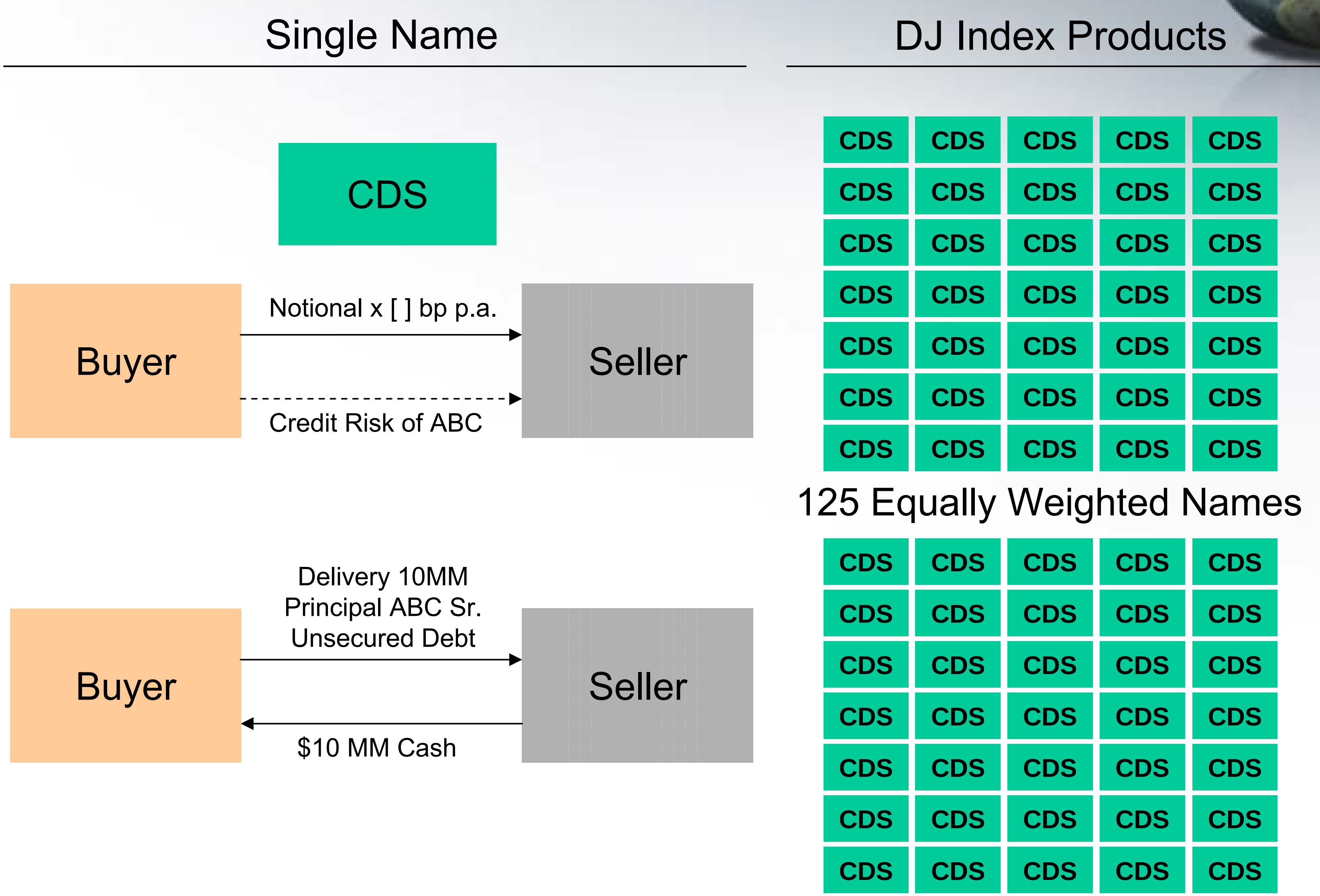
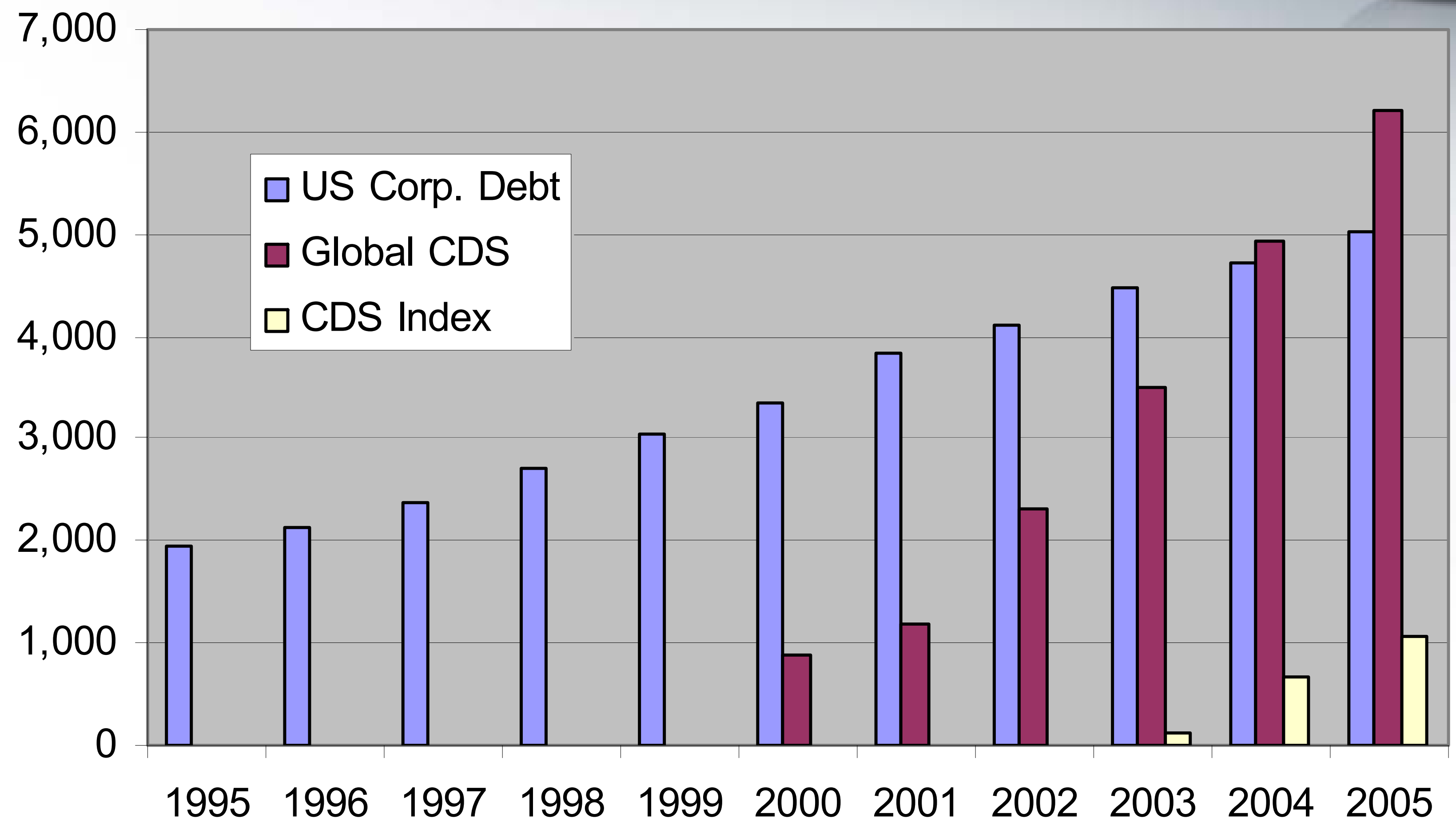
The Single Name Corporate CDS Market

