

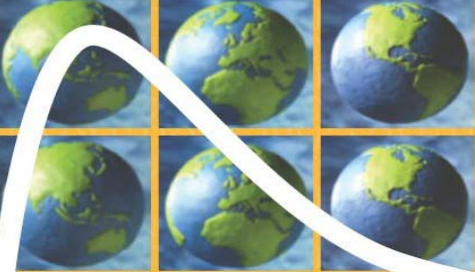
STANDARD
&POOR'S

Recent developments in Portfolio Modelling



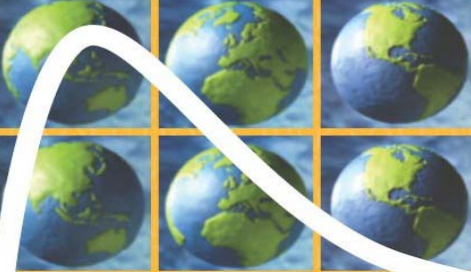
Presentation

RiskLab Madrid



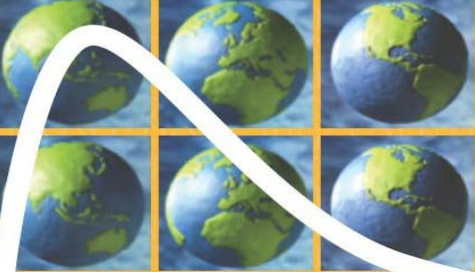
Agenda

- What is *Portfolio Risk Tracker*?
- Original Features
- Transparency
- Data
- Technical Specification



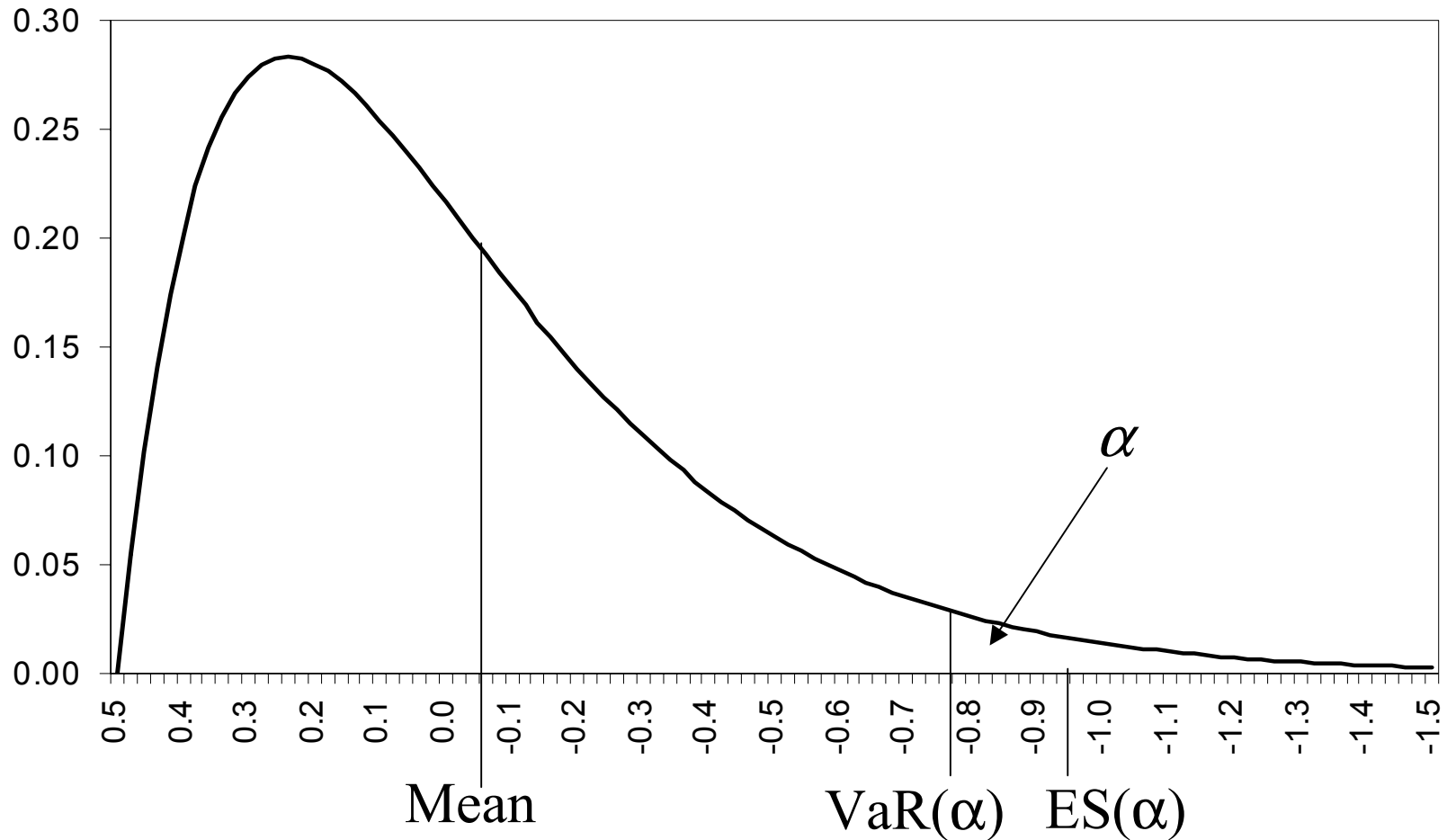
What is Portfolio Risk Tracker?

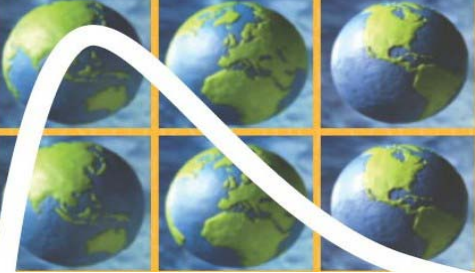
- *Portfolio Risk Tracker* is a tool enabling financial institutions to assess the risk of their portfolio of corporate bonds / loans, Treasury bonds, emerging market positions, structured products equities etc.
 - Expected loss
 - Portfolio Value at Risk.
 - Portfolio expected shortfall.
 - Risk contributions of sub-portfolios or individual assets.
- These outputs can be used for RAPM or strategic asset allocation.



What for?

