Default and Credit Migration Risk in Trading Portfolios

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Background

Financial Industry – before Lehman

- **Growth of the corporate bonds and credit derivatives market**

  Starting from the late 90s, **corporate bonds'** market and the **credit derivatives'** market increased hugely

  In 2007 total notional amount on outstanding credit derivatives was **$35.1 trillion** with a gross market value of $948 billion (ISDA's Website)

  The total market value of outstanding corporate bonds (in the United States only) as of Q3 2008 was approximately **$6.1 trillion** (SIFMA, Federal Reserve System)

- **Squeeze of credit spreads (and their volatility)**

  After Fall 2001 (i.e. after the IT bubble and the twin towers) credit spreads underwent a long period of decrease, that lasted till Spring 2007

Factors above boosted the 'hunt for yield':

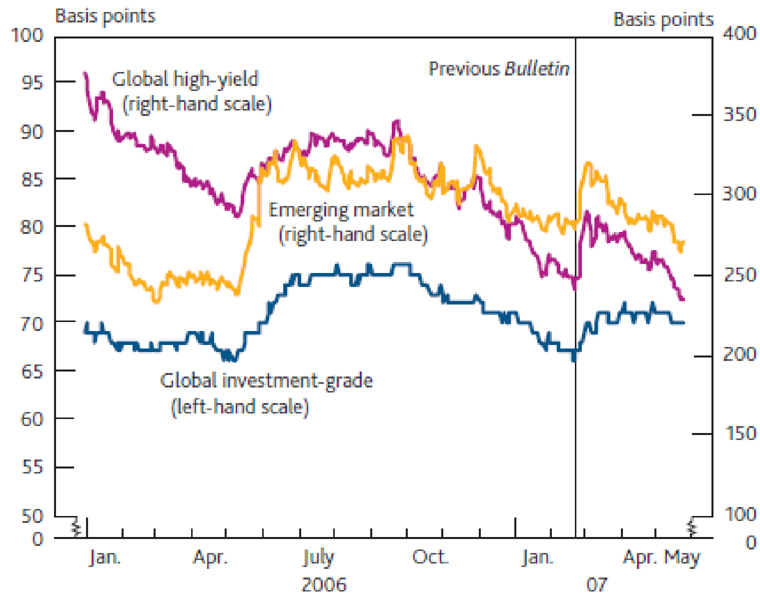
raising exposures by increasing notional and buying riskier names

Credit Spreads

Some data – before Lehman

Corporate bond spreads[(a)]

Source: Bank of England Quarterly Bulletin 2007 Q2

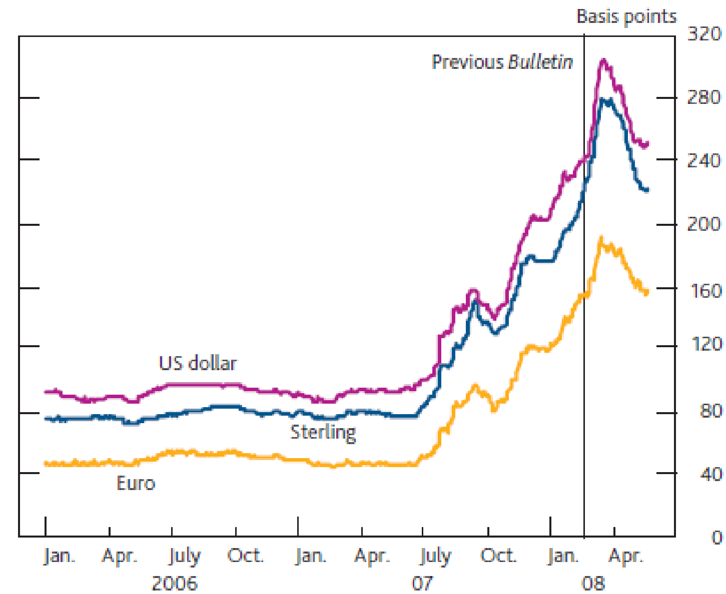


Source: Merrill Lynch.

(a) Option-adjusted spreads.

Investment-grade corporate bond spreads[(a)]

Source: Bank of England Quarterly Bulletin 2008 Q2



Source: Merrill Lynch.

(a) Option-adjusted spreads over government bond yields.

Credit Trading

- Banks boosted the exposure to corporate bonds and credit derivatives in their **trading book**

- Managing credit risk thanks to such financial products in trading books is the **Credit Trading** strategy

  Trading portfolios are designed for speculative activity, with short holding period (days)

- In theory, the trading regime should minimize the risk, in accordance with the **Constant Level of Risk** assumption according to which, in case of deterioration of the creditworthiness of the obligor, exposures with high credit quality would have been replaced with the goal of moving the asset allocation back to the original risk profile

- If perfect market liquidity and continuous Brownian motion for asset prices are granted, losses induced by the frequent rebalancing of the portfolio can indeed be neglected

Background

Regulation – before Lehman

- **Regulatory Arbitrage**

  Banks were building large directional positions in the credit trading business, leveraging on the favourable regulatory treatment compared to the banking book

- **2004 - Credit Portfolio Models in the Basel II framework**

  Models for default risk measurement according to real-world default probabilities, also taking into account portfolio and rating migration effects, were already introduced in the 90s (KMV, CreditMetrics) and used for internal risk management

  In 2004, the Basel committee first published the Basel II framework, that incorporates some of such advances in the so-called Internal Rating Based (IRB) approach to the computation of the credit risk component of the minimum capital requirement.

  The capital requirement according to the IRB approach is based on a time horizon of one year with a confidence interval of 99.9%

- **2005 – Incremental Default Risk Charge**

  Regulators have taken steps aimed at aligning the minimum capital requirements under the trading book regime to the credit trading risk the banking system has been gaining exposure to.

  The first measure proposed was the ***Incremental Default Risk Charge*** (IDRC), i.e. an add-on to the regulatory capital to account for default risk in the trading book (first proposed in 2005).

  The capital requirement according to the IDRC approach, as proposed, was based on a ***time horizon of one year*** with a ***confidence interval of 99.9%*** like the IRB approach for credit risk

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Basel Committee requirements

Regulation – after Lehman collapse (September 2008)

- **2009 – Incremental Risk Charge and Basel 2.5**

  Before the enforcement of the IRC and under the pressure caused by the Lehman crisis, regulators published a wide package of measures to ***strengthen the minimum capital requirement under the trading book regime.*** This package is commonly cited as ***Basel 2.5***.

  Among other measures, the IDRC was modified in order to account also for rating migration risk, thus leading to the ***Incremental Risk Charge*** (IRC).

  The decision was cause by the widespread economic impact of downgrades (more than defaults).

  The introduction of the IRC is expressly meant to address the regulatory arbitrage between banking and trading book.

  IRC must be enforced by major banks within December 2011.

Integration of Market Risk & Credit Risk

- Regulatory directions ask to combine two processes:
  1. Market Process: The economic profit/loss that is related (for bond-like products) to
     - In case of default: Current market value minus recovery
     - In case of upgrade/downgrade: Re-Pricing (based on a simulated credit spread move)
  2. Credit Process: Default & Migration generation
- Differently from Value-at-Risk, no one of the major players attempts to force his model to become the best-practice (like JPM RiskMetrics in the 90s)
- There is, however, a broad convergence regarding the main building block of the IRC, i.e.
  1. to base on **Merton** the credit process for default/migration
  2. to simulate the joint default/migration process thank to a **Gaussian Copula**
- Also broad convergence has been achieved on how to implement a **multi-step** (in time) simulation, based on the **Liquidity Horizon** (LH) concept with the constant level of risk (CLR) assumption enforced across each step

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Modelling the economic profit/loss

Market Process

- The simulation of economic profit/loss is well defined in case of default
- In case of rating migration, it requires re-pricing of the positions according to a shock of the spread level
- Calibration of recovery rates and spread changes may allow us to make the model more or less pro-cyclical (point-in-time vs. average-through-the-cycle – real world vs. risk neutral)
- Below an example of credit spread shocks adopted for migrations based on calibrated spread levels

Rating	Spread Level	AAA	AA	A	BBB	BB	C	CCC
AAA	40	0	40	80	180	310	660	1360
AA	80	-40	0	40	140	270	620	1320
A	120	-80	-40	0	100	230	580	1280
BBB	220	-180	-140	-100	0	130	480	1180
BB	350	-310	-270	-230	-130	0	350	1050
B	700	-660	-620	-580	-480	-350	0	700
CCC	1400	-1360	-1320	-1280	-1180	-1050	-700	0
D	2000	-1960	-1920	-1880	-1780	-1650	-1300	-600

Extension of the Merton model to incorporate rating transitions

single obligor

- The asset value process is assumed to follow a geometric Brownian motion

$$dA_t = \mu A_t dt + \sigma A_t dW_t$$

- Default at time *T* is triggered if the asset value is equal or less than the face value of the debt at *T*

$$PD_{t,T} = \Pr\{A_T \le F_T\}$$

- Incorporating rating levels is easy, define thresholds

$$-\infty = b_{k+1} < b_k < \ldots < b_1 < b_0 = +\infty$$

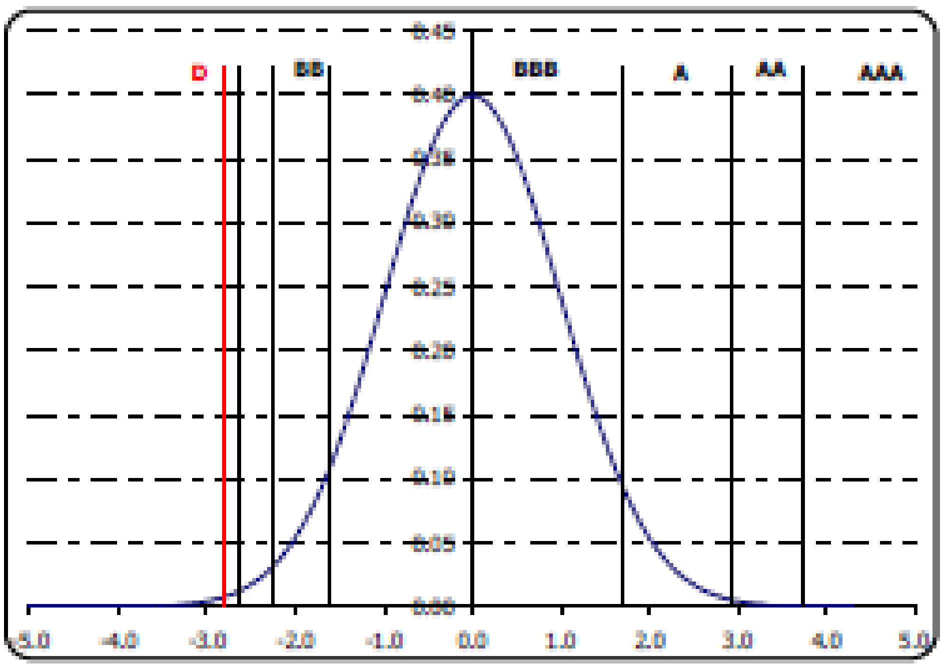
- so that making the transition from the current rating, i, to rating, j, is

$$p_{i,j} = \Pr\{b_j < A_T \le b_{j+1}\}$$

The Merton Model with rating migrations

Example with standardized variables

	AAA	AA	A	BBB	BB	B	CCC	D
TransProb	0.01%	0.16%	4.14%	90.24%	4.28%	0.74%	0.17%	0.26%
CumulProb	100%	99.99%	99.8%	95.69%	5.45%	1.17%	0.43%	0.26%
b_j	∞	3.72	2.93	1.72	-1.60	-2.27	-2.63	
d								-2.79



Rating transition (default) matrix

Example

- Rating Agencies provide and update with yearly frequency the observed transition probabilities for a vast population of issuers. This piece of information is represented in the form of a yearly transition matrix

		--Rating one year later (%)--								
Rating as of Jan. 1	**#**	**AAA**	**AA**	**A**	**BBB**	**BB**	**B**	**CCC/CC**	**SD**	**NR**
AAA	349	97.42	2.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AA	189	2.12	90.48	6.88	0.53	0.00	0.00	0.00	0.00	0.00
A	273	0.00	2.56	91.94	5.49	0.00	0.00	0.00	0.00	0.00
BBB	199	0.00	0.00	5.53	88.44	4.52	1.51	0.00	0.00	0.00
BB	196	0.00	0.00	0.00	4.59	86.73	5.61	1.53	1.53	0.00
B	196	0.00	0.00	0.00	0.00	8.67	84.69	2.55	2.04	2.04
CCC/CC	19	0.00	0.00	0.00	0.00	0.00	47.37	42.11	10.53	0.00

Source: http://www.standardandpoors.com/ratings/articles/en/us/?assetID=1245302231824

**Implied senior debt ratings through 1995; sovereign credit ratings thereafter. Source: http://creditpro.standardandpoors.com.*

Do rating transitions follow a time-homogeneous Markov chain?

- Rating Agencies provide transition matrixes over several time horizons, ranging from one-year to ten years
- Data contradict the hypothesis according to which rating migrations follow a time-homogeneous Markov chain

Sovereign Local-Currency Average Five-Year Transition Rates (1993-2010)*

Rating as of Jan. 1	#	--Rating five years later (%)-- AAA	AA	A	BBB	BB	B	CCC/CC	SD	NR
AAA	270	87.4	12.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0
AA	136	9.6	58.8	27.9	3.7	0.0	0.0	0.0	0.0	0.0
A	173	0.0	12.1	69.9	15.6	1.7	0.6	0.0	0.0	0.0
BBB	134	0.0	0.0	24.6	48.5	17.2	6.0	0.8	3.0	0.0
BB	113	0.0	0.0	0.9	22.1	48.7	19.5	2.7	6.2	0.0
B	101	0.0	0.0	1.0	5.9	38.6	44.6	2.0	4.0	4.0
CCC/CC	14	0.0	0.0	0.0	7.1	7.1	50.0	7.1	28.6	0.0

Source: http://www.standardandpoors.com/ratings/articles/en/us/?assetID=1245302231824

**Implied senior debt ratings through 1995; sovereign credit ratings thereafter. Source: http://creditpro.standardandpoors.com.*

Rating as of Jan. 1	--Rating five years later (%) - Fifth power of the one-year restated transition matrix AAA	AA	A	BBB	BB	B	CCC/CC	SD
AAA	88.2	10.1	1.5	0.2	0.0	0.0	0.0	0.0
AA	8.3	62.4	24.3	4.5	0.3	0.1	0.0	0.0
A	0.4	9.0	69.3	18.6	1.8	0.7	0.0	0.1
BBB	0.0	1.0	18.6	57.8	14.6	6.5	0.5	0.9
BB	0.0	0.1	1.8	13.9	54.1	19.8	2.4	7.8
B	0.0	0.0	0.2	2.7	26.0	56.8	3.5	10.6
CCC/CC	0.0	0.0	0.0	1.1	16.7	54.1	4.2	23.8

Alternative processes

■ Time-inhomogeneous Markov chains?

Empirical multi-year default frequencies can be interpolated well by continuous-time Markov chains if the Markov chain is allowed to evolve with non-homogeneous behaviour in time [4], but…

■ Is rating transition (default) a path dependent process?

Rating agencies' data show evidence of rating path dependency (analysis referred to corporate in the period 1991-2002 [6])

Rating Change Momentum: 1991–2002
(%)

	Downgraded in t	Upgraded in t	Unchanged in t	Total
Global Corporate Finance Ratings				
Downgraded in t-1	26.6	7.6	65.9	100.0
Upgraded in t-1	7.1	16.2	76.7	100.0
Unchanged in t-1	10.9	7.2	82.0	100.0
Unconditional	12.1	8.1	79.8	100.0

Source: S.K. Mah and M.Verde, 2004, "Rating Path Dependency," Fitch Ratings Report on Structured Finance, March 4 2004, New York

This has been addressed in [7] under the assumption the issuers' universe is composed by two families, following two distinct Markov processes (fast and slow)

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Consequences on capital

- **Increase the pro-cyclicality of the capital charge**

Downgrading/default probabilities tend to increase, conditional on the realised downgrades/default

- **Cause heavy tails in the loss distribution function**

Multi-step simulations could reveal, at the required quantile (99.9%), an increased number of downgrading/defaults compared to simulations based on time-homogeneous Markov chains caused by “adverse paths”, without modifications of the correlation structure between obligors

Multi-obligor Merton Model

- Standardized asset (A_i), $i=1,\ldots,M$ log-returns of M obligors over a given horizon T is

$$Ln\left(\frac{A_{i,T}}{A_{i,0}}\right)=\rho_i X_i+\sqrt{1-\rho_i^{\,2}}\,\varepsilon_i$$

- Where:
  - X_i is called the composite factor of obligor i, sampled from a multivariate standard normal distribution
  - ε_i is the idiosynchratic factor of obligor i, sampled from an univariate standard normal distribution
  - ρ_i captures the linear correlation of the return of the issuer asset A_i and the composite factor
- The formula represents a division into systematic and specific risk
- The X_i and ε_i are all assumed to be independent, so that the returns are independent conditional upon the realization of the composite factors

Merton Single-factor model

- The limit case in which the stochastic variable X_i is the same across all obligors is the single-factor model:

$$Ln\left(\frac{A_{i,T}}{A_{i,0}}\right) = \rho_i Z + \sqrt{1-\rho_i^{\,2}}\,\varepsilon_i$$

- Based on this assumption, the *market* is represented by a scalar variable *Z*, conditioning all the obligors and the correlation structure is defined by the set $\{\rho_i\}$ $i=1,\ldots,M$
- The BCBS based founded the Internal Rating Based (IRB) approach for the evaluation of the solvency ratio across the banking system on a single-factor model, the Asymptotic Single Risk Factor (ASRF) model [9,10].

Merton Multi-factors models

- In the more general case, the stochastic variable X_i is driven by a more detailed set of systematic factors.
- Reflecting industry standard practice, an example would be the decomposition into K regional/country-specific and/or industrial factors [8]. In this case the log-return of the standardized asset for the i-th obligor reads:

$$Ln\left(\frac{A_{i,T}}{A_{i,0}}\right) = \rho_i \left(\mathbf{w}_i \cdot \boldsymbol{\eta}_i\right) + \sqrt{1-\rho_i^{\,2}}\,\varepsilon_i$$

- Where:
  - η_i is sampled from a multivariate standard normal distribution, with dimension K and with correlation matrix **C**
  - $\mathbf{w}_i$ is the vector of the weights for the i-th obligor

- The correlation structure in multi-factors models is assigned by:
  1. the <u>inter-sector</u> correlation matrix **C**
  2. the <u>infra-sector</u> correlations ρ_i

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Calibration of the correlation structure

- **Single-factor models:**

  Correlations $R_{ij} = \rho_i \rho_j$ represent directly the correlation between the standardized assets of two obligors

- **Multi-factor models:**

  The correlation between the standardized assets of two obligors is the combination of the inter-sector and infra-sector correlations as:

$$R_{ij} = \rho_i \mathbf{w}_i \mathbf{C} \mathbf{w}_j^T \rho_j$$

- Merton's standardized assets are latent variables (not directly observable)
- Two alternative calibration processes arise from:
  1. Equity prices & financial statement data
  2. Credit Default Swaps quotes

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1. **Equity prices & financial statement data**

- Merton – process for the asset A_t:

$$E_t = A_t \Phi(d_1) - F e^{-r(t-T)} \Phi(d_2)$$

Where:

$$d_{1/2} = \frac{\ln\left(A_t/F\right) + \left(r \pm \frac{1}{2}\sigma^2 (T-t)\right)}{\sigma\sqrt{T-t}}$$

- Equity is an European call on the firm’s asset A with strike equal to the face value of the liabilities F
- Merton’s stylized model assumes the liability is a zero-coupon bond maturing at T (i.e. the expiry of the call). As a consequence, default can only happen at T

- The face value of liabilities F can be evaluated on the basis of low-frequency financial statements’ data

2. **Credit Default Swaps (CDSs) quotes**

- The CDS market provides at time *t* a way to estimate (risk neutral) default probabilities ($PD_{t,T}$) at expiry *T*
- CDS quotes are available as high-frequency market data (let be 1/δ the frequency)
- By assuming (Merton) that the log asset value ln(A_T) is a normally-distributed stochastic variable, it follows:

$$PD_{t,T} = \Phi\left[\frac{\ln(F_T) - \ln(A_t)}{\sigma\sqrt{T-t}}\right]$$

- Under the assumption that the face value of the firm's liability at time T (F_T) does not changes rapidly in time, we can assume that changes in the default probabilities are due to changes in the asset value, so that:

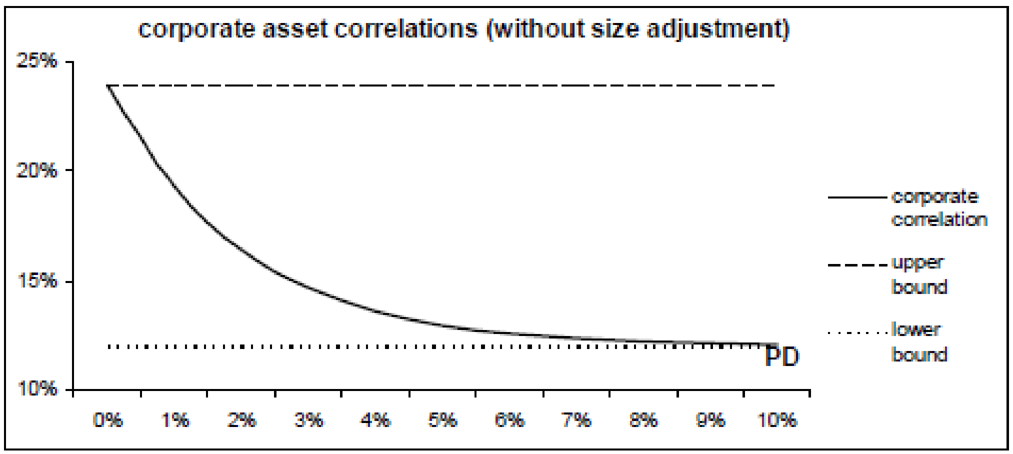
$$\ln\left(\frac{A_{t+\delta}}{A_t}\right) = \sigma\sqrt{T-t}\left[\Phi^{-1}\left(PD_{t+\delta,T}\right) - \Phi^{-1}\left(PD_{t,T}\right)\right]$$

- Asset correlation can be therefore estimates w/o assumptions on the asset volatility
- This approach to asset correlation calibration is detailed in [12]

Correlation structure according to the IRB model

see: [9] An Explanatory Note on the Basel II IRB Risk Weight Functions, BCBS July 2005

- Asset correlations of the IRB approach for corporate, bank and sovereign issuers have been set by regulators thanks to their data sets including accounting and default data.
- The analysis revealed two systematic dependencies:
  1. Asset correlations decrease with increasing PDs
  2. Asset correlations increase with firm size
- Regulators set an analytical formula for $R_i = \rho_i \rho_i$. Inputs are only the obligors' PD and annual sales. Below the chart of R_i for large firms (more than € 50 mn annual sales)