Alan White

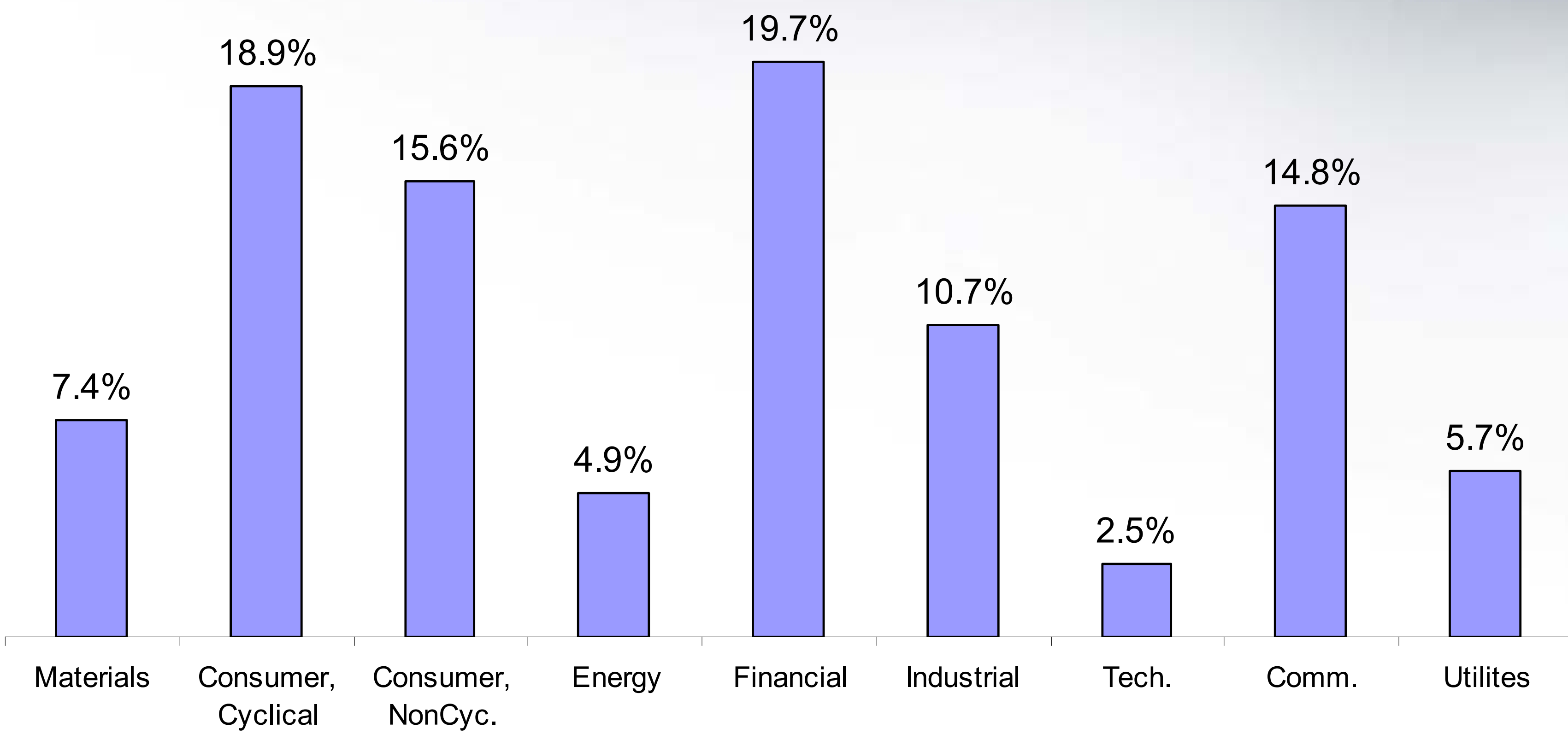
CDS Structure



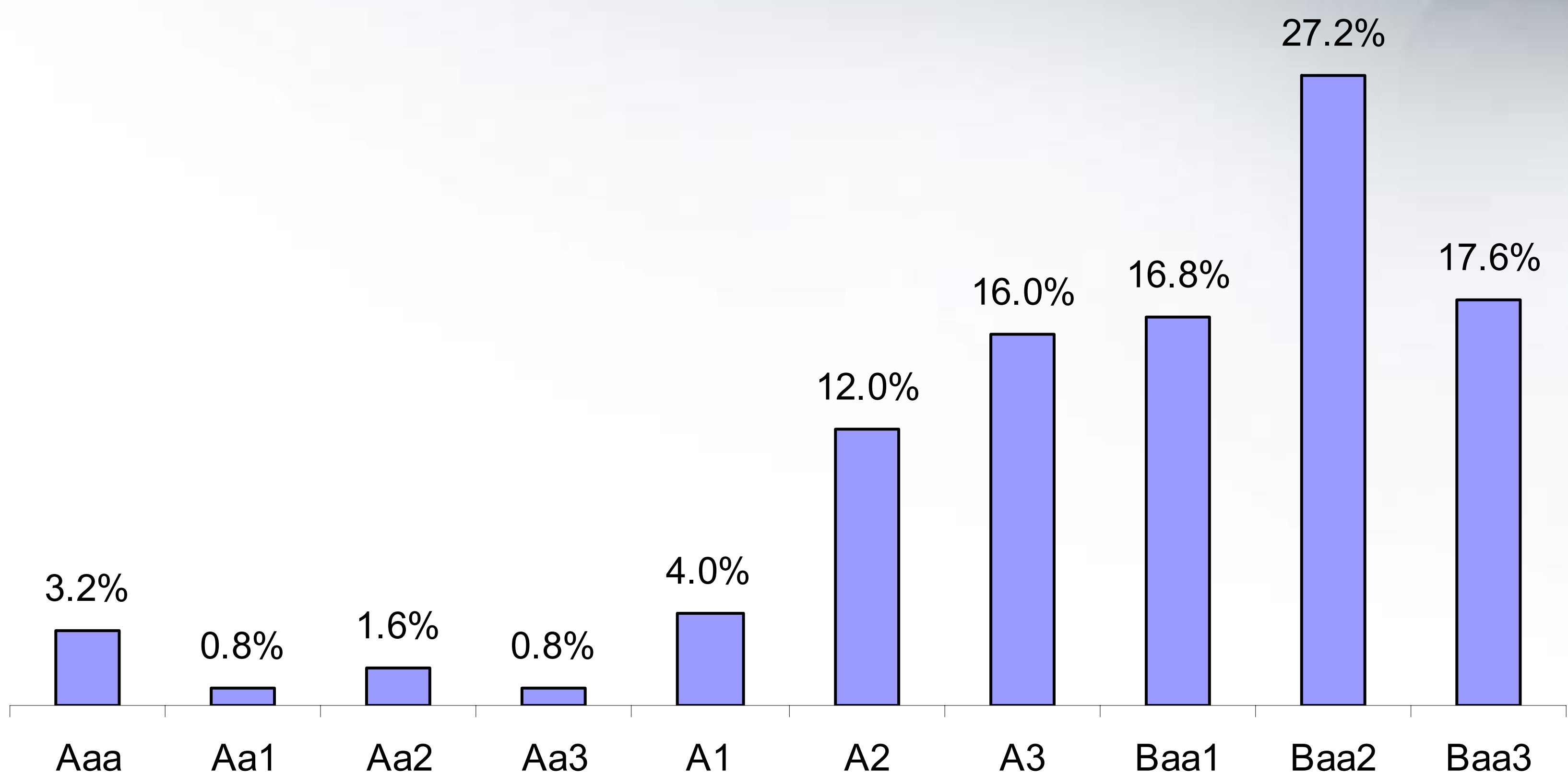
Market Growth Notional Outstanding



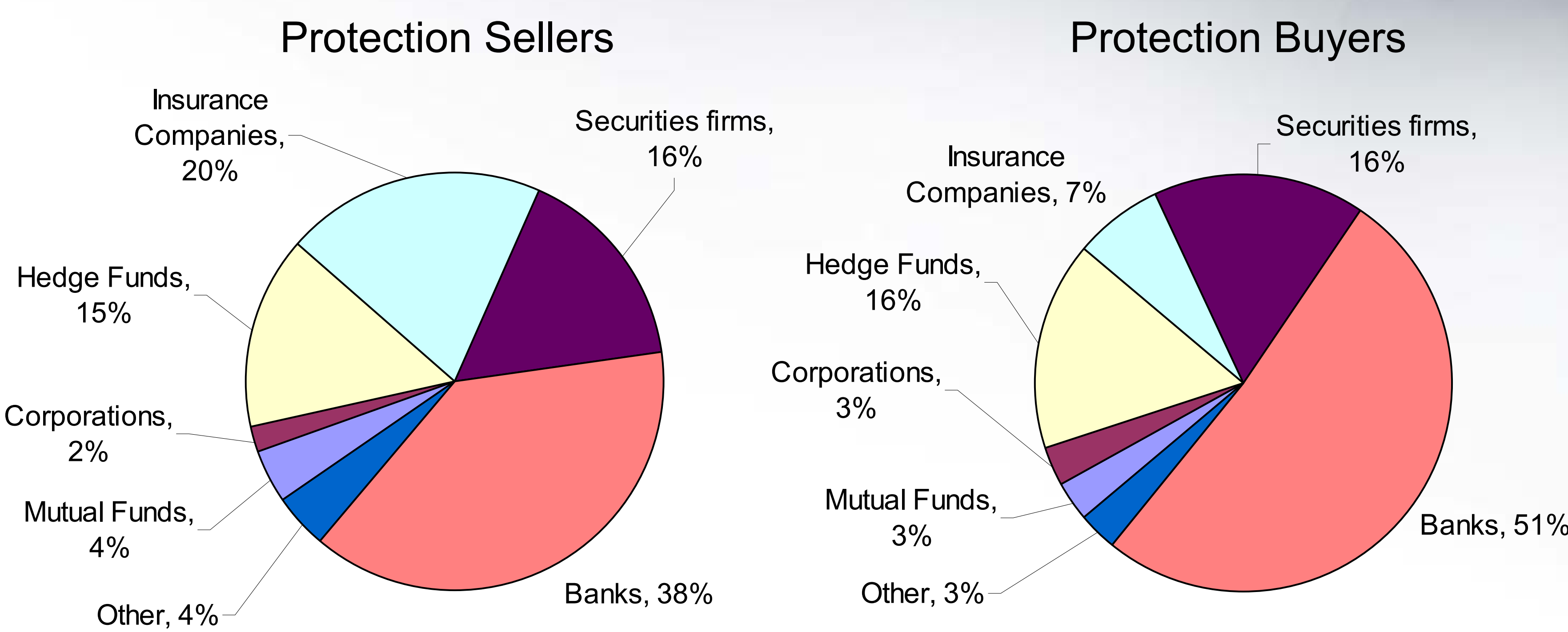
CDX-IG Index Industry Composition



CDX-IG Index Moody's Ratings



End Users


Protection Sellers
Insurance Companies, 20%
Securities firms, 16%
Hedge Funds, 15%
Corporations, 2%
Mutual Funds, 4%
Other, 4%
Banks, 38%
Protection Buyers
Insurance Companies, 7%
Securities firms, 16%
Hedge Funds, 16%
Corporations, 3%
Mutual Funds, 3%
Other, 3%
Banks, 51%

Risk and Return

Corporate Bonds vs. CDS

ABC Corporate Bond Return	ABC Corporate CDS
Credit Risk	Credit Risk
Interest Rate Risk	Allows direct trading of credit risk

Arbitrage Trade

- Buy the bond, buy protection earn the risk-free rate of interest
- Make a riskless investment, sell protection earn the bond yield

$\Rightarrow$ CDS spread, $s \approx y - r$

$\Rightarrow$ return on trade, $r \approx y - s$

Comparing with Treasury and Swap Rates

Spreads In Basis Points

Rating	$r - r_T$		$r - r_S$	
	Mean	S.E.	Mean	S.E.
Aaa / Aa	51.30	1.97	–9.55	1.31
A	64.33	1.82	–5.83	1.59
Baa	84.93	3.63	–2.21	2.79
All Ratings	62.97	1.38	–6.51	1.06

Ratings and CDS Spreads

CDS Spreads and Ratings Events

Conditioning on Ratings Event

Average CDS Spread Change (bp)

		Window (days relative to event)				
Event	n	–90, – 61	–60, – 31	–30, –1	–1, 1	1, 10
Downgrade	83	14.1**	8.4**	15.0**	3.8	8.2
Review for Downgrade	114	6.0*	3.2	14.6**	9.9**	-1.0
Negative Outlook	69	4.0	7.0*	17.7**	2.0	0.6

*   5% significance
** 1% significance

CDS Spreads and Ratings Events

Conditioning on CDS Spread Changes

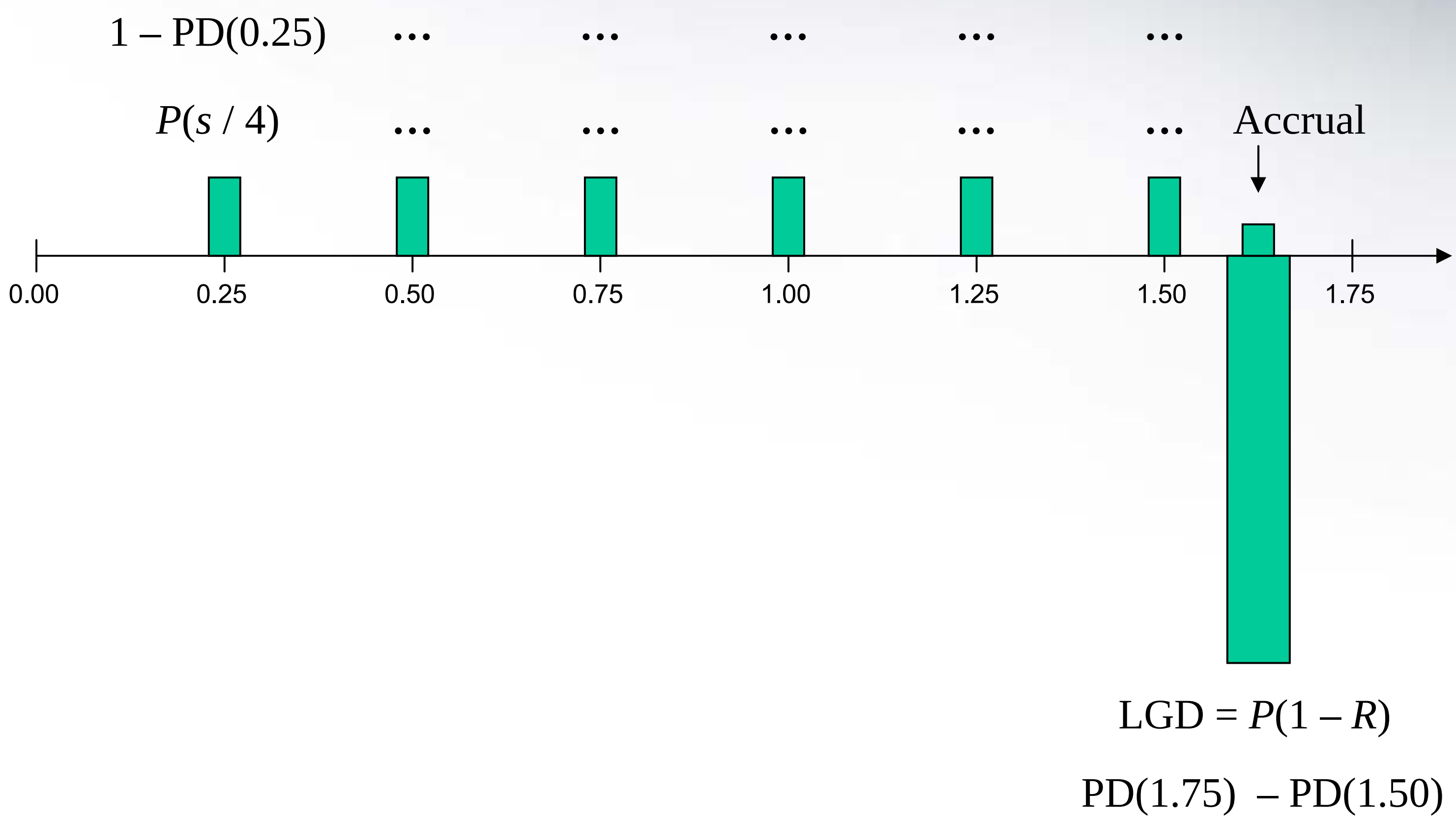
Percent of events in following 30 days in the subset of firms with the top p% of credit spreads

p	Downgrade	Review for Downgrade	Negative Outlook
50	80**	72**	68**
25	59**	46**	48**
10	37**	28**	15

*   5% significance
** 1% significance

Recovery Rates and Probability of Default

CDS Structure

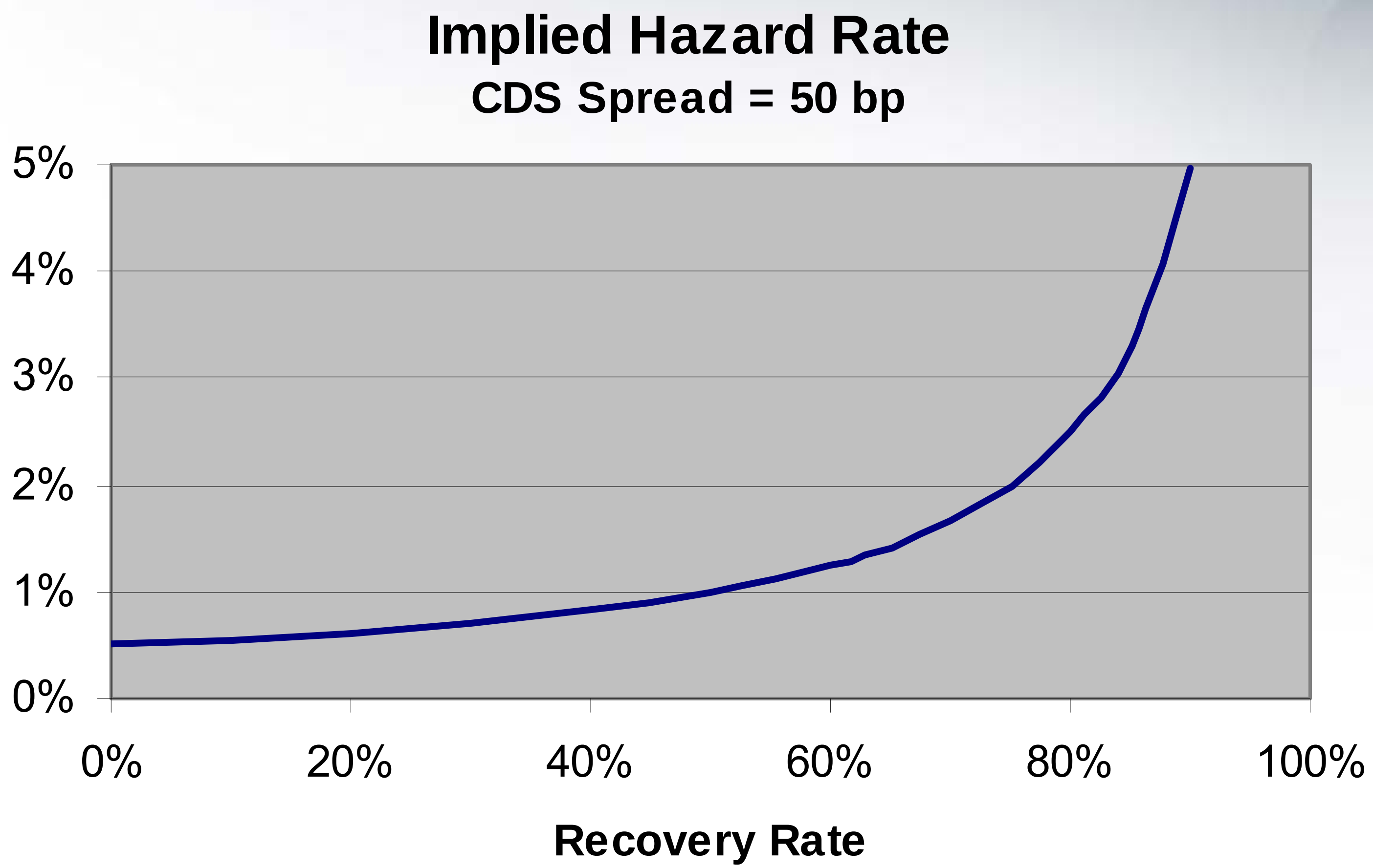


Extracting Hazard Rates – I

Fixed Recovery Model

- CDS value is the PV of payments weighted by the probability that the payment occurs
- Often set $PD(t) = 1 - \exp(-\lambda t)$
- Find the hazard rate λ that sets the CDS value to zero
- Implied λ is sensitive to assumed recovery rate, R

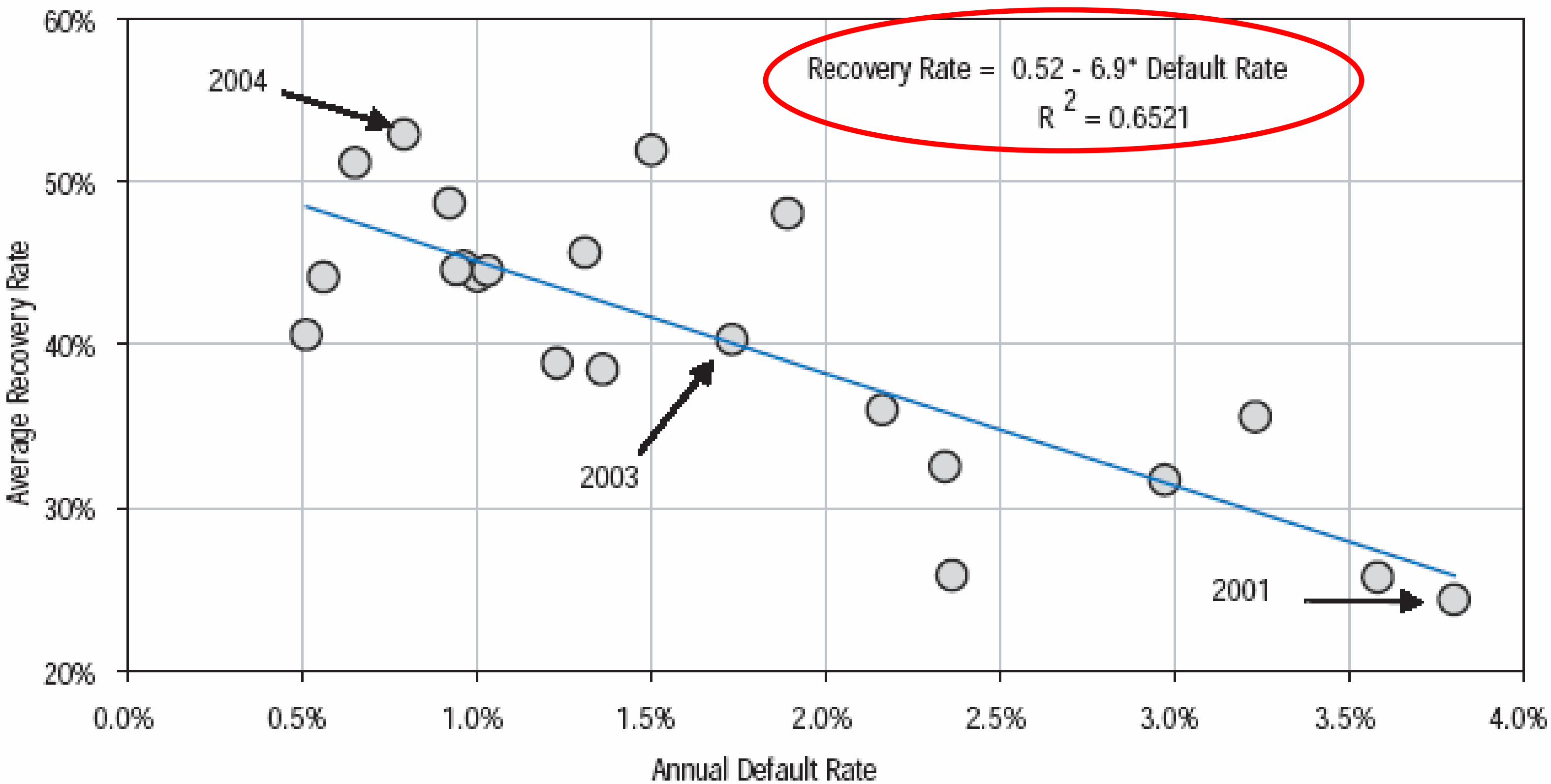
Implied Hazard Rates



A Recovery Model

Hamilton, Varma, Ou, and Cantor 2005

Exhibit 10 – Correlation between Recovery Rates and Annual Default Rates, 1983-2004



Gaussian Copula

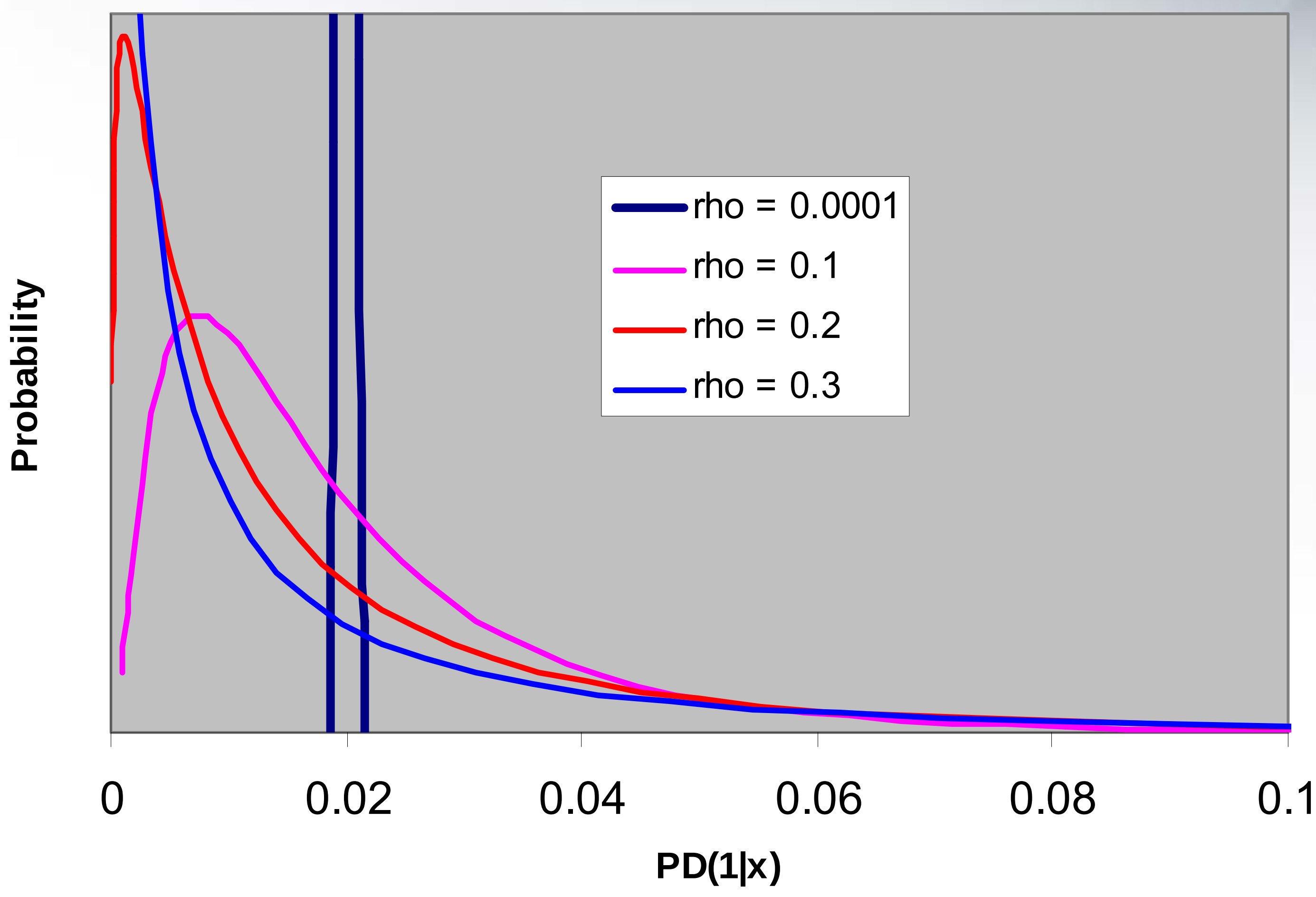
- Latent variable $x \sim N(0,1)$
- Conditioning on x

$$PD(t|x) = N\left[\frac{N^{-1}(PD(t)) - \sqrt{\rho}x}{\sqrt{1-\rho}}\right]$$

$$R|x = 0.52 - 6.9 \times N\left[\frac{N^{-1}(PD(1)) - \sqrt{\rho}x}{\sqrt{1-\rho}}\right]$$