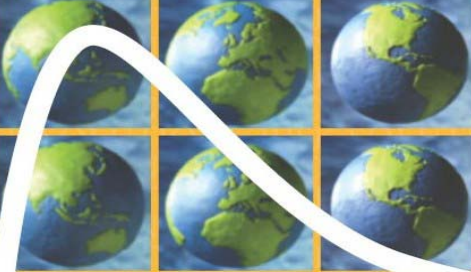
VaR and Expected Shortfall for Stylized Loss Distribution





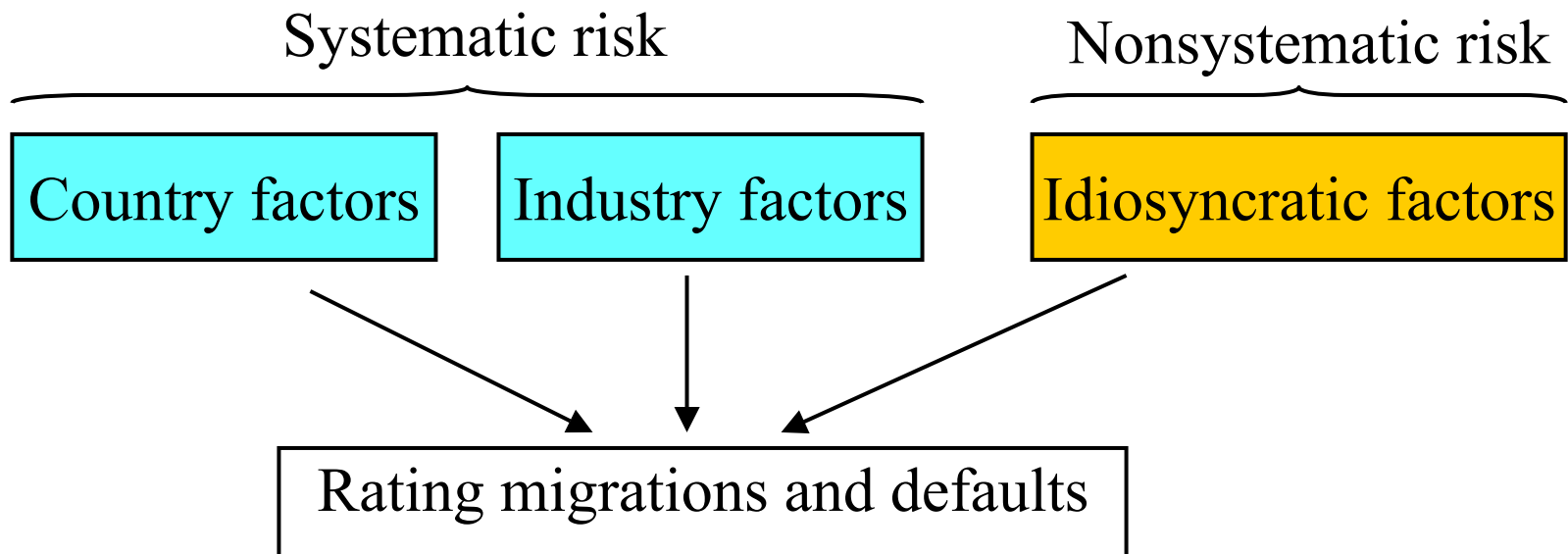
Original features

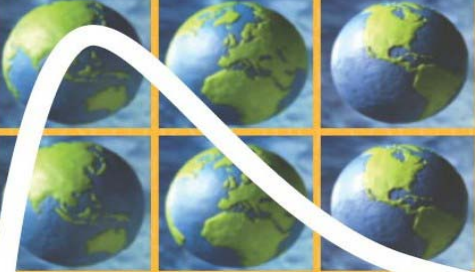
- A dynamic framework
- Incorporates market and credit risk
- Links PD and LGD
- Includes emerging market risk
- Structured products
- Other features



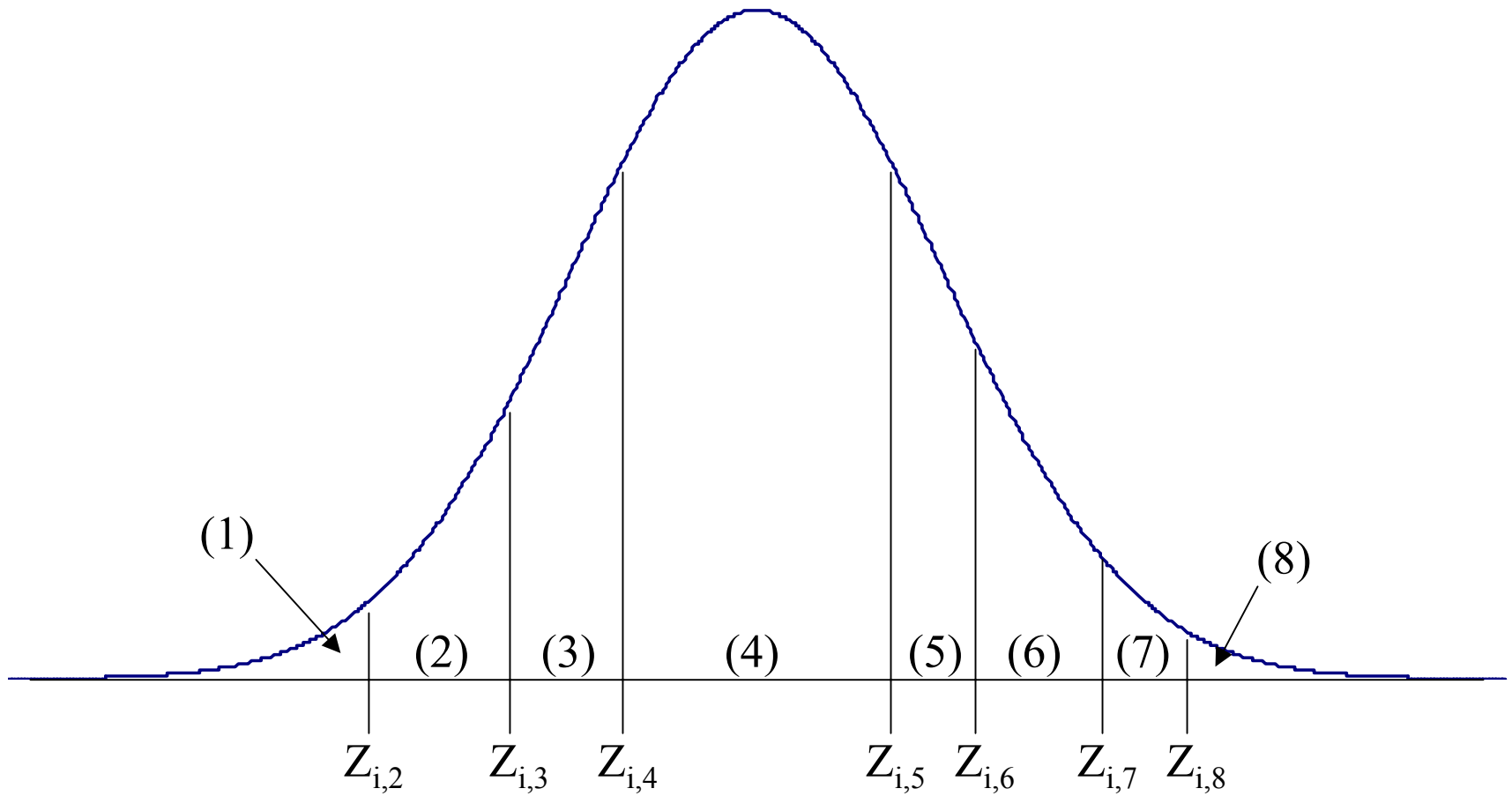
Basics of rating based models

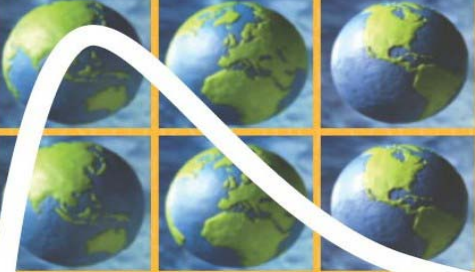
- The credit worthiness of obligors is assumed to be driven by a latent variable.
- This latent variable (intuitively, the firm value) is affected by country factors, industry factors and a firm-specific factor.



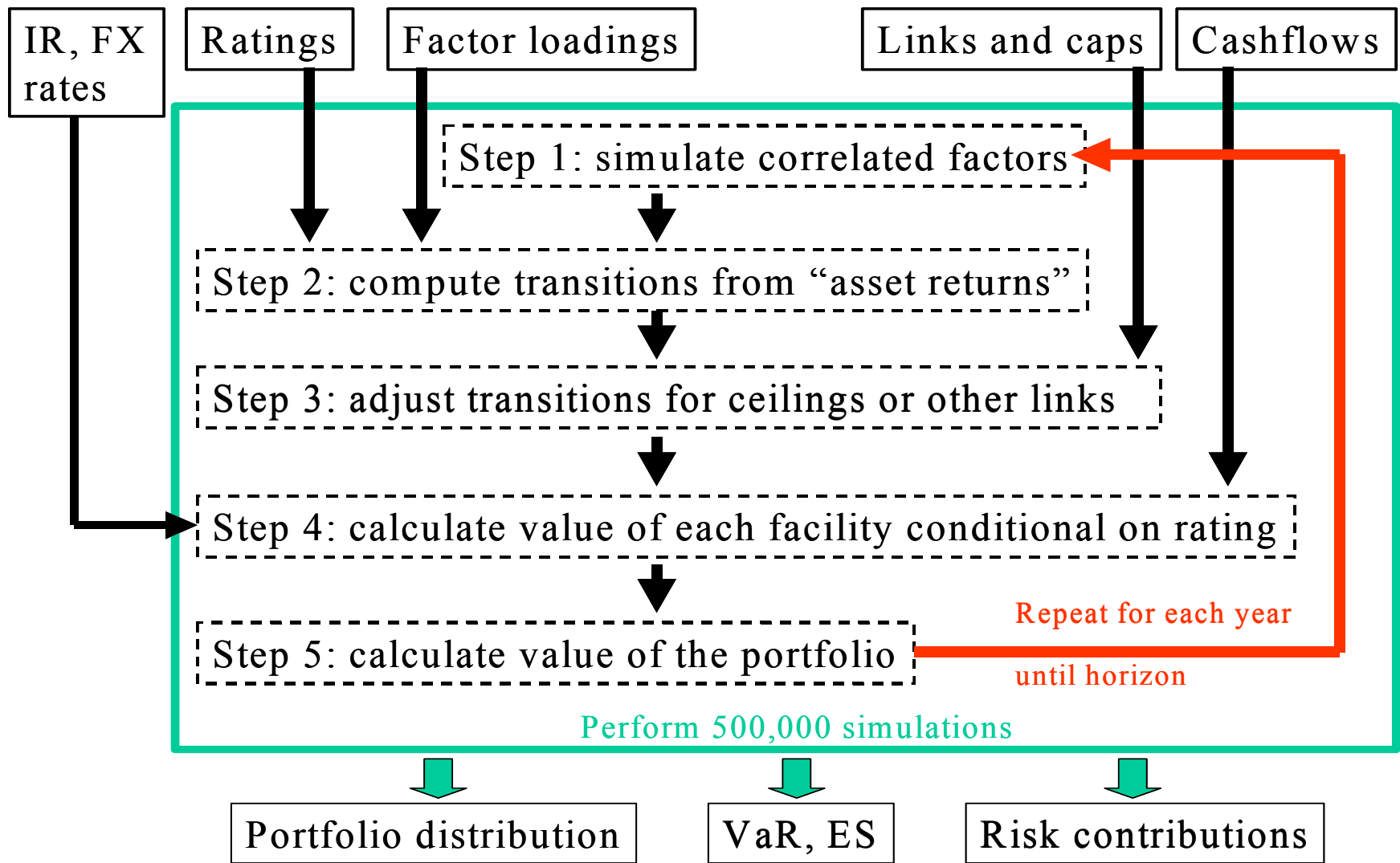


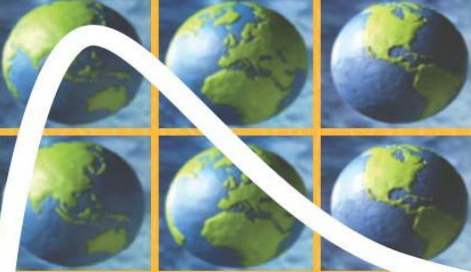
Basics of rating based models





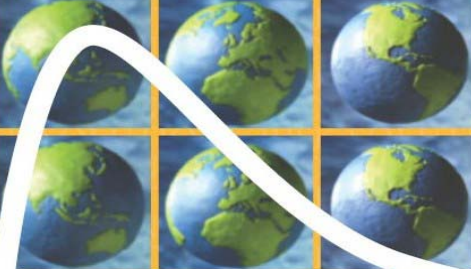
Simplified flow chart





Dynamic framework

- Most credit portfolio models implicitly assume that the horizon of the simulation is one year, ...
- ...or ignore the timing of losses before the horizon.
- Neither of these assumptions is fully satisfactory.
- *Portfolio Risk Tracker* differs from most other models in that it explicitly takes into account cash-flows during all years until the horizon.



Dynamic framework Example

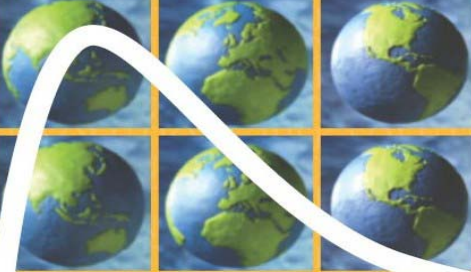
- Consider a simple four-year loan with principal P and annual coupon c .

Period:	1	2	3	4
Cash flows:	c	c	c	$c+P$.

- Suppose also that the horizon of the calculation is 4 periods and that the path of the obligor's rating on one Monte Carlo simulation is either:

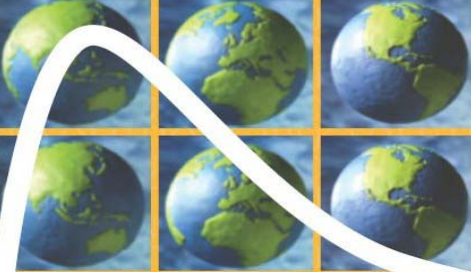
Period:	1	2	3	4
Rating path 1:	D	D	D	D.
Rating path 2:	BBB	BBB	BB	D.

- A single period model would assign the same loss to both paths.



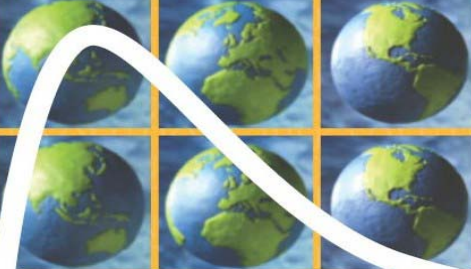
Market and Credit Risk

- *Portfolio Risk Tracker* is a ratings-based model of credit risk: Rating transitions and forward spread curves determine the future values of loans and bonds.
- It also incorporates interest rate risk which is particularly important for:
 - Treasury bonds;
 - Floating-rate notes;
 - Swaps;
 - and for the discounting of payoffs.
- The chosen model is a Libor-market model.

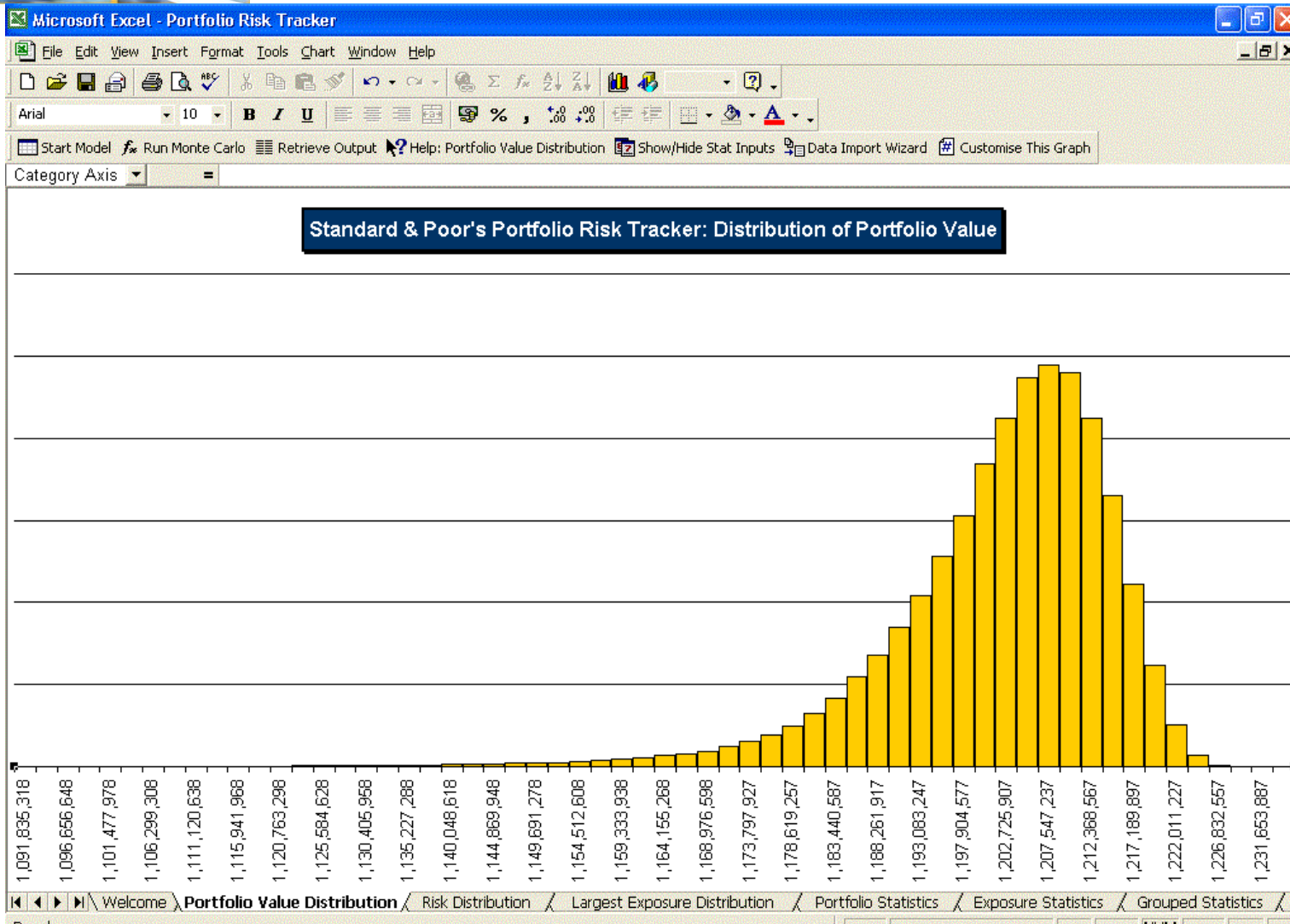


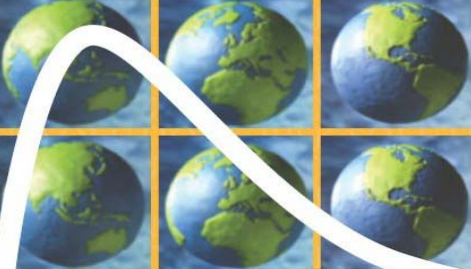
Market and Credit Risk

- Equity positions are also included.
- Default on the bond immediately triggers the equity value to drop to zero.
- This allows the modelling of the hedging of corporate bond portfolios using equities.
- A stochastic FX model enables the user to incorporate positions in various currencies consistently.

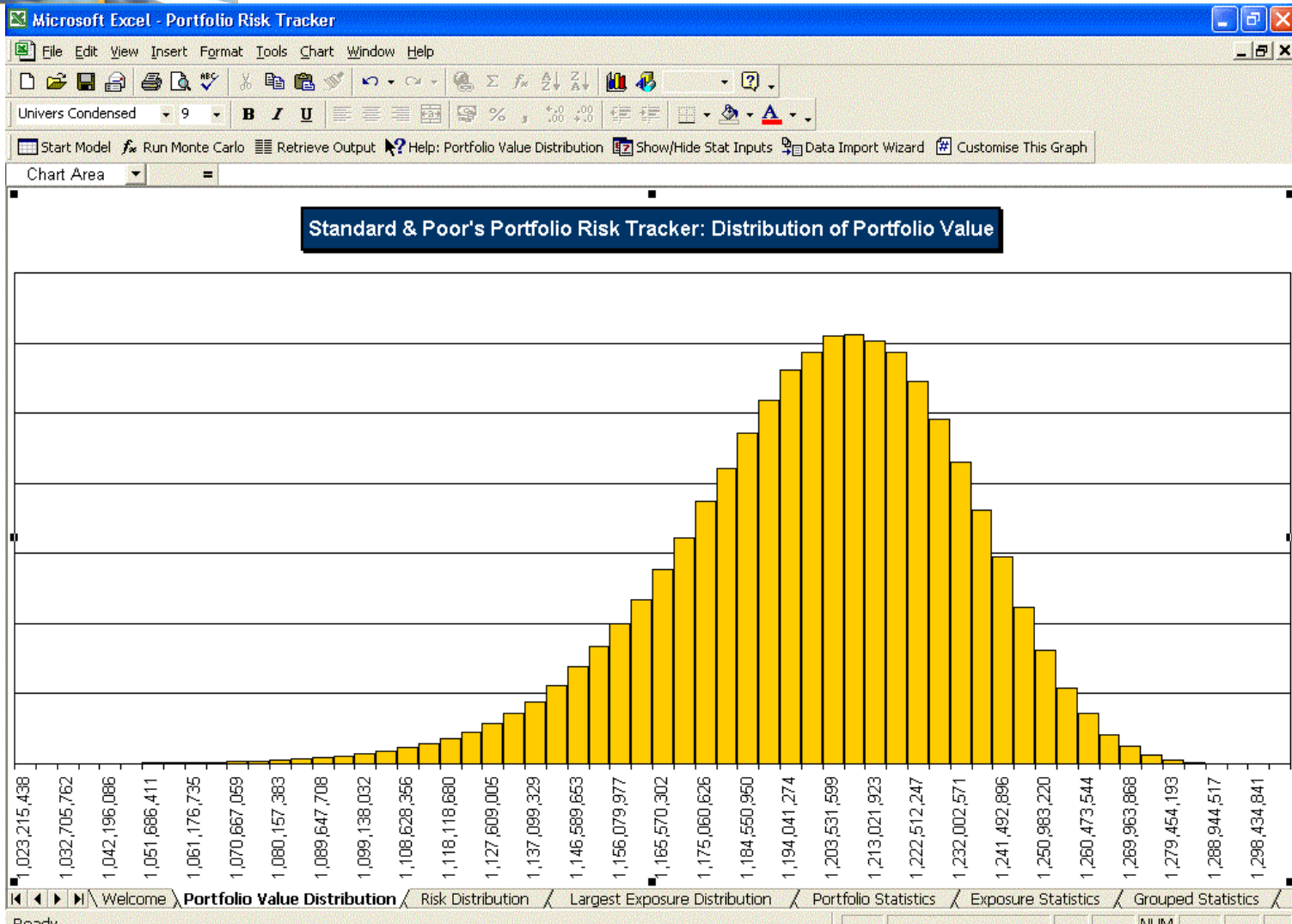


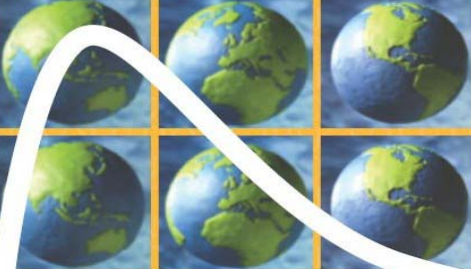
Excluding interest rate risk



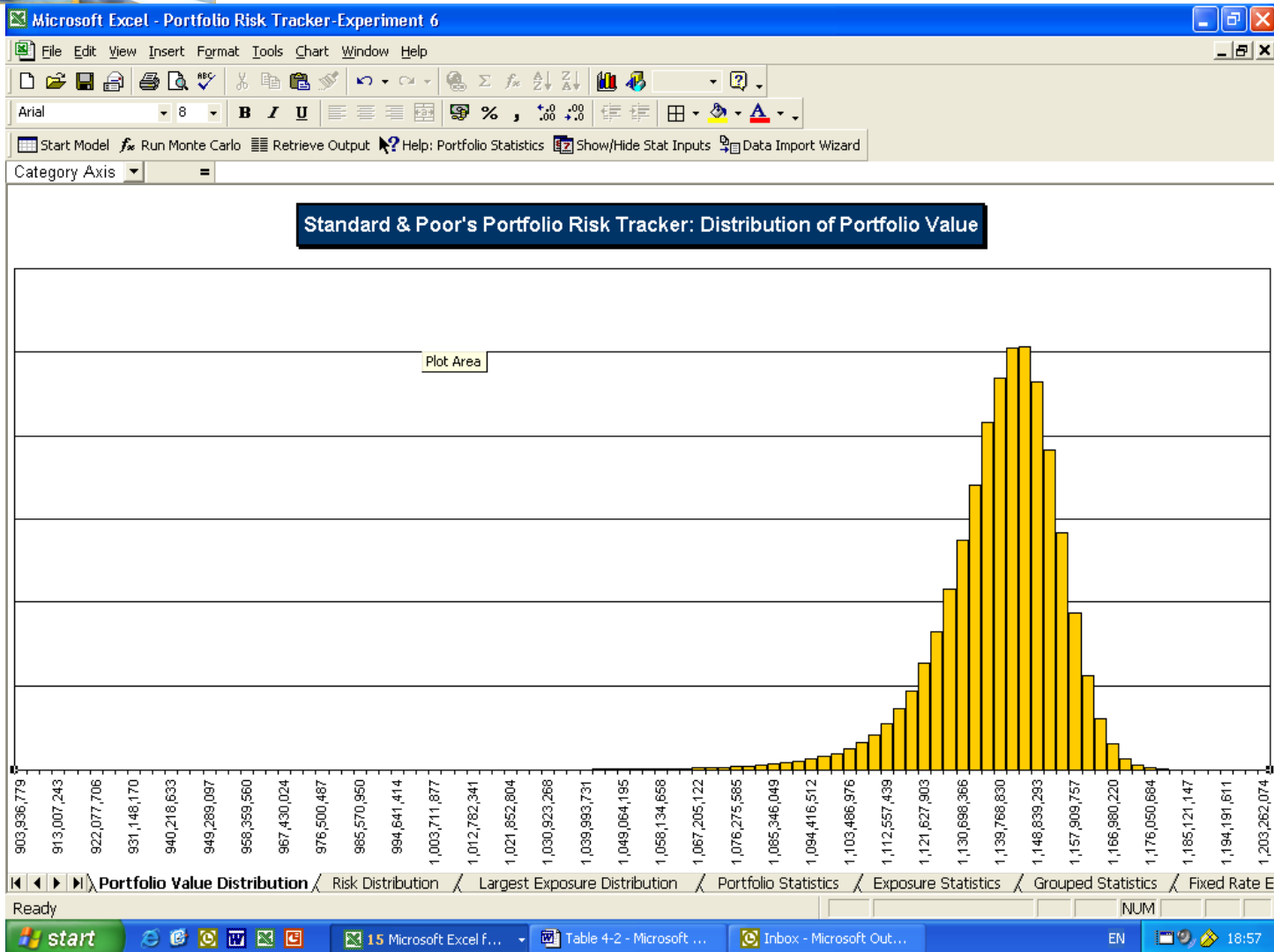


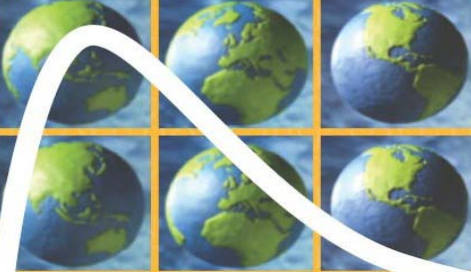
Including interest rate risk





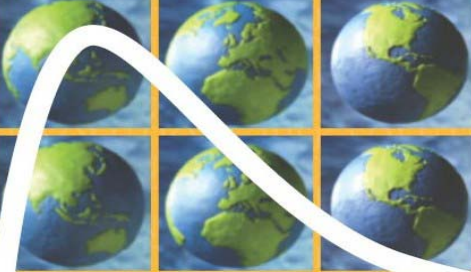
Effectiveness of equity hedge





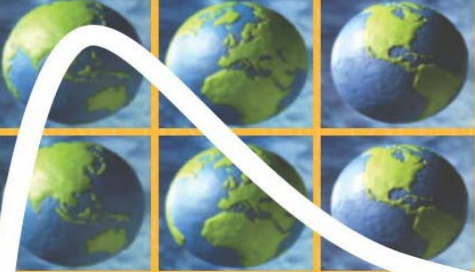
Linking PDs and Recoveries

- PDs and recovery rates have been shown to correlate strongly.
- When a sector or the economy as a whole is affected by a shock, the number of defaults increases and recoveries drop.
- Several reasons can explain this link:
 - Excess supply of liquidated assets not matched by increased demand from vulture funds,
 - Drop in the value of collateral etc.

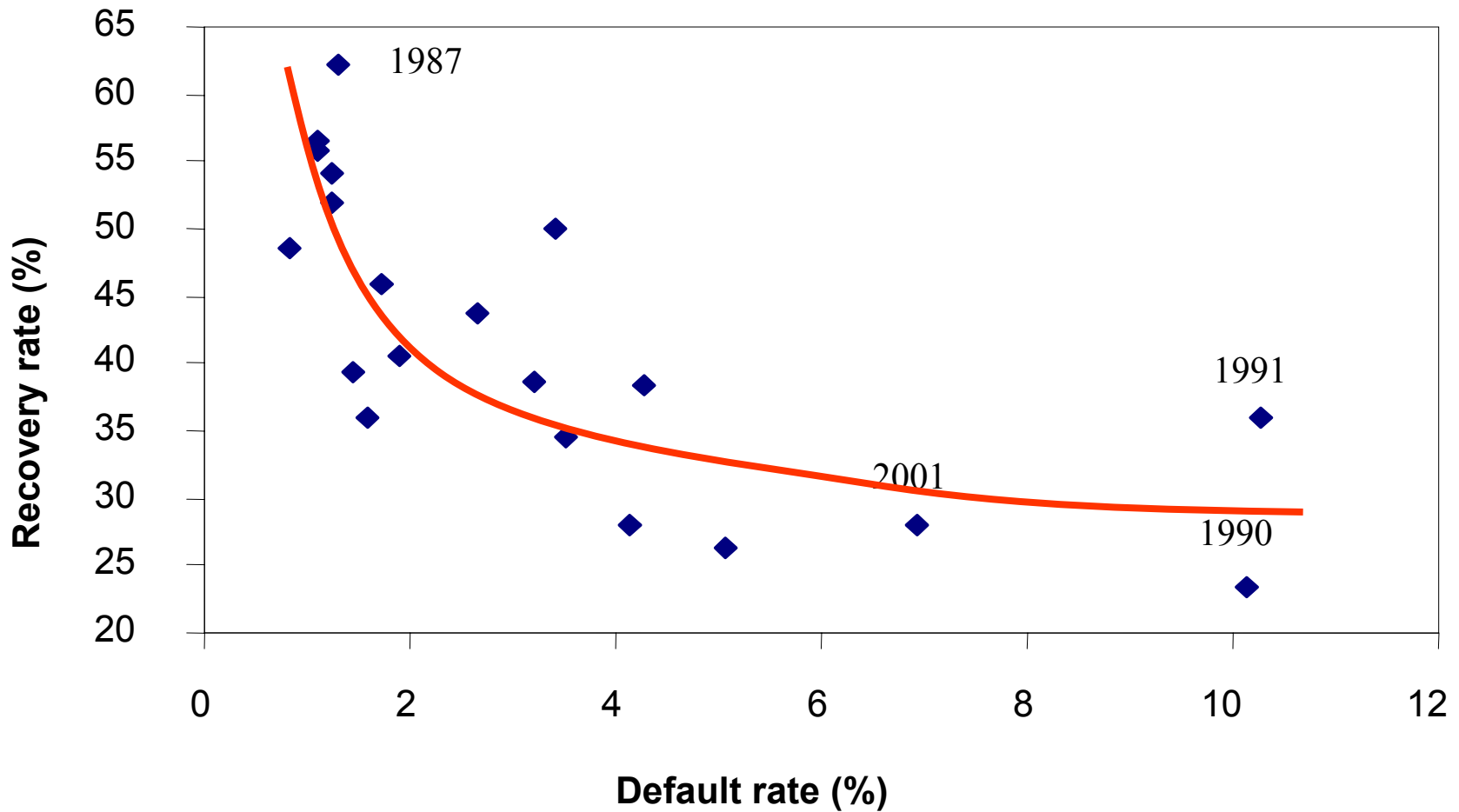


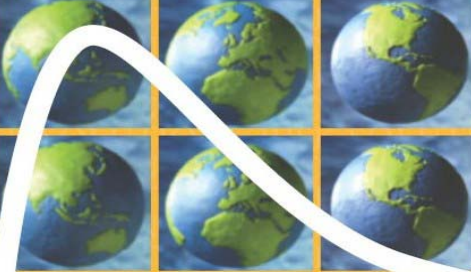
Linking PDs and Recoveries

- *Portfolio Risk Tracker* models recovery rates as beta-distributed random variables.
- The unconditional mean and variance of the distribution are chosen by the user.
- The mean is linked to the systematic factors driving the companies “asset value”, thereby introducing a convex link between PD and LGD.
- The curvature is similar to that observed in practice (see overleaf)



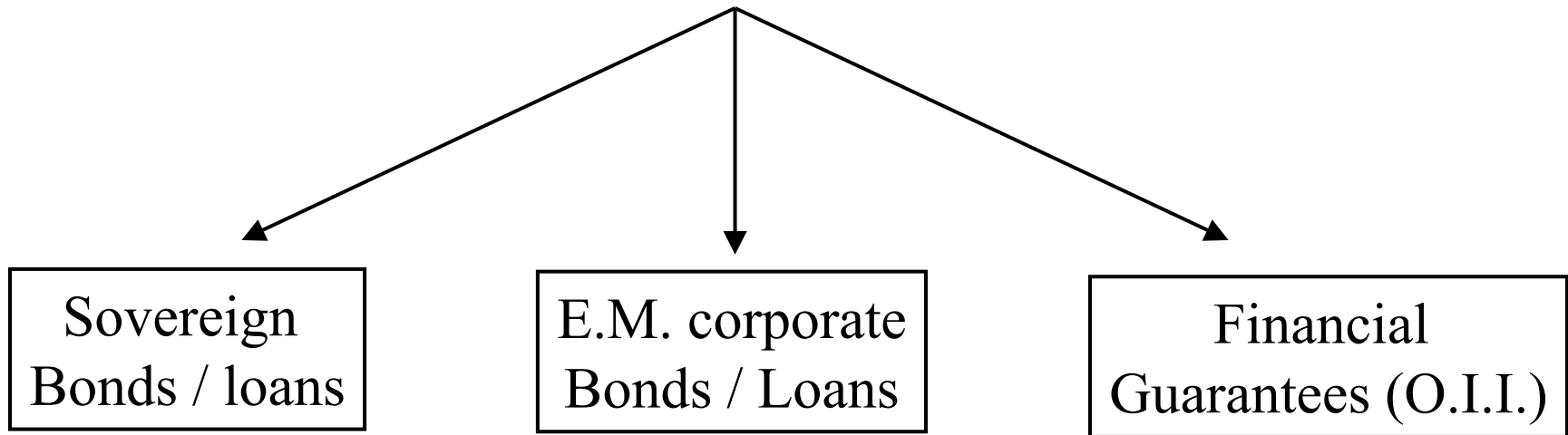
Linking PDs and Recoveries



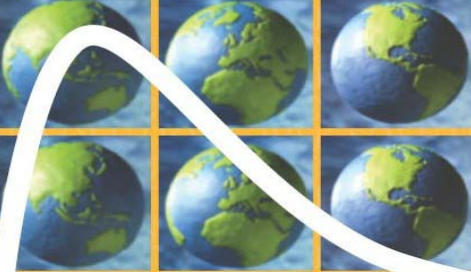


Emerging market risk

Emerging market positions can be divided into three categories

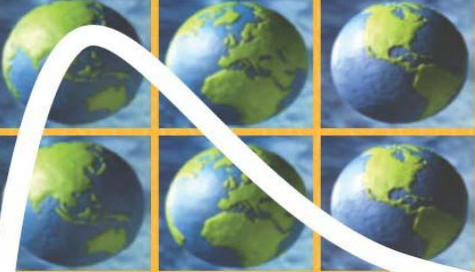


Over 60 country factors are included in *Portfolio Risk Tracker*



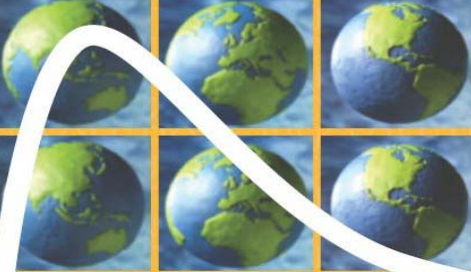
Emerging market risk

- The user can choose to cap the rating of a corporate to that of its sovereign.
- Some O.I.I. payoffs are built in *Portfolio Risk Tracker*.
- Sovereign default is *not* an absorbing state.
- Several choices of carefully estimated sovereign transition matrices are provided as well as estimates for default duration.



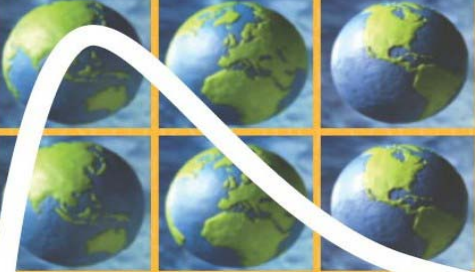
Structured products

- Structured products are often excluded from portfolio risk calculations.
- *Portfolio Risk Tracker* allows for ABS and CDOs to be included.
- The user can therefore assess the contribution of a specific tranche or an entire CDO/ABS to the total risk of his portfolio.
- The same obligors may be included in the underlying pools of multiple CDOs, or as standalone bonds / loans.



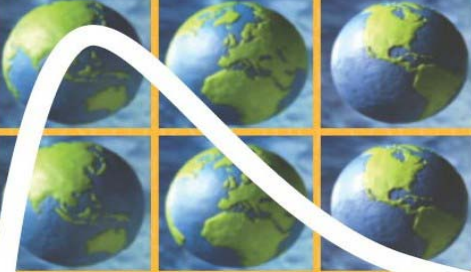
Structured products

- Several “typical” structures are built-in and more will be added as the market develops.
- The pricing / risk analysis relies on a technique similar to Least Square Monte Carlo developed by Longstaff-Schwartz (2001).
- Step 1: One simulates the performance of the underlying pool and estimates a pricing formula relating the payoff on the tranche to the share of the underlying pool in different rating categories.
- Step 2: This numerical pricing formula is used in the standard Monte-Carlo simulations with the rest of the portfolio.



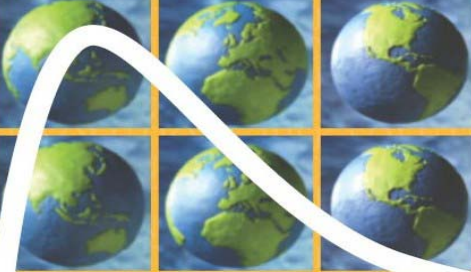
Other contingent claims

- *Portfolio Risk Tracker* is also equipped with formulas for various standard derivatives.
- These include:
 - some interest-rate options;
 - credit derivatives (CDS);
 - swaps;
 - etc.



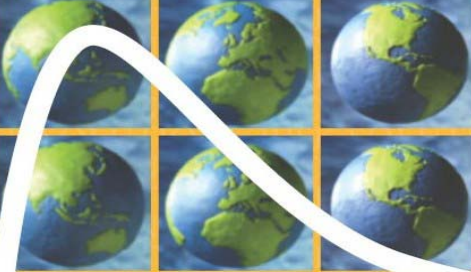
Other features

- Many additional features are embedded into *Portfolio Risk Tracker*.
- Three sources of factor correlations are provided:
 - Standard equity index correlation
 - Correlation of spreads
 - Correlations extracted from default data
- Spreads can be adjusted to be consistent with mean recovery rates.
- Spreads can be inferred from expected returns.



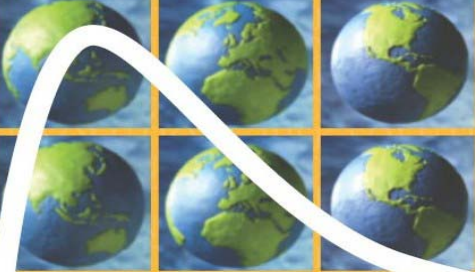
Other features

- The rating of a counterparty can be linked to that of another obligor (parent company for example).
- Risky collateral can be included to back up loans.
- Specific transition matrices can be chosen for specific types of obligors.
- Marginal VaRs can be estimated using EVT. This avoids the high instability of MVaRs far in the tail.



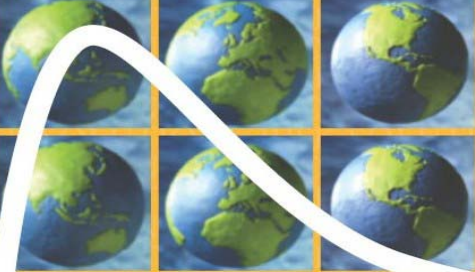
Experiment of MVaR calculations on dummy portfolio

- In order to test the effectiveness of tail fitting on MVaR calculations, we created a simple portfolio.
- 200 identical lines.
- Same industry factor, country factor, loadings, ratings etc.
- Calculate MVaR for 100,000 up to 1M simulations with or without tail fitting.

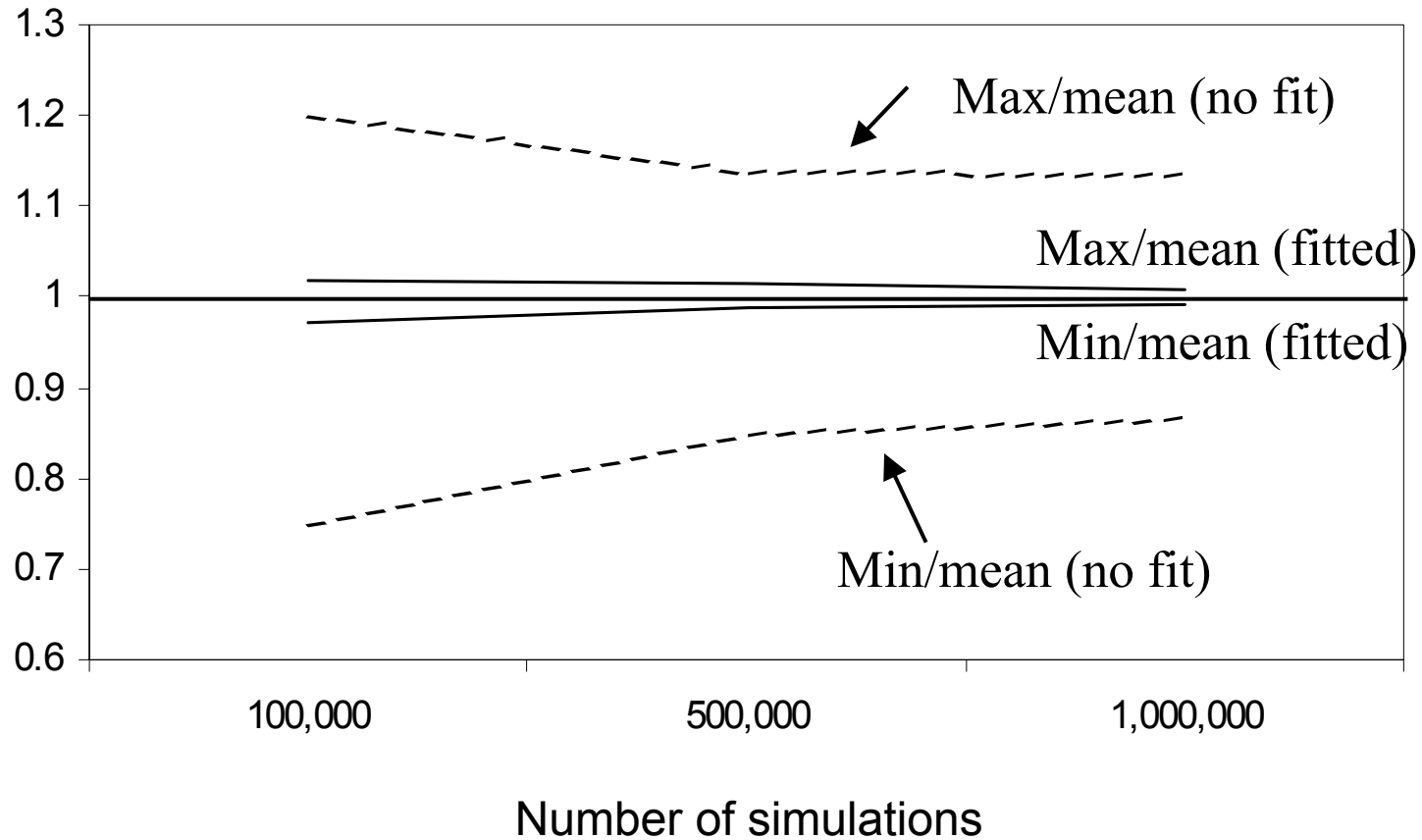


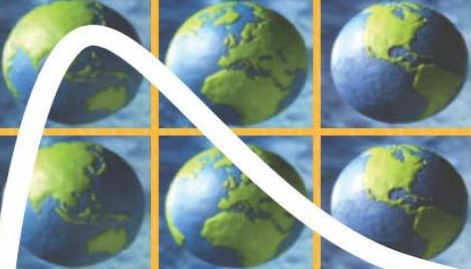
Results

- With 100,000 simulations, mean values are already almost all identical.
- Correlation and volatility are also identical.
- VaRs and ES however exhibit a large variation across assets.
- No improvement due to tail fitting for base quantile as expected.



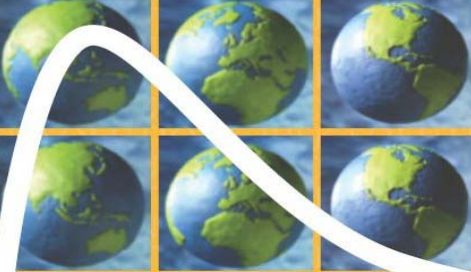
Results - Example 1% MVaR





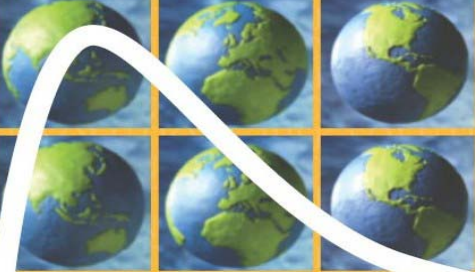
Data

- *Portfolio Risk Tracker* is delivered with Standard & Poor's data:
 - Corporate transition matrices: industrials, banks, recession, expansion, risk-neutral.
 - Sovereign transition matrices: S&P simple, monthly¹², probit model.
 - Factor correlations: equity-based, spread-based, extracted from default correlations.
 - Correlations of numeraires: interest rates, FX rates
 - Yield curves
 - Forward exchange rates.
- Data is updated weekly (IR, FX rates) or quarterly (transitions, correlations).



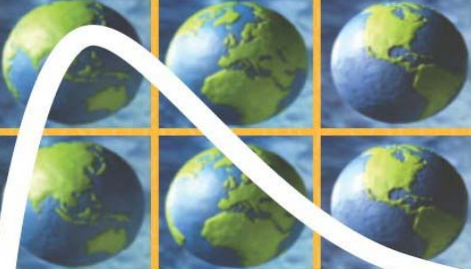
Transparency

- Considerable care is given to the cleaning and processing of data and a wide choice of possible inputs is supplied.
- The user is however free to change *all* inputs and replace with his/her own: transition and correlation matrices, interest and exchange rates etc.
- *Portfolio Risk Tracker* also offers complete transparency in modelling. The user receives a technical manual describing the equations used in the model.



Technical specification

- *Portfolio Risk Tracker* is developed for Windows XP.
- It is coded in Java.
- User-friendly Excel or Access front-end.
- Product delivered on CD-Rom and installed on site.



Contact

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