Source: An Explanatory Note on the Basel II IRB Risk Weight Functions, BCBS July 2005

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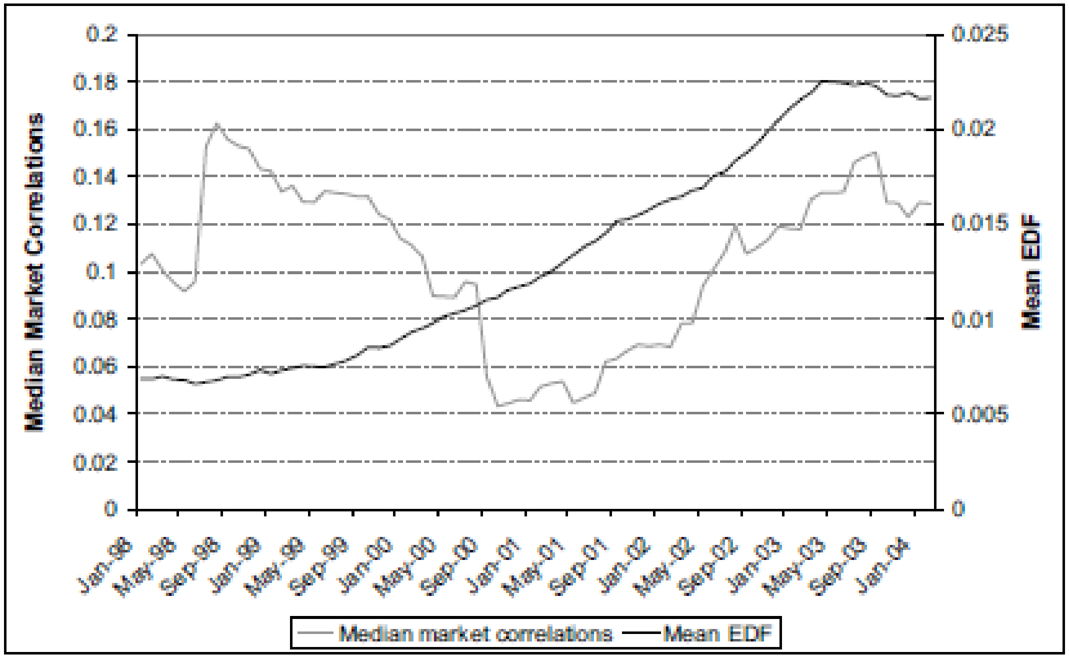
Correlation structure calibrated on historical equity prices

see: [11] Asset correlations and credit portfolio risk – an empirical analysis, 2007

- An example of calibration from equity prices & financial statement data is provided in [11], based on Moody's KMV asset values for around 2,000 European firms from 1996 to 2004
- The chart below shows the evolution in time of the median R_i, compared to the median annual Expected Default Frequency (EDF)



Source: K. Düllmann, M. Scheicher, C. Schmieder, Asset correlations and credit portfolio risk – an empirical analysis, 2007

- <u>Results show asset correlations in line with the IRB formula</u>

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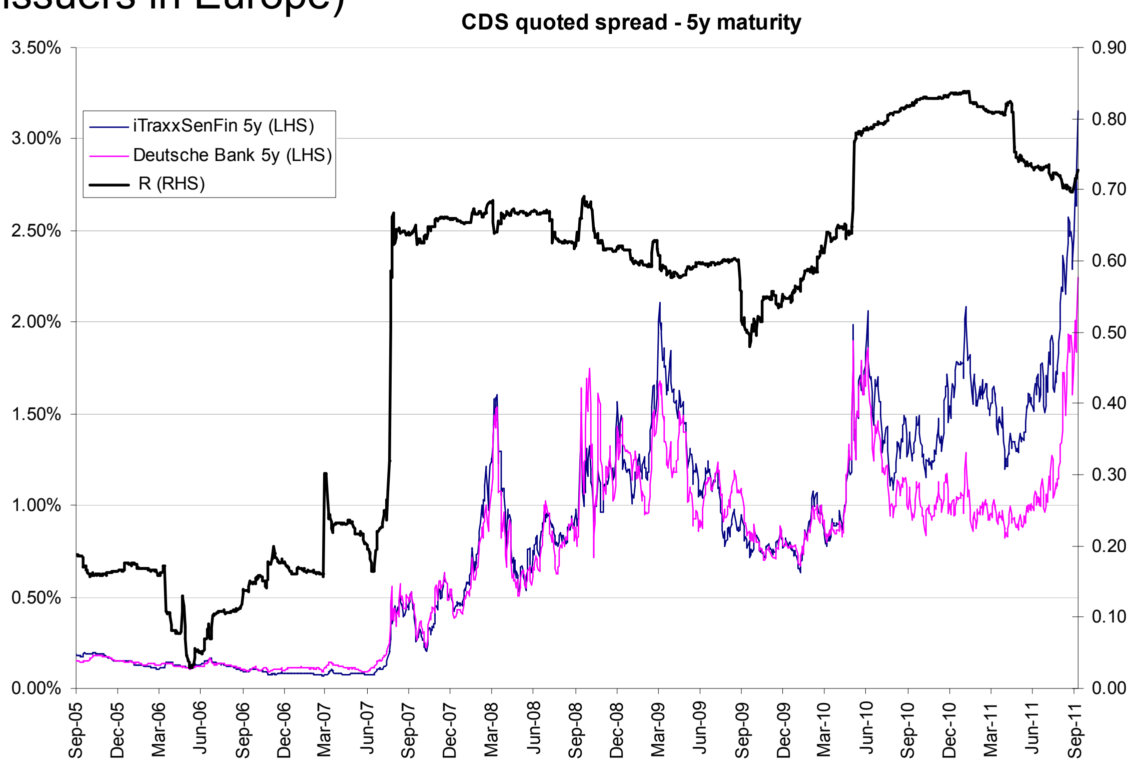
Correlation structure calibrated on historical CDS quotes

- An example of calibration from CDS quotes is shown in the chart below, shows the evolution in time of R for the obligor Deutsche Bank, compared with the spread of the CDS and of the corresponding credit index (iTraxx financials – the most traded 25 financial issuers in Europe)



Source: UniCredit internal data

- Results show asset correlation in line with the IRB formula <u>only before the crisis start</u>

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Consequences on capital

- **Increase the pro-cyclicality of the capital charge**

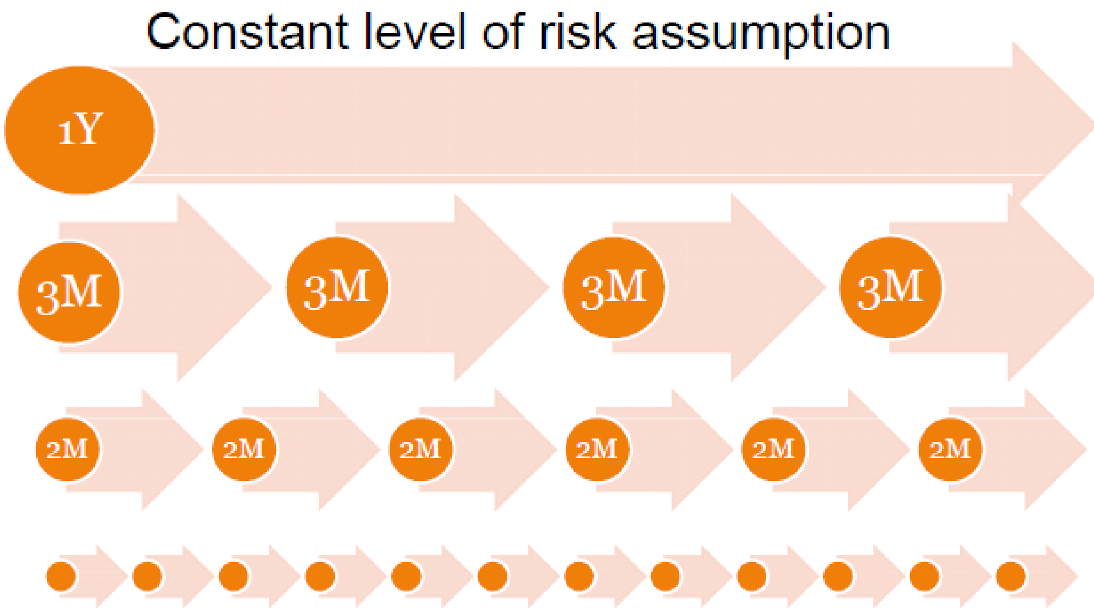
In periods of market stress, correlations tend to increase, thus leading to increased capital charges

- **Cause larger unexpected losses**

For gaussian-copulas, correlations, among other model parameters, are the most effective in driving the capital calculation

Lack of consensus on the way the correlation structure is calibrated across the banking industry

Liquidity Horizon and Constant Level of Risk



- The simulation of rating migrations (including default) is split into time steps of the length of the liquidity horizon until the capital horizon of one year is achieved
- At the end of each step, the portfolio is re-balanced in order to match the original composition
- A shorter LH is favourable in case of exposures to Investment Grade obligors (with low annual migration/default probabilities)

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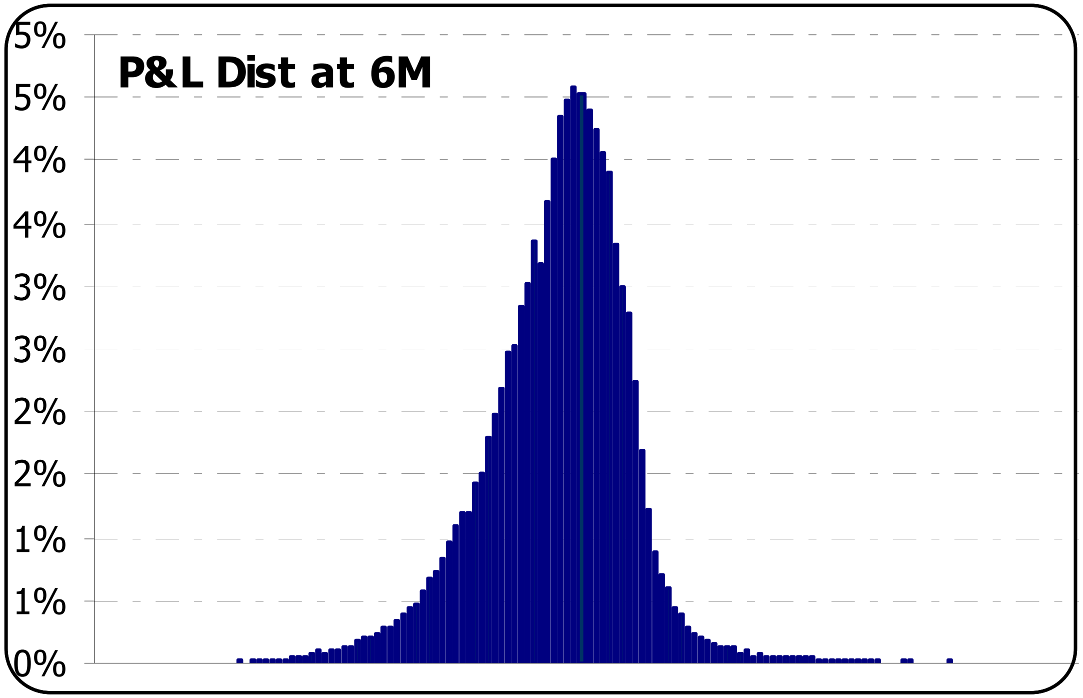
IRC implementation outline

1. Define IRC model positions - Π_0
2. Assign to liquidity buckets
3. Starting at $t=t_0$ for each time $t=t_i$
   - Simulate the credit process for the whole universe of obligors until $t=t_i+1$
   - Mark all positions to model using current time and ratings
   - Calculate P&L
   - Rebalance according to trading strategy (constant level of risk)
   - Redo until t=T (capital horizon)
4. Redo step 3 N times
5. Calculate 99.9% quantile of P&L distribution

Some Results

IRC profit&loss distribution

- 99.9 percentile of the loss distribution would be the IRC. Although this is a loss distribution, it has profits as the portfolio includes both long and short credit positions
- Unlike many common cases in VaR simulations, the loss distribution of IRC is non-symmetric
- In case of an investment-grade portfolio, *paying a visit* to the a number of available rating states (including default) that is statistically relevant for all obligors may require the number of paths N to be much higher than the common Monte Carlo simulations used for VaR (N of the order of 10^6)



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Conclusions

- Credit trading strategies are currently widespread, with main focus on sovereign, rather than corporate, risk
- Measuring credit risk in trading portfolios is a key topic both for internal risk management and regulatory capital (IRC add-on)
- The proper evaluation of default and credit migration risk under the constant level of risk assumption translates into the call for modeling portfolio credit risk in the framework of short-term, multi-step simulations
- The current best practice in the financial industry is Merton & Gaussian Copula
- This choice has the fundamental advantage of being parsimonious in the number of parameters
- Critical and unresolved issues are:
  1. The difficulty in adapting to this problem the mainstream treatment of portfolio credit risk by continuous-time Markov Chains applied to the rating migration process
  2. The lack of an unambiguous approach to the estimation of asset correlations, leading to large discrepancies in the capital level required by the various models developed so far

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Annex 1

Basel 2.5 at a glance

Year	Document	Main Focus
Jul-05	The Application of Basel II to Trading Activities and the Treatment of Double Default Effects	Counterparty risk and Double Default on OTC derivatives. Improvements to the trading book regime, especially specific risk. IDRC.
Jun-06	International Convergence of Capital Measurement and Capital Standards	A Revised Framework Comprehensive Version
Oct-07	Guidelines for Computing Capital for Incremental Default Risk in the Trading Book	IDRC
Jul-08	Guidelines for Computing Capital for Incremental Risk in the Trading Book	IRC
Jul-08	Proposed revisions to the Basel II market risk framework	IRC + Qualitative Standards in Risk Management
Jul-09	Enhancements to the Basel II framework	Securitisation, ReSecuritisations, Secific Risk (e.g. concentration)
Jul-09	Revisions to the Basel II market risk framework (BCBS 158)	SVaR, IRC, CRM, Secturitisations
Jul-09	Guidelines for computing capital for incremental risk in the trading book (BCBS 159)	IRC

Annex 2

IRC – Regulatory Requirements (1/2)

- **Scope**
  1. encompasses all positions subject to a capital charge for specific interest rate … with the exception of securitisation exposures and n-th-to-default credit derivatives;
  2. a bank can choose consistently to include all listed equity and equity derivatives …
- **Loss Events Definition**
  1. includes direct or indirect losses due to an obligor's default as well as to an internal/external rating downgrade or upgrade;
  2. must measure losses due to default and migration at the 99.9 percent confidence interval over a capital horizon of one year, taking into account the liquidity horizons applicable to individual trading positions;
  3. impact of re-balancing positions at the end of their liquidity horizons so as to achieve a constant level of risk (CLR) over a one-year capital horizon should be captured.
     - Positions are rebalanced in a manner that maintains the initial risk level
     - Positions whose credit characteristics have changed are replaced with others with the same risk characteristics the original had at the start of the liquidity horizon.

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Annex 2

IRC – Regulatory Requirements (2/2)

- **Liquidity Horizon**
  1. The liquidity horizon represents the time required to sell the position or to hedge all material risks covered by the IRC model in a stressed market.
  2. The liquidity horizon for a position or set of positions has a floor of three months.
  3. A non-investment-grade position is expected to have a longer assumed liquidity horizon than an investment-grade position.
  4. The liquidity horizon is expected to be greater for positions that are concentrated.
  5. A bank may elect to use a one-year constant position assumption.

- **Portfolio Effects**
  1. … includes the impact of correlations between default and migration events among obligors.
  2. … the impact of diversification between default or migration events and other market variables would not be reflected in the computation.
  3. A bank's IRC model must appropriately reflect issuer and market concentrations.

Annex 3

Current iTraxx 125 basket

Markit iTraxx Europe: Reference Portfolio

	Reference Entity	Weight %		Reference Entity	Weight %		Reference Entity	Weight %
1	Adecco S.A.	0.80	43	E.ON AG	0.80	85	PUBLICIS GROUPE SA	0.80
2	Aegon N.V.	0.80	44	EDISON S.P.A.	0.80	86	REED ELSEVIER PLC	0.80
3	Aktiebolaget Electrolux	0.80	45	EDP - Energias de Portugal, S.A.	0.80	87	RENTOKIL INITIAL PLC	0.80
4	Aktiebolaget Volvo	0.80	46	ELECTRICITE DE FRANCE	0.80	88	REPSOL YPF , S.A.	0.80
5	AKZO Nobel N.V.	0.80	47	EnBW Energie Baden-Wuerttemberg AG	0.80	89	ROLLS-ROYCE plc	0.80
6	Allianz SE	0.80	48	ENEL S.P.A.	0.80	90	RWE Aktiengesellschaft	0.80
7	ALSTOM	0.80	49	ENI S.P.A.	0.80	91	SAFEWAY LIMITED	0.80
8	Anglo American plc	0.80	50	European Aeronautic Defence and Space Company EADS N.V.	0.80	92	SANOFI-AVENTIS	0.80
9	ArcelorMittal	0.80	51	EXPERIAN FINANCE PLC	0.80	93	Siemens Aktiengesellschaft	0.80
10	ASSICURAZIONI GENERALI - SOCIETA PER AZIONI	0.80	52	FINMECCANICA S.P.A.	0.80	94	SOCIETE GENERALE	0.80
11	AVIVA PLC	0.80	53	Fortum Oyj	0.80	95	SODEXO	0.80
12	AXA	0.80	54	FRANCE TELECOM	0.80	96	Solvay	0.80
13	BAE SYSTEMS PLC	0.80	55	GAS NATURAL SDG, S.A.	0.80	97	STMicroelectronics N.V.	0.80
14	BANCA MONTE DEI PASCHI DI SIENA S.P.A.	0.80	56	GDF SUEZ	0.80	98	Suedzucker Aktiengesellschaft Mannheim/Ochsenfurt	0.80
15	BANCO BILBAO VIZCAYA ARGENTARIA, SOCIEDAD ANONIMA	0.80	57	Glencore International AG	0.80	99	Svenska Cellulosa Aktiebolaget SCA	0.80
16	BANCO POPOLARE SOCIETA COOPERATIVA	0.80	58	GROUPE AUCHAN	0.80	100	Swedish Match AB	0.80
17	BANCO SANTANDER, S.A.	0.80	59	Hannover Rueckversicherung AG	0.80	101	Swiss Reinsurance Company Ltd	0.80
18	BARCLAYS BANK PLC	0.80	60	Henkel AG & Co. KGaA	0.80	102	TATE & LYLE PUBLIC LIMITED COMPANY	0.80
19	BASF SE	0.80	61	Holcim Ltd	0.80	103	TELECOM ITALIA SPA	0.80
20	Bayer Aktiengesellschaft	0.80	62	IBERDROLA, S.A.	0.80	104	TELEFONICA, S.A.	0.80
21	Bayerische Motoren Werke Aktiengesellschaft	0.80	63	IMPERIAL TOBACCO GROUP PLC	0.80	105	Telekom Austria Aktiengesellschaft	0.80
22	Bertelsmann AG	0.80	64	INTESA SANPAOLO SPA	0.80	106	TELENOR ASA	0.80
23	BNP PARIBAS	0.80	65	JTI (UK) FINANCE PLC	0.80	107	TeliaSonera Aktiebolag	0.80
24	BP P.L.C.	0.80	66	KINGFISHER PLC	0.80	108	TESCO PLC	0.80
25	BRITISH AMERICAN TOBACCO p.l.c.	0.80	67	Koninklijke Ahold N.V.	0.80	109	THE ROYAL BANK OF SCOTLAND PUBLIC LIMITED COMPANY	0.80
26	BRITISH TELECOMMUNICATIONS public limited company	0.80	68	Koninklijke DSM N.V.	0.80	110	TNT N.V.	0.80
27	CADBURY HOLDINGS LIMITED	0.80	69	Koninklijke KPN N.V.	0.80	111	TOTAL SA	0.80
28	CARREFOUR	0.80	70	Koninklijke Philips Electronics N.V.	0.80	112	UBS AG	0.80
29	CASINO GUICHARD-PERRACHON	0.80	71	LANXESS Aktiengesellschaft	0.80	113	UNICREDIT, SOCIETA PER AZIONI	0.80
30	Centrica Plc	0.80	72	Linde Aktiengesellschaft	0.80	114	Unilever N.V.	0.80
31	COMMERZBANK Aktiengesellschaft	0.80	73	LLOYDS TSB BANK plc	0.80	115	UNITED UTILITIES PLC	0.80
32	COMPAGNIE DE SAINT-GOBAIN	0.80	74	LVMH MOET HENNESSY LOUIS VUITTON	0.80	116	Vattenfall Aktiebolag	0.80
33	Compagnie Financiere Michelin	0.80	75	MARKS AND SPENCER p.l.c.	0.80	117	VEOLIA ENVIRONNEMENT	0.80
34	COMPASS GROUP PLC	0.80	76	METRO AG	0.80	118	VINCI	0.80
35	CREDIT AGRICOLE SA	0.80	77	Muenchener Rueckversicherungs-Gesellschaft Aktiengesellschaft in Muenchen	0.80	119	VIVENDI	0.80
36	Credit Suisse Group Ltd	0.80	78	NATIONAL GRID PLC	0.80	120	VODAFONE GROUP PUBLIC LIMITED COMPANY	0.80
37	Daimler AG	0.80	79	Nestle S.A.	0.80	121	VOLKSWAGEN AKTIENGESELLSCHAFT	0.80
38	DANONE	0.80	80	NEXT PLC	0.80	122	Wolters Kluwer N.V.	0.80
39	DEUTSCHE BANK AKTIENGESELLSCHAFT	0.80	81	Nokia Oyj	0.80	123	WPP 2005 LIMITED	0.80
40	Deutsche Post AG	0.80	82	PEARSON plc	0.80	124	XSTRATA PLC	0.80
41	Deutsche Telekom AG	0.80	83	Portugal Telecom International Finance B.V.	0.80	125	Zurich Insurance Company Ltd	0.80
42	DIAGEO PLC	0.80	84	PPR	0.80			

UniCredit Group

Annex 4

Current iTraxx SovX WE basket

Markit iTraxx SovX Western Europe Series 5 Final Membership List

Markit Ticker	Reference Entity
DBR	Federal Republic of Germany
FRTR	French Republic
GREECE	Hellenic Republic
IRELND	Ireland
BELG	Kingdom of Belgium
DENK	Kingdom of Denmark
NORWAY	Kingdom of Norway
SPAIN	Kingdom of Spain
SWED	Kingdom of Sweden
NETHRS	Kingdom of the Netherlands
PORTUG	Portuguese Republic
AUST	Republic of Austria
FINL	Republic of Finland
ITALY	Republic of Italy
UKIN	United Kingdom of Great Britain and Northern Ireland