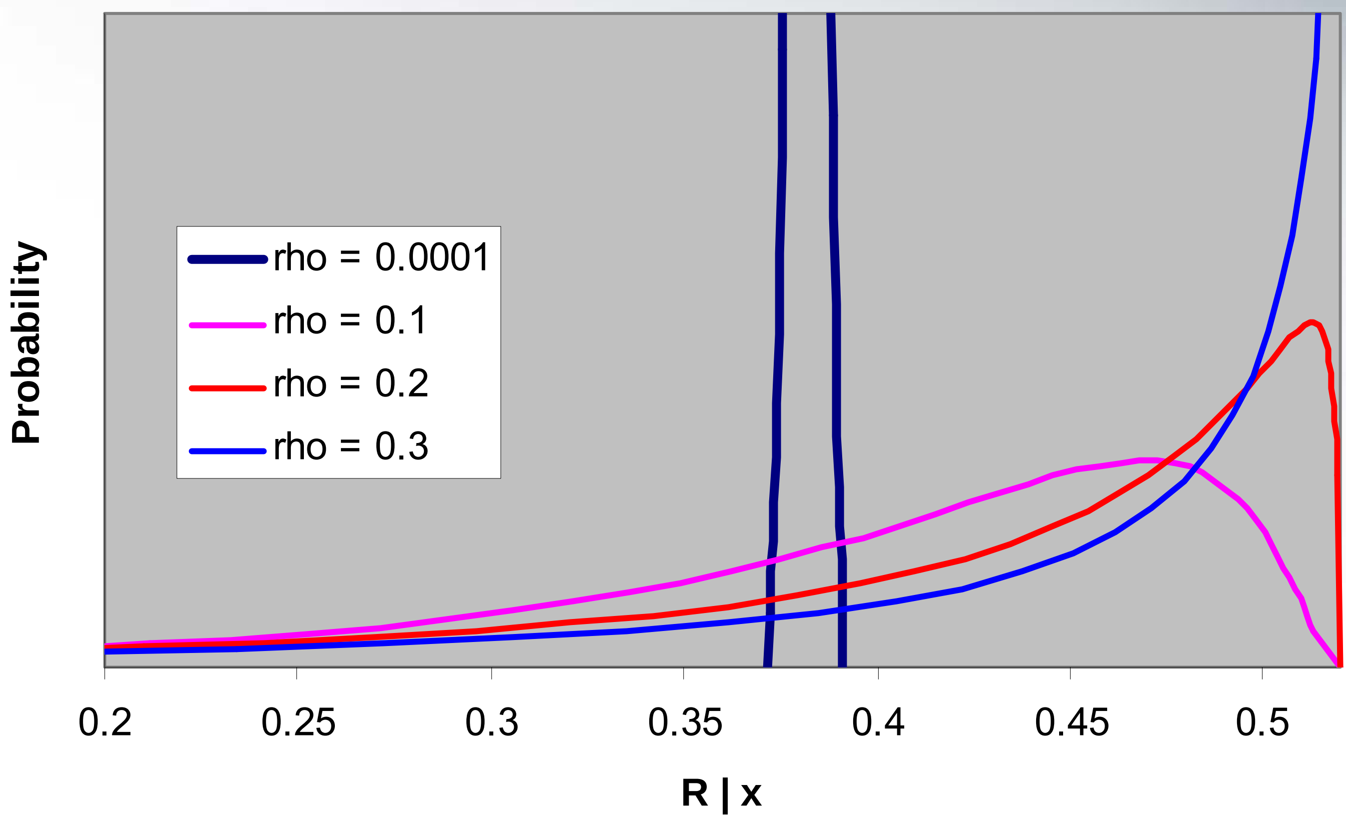
Conditional 1-Year PD

Unconditional PD(1) = 0.02



Conditional Recovery Rate

Unconditional PD(1) = 0.02



Rho	0.0001	0.1	0.2	0.3
Exp. Recovery	38.2%	38.4%	39.3%	40.5%

Extracting Hazard Rates – II

Variable Recovery Model

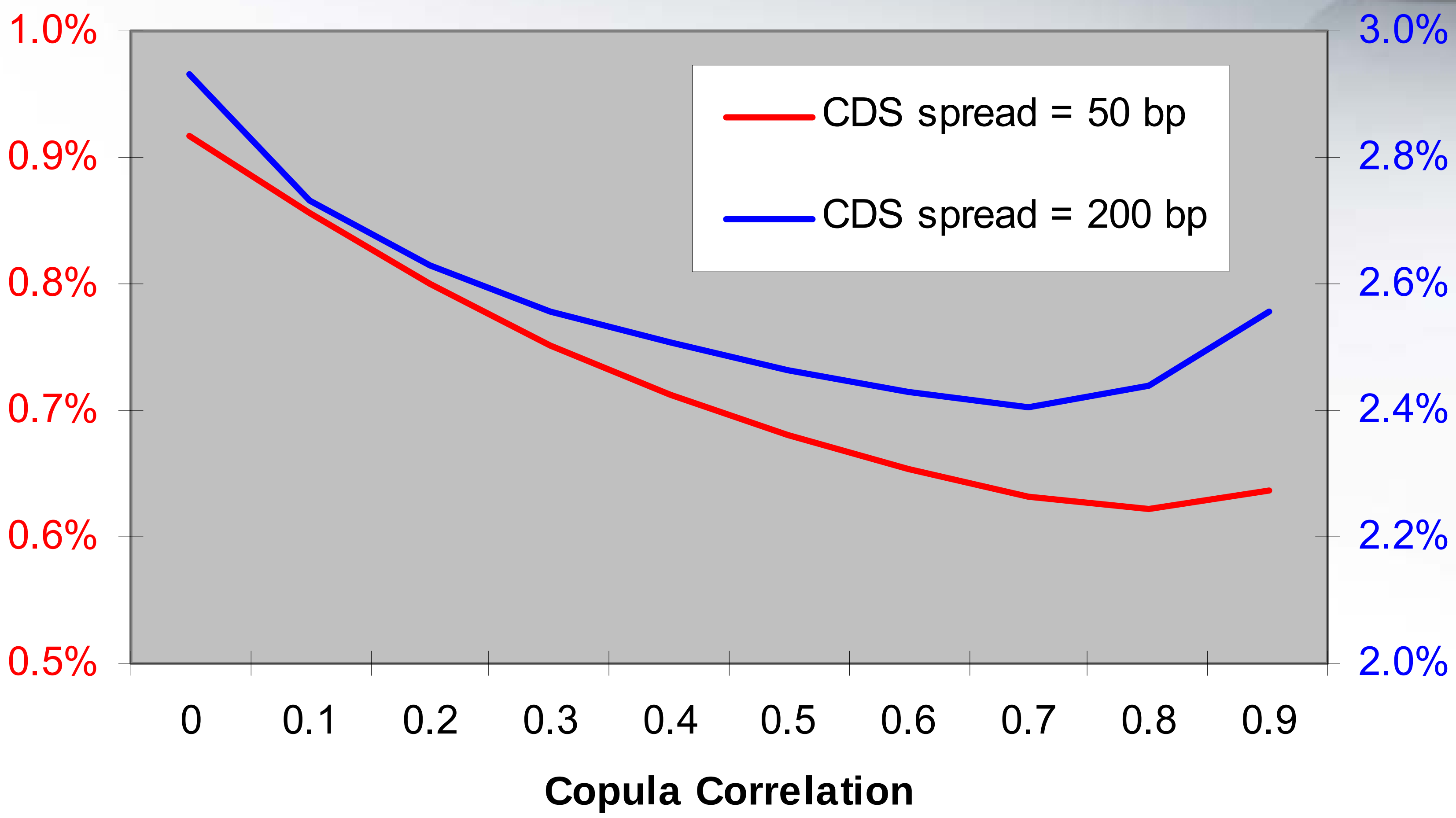
- For CDS with spread s, hazard rate λ, copula correlation ρ, and latent variable value x, the probabilities of default are known and the conditional CDS value can be computed
- Integrating the conditional values over x produces the unconditional CDS value
- $\lambda_{IC}(s, \rho)$ is the copula implied hazard rate,

$$V_C(s, \lambda_{IC}(s, \rho), \rho) = 0$$

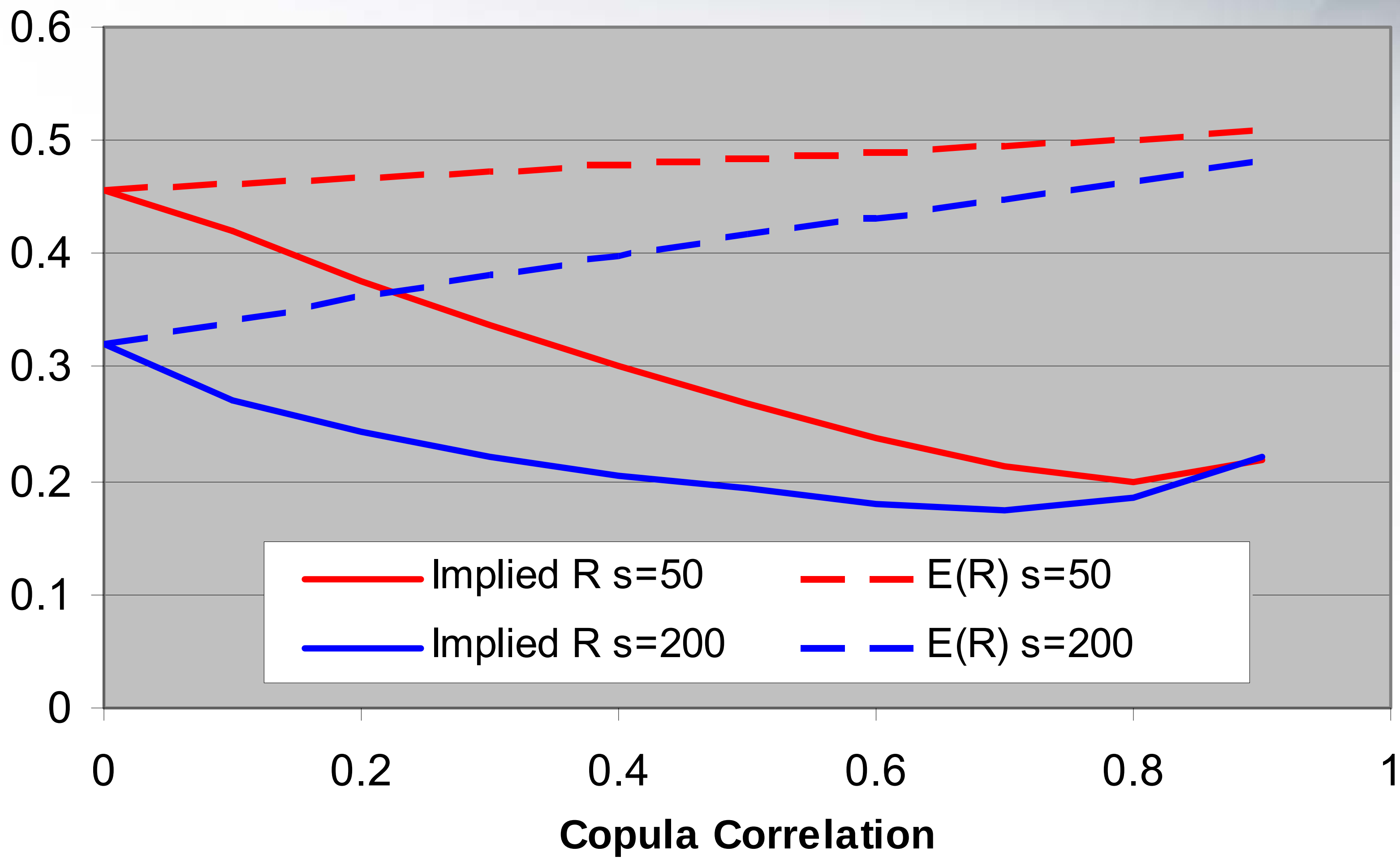
Extracting Recovery Rates

- $E_C[R(\lambda, \rho)]$ is the expected recovery rate under the copula model found by integrating over the latent variable
- $R_{IF}(s, \lambda_{IC})$ is the implied fixed recovery rate based on the copula implied hazard rate

Copula Implied Hazard Rate



Recovery Rates



Conclusion

- If CDS quotes reflect a recovery model in which probability of default and recovery are negatively related, and
- A fixed recovery rate model is used to infer probabilities of default
- The appropriate recovery rate needed to determine the probability of default is much lower than intuition would suggest