

The role of rating philosophy at calculation of credit measures

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How philosophy comes into the picture?



What is rating?



Rating needs to reflect the riskiness/creditworthiness of a counterparty as well as to provide a qualitative assessment about the probability of default.

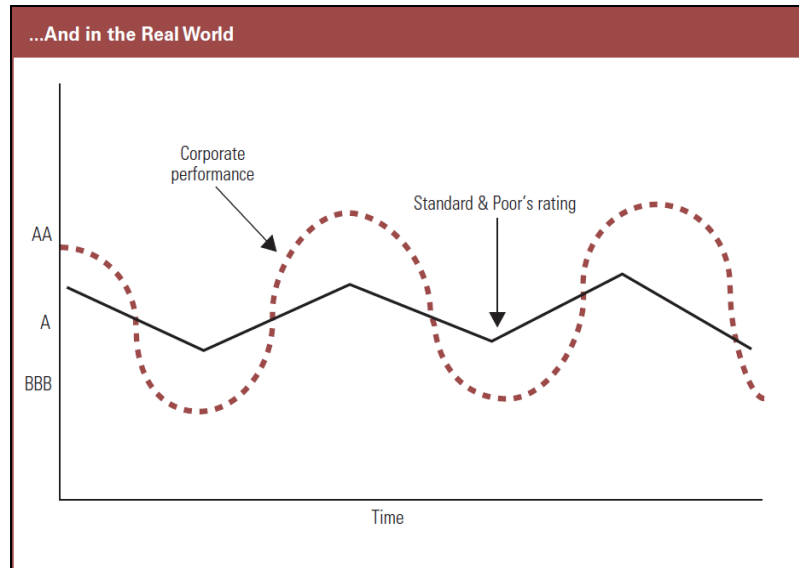
How to measure creditworthiness?

Moody's	Standard & Poor's	Fitch	AM Best	Credit worthiness
Aaa	AAA	AAA	aaa	An obligor has EXTREMELY STRONG capacity to meet its financial commitments.
Aa1	AA+	AA+	aa+	An obligor has VERY STRONG capacity to meet its financial commitments. It differs from the highest rated obligors only in small degree.
Aa2	AA	AA	aa	
Aa3	AA-	AA-	aa-	
A1	A+	A+	a+	An obligor has STRONG capacity to meet its financial commitments but is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligors in higher-rated categories.
A2	A	A	a	
A3	A-	A-	a-	
Baa1	BBB+	BBB+	bbb+	An obligor has ADEQUATE capacity to meet its financial commitments. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments.
Baa2	BBB	BBB	bbb	
Baa3	BBB-	BBB-	bbb-	
Ba1	BB+	BB+	bb+	An obligor is LESS VULNERABLE in the near term than other lower-rated obligors. However, it faces major ongoing uncertainties and exposure to adverse business, financial, or economic conditions which could lead to the obligor's inadequate capacity to meet its financial commitments.
Ba2	BB	BB	bb	
Ba3	BB-	BB-	bb-	
B1	B+	B+	b+	An obligor is MORE VULNERABLE than the obligors rated 'BB', but the obligor currently has the capacity to meet its financial commitments. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitments.
B2	B	B	b	
B3	B-	B-	b-	
Caa	CCC	CCC	ccc	An obligor is CURRENTLY VULNERABLE, and is dependent upon favourable business, financial, and economic conditions to meet its financial commitments.
Ca	CC	CC	cc	An obligor is CURRENTLY HIGHLY-VULNERABLE.
	C	C	c	The obligor is CURRENTLY HIGHