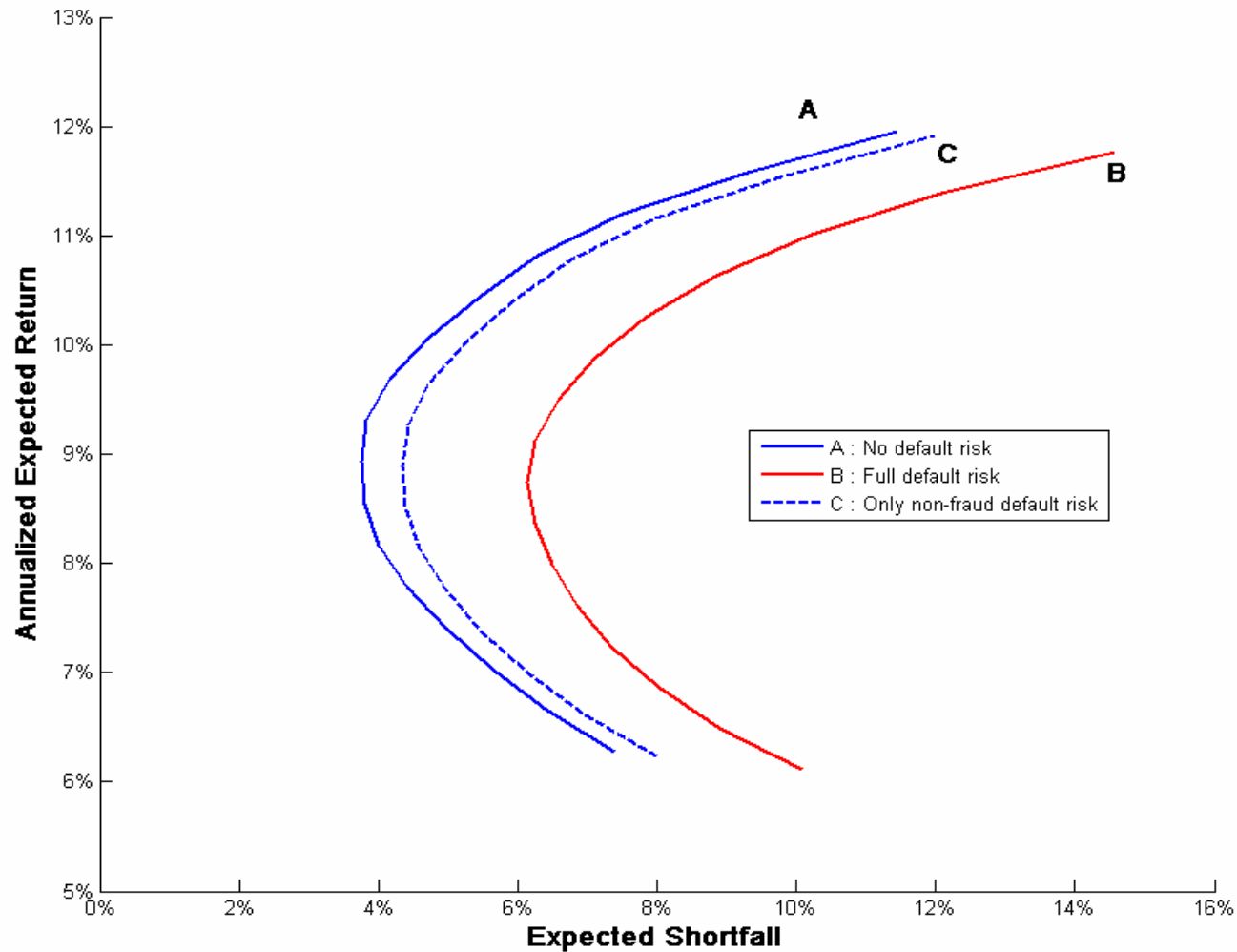
$$P \& L = \underbrace{\sum_{i=1}^N w_i R_i (1 - B_i)}_{\text{Financial Return}} + \underbrace{\sum_{i=1}^N w_i B_i LGD_i}_{\text{Default}}$$

$(R_1, R_2, \dots) \sim \text{Multivariate Normal}$

- Parameterized with Edhec HF Indices

# Intelligent Diversification

## Efficient Frontier



# Conclusion

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- Probability of default = 0.30%
- Default risk is not naively diversifiable
- By reducing fraud risk, much more efficient portfolio
- Operational Due Diligence is key for avoiding blow-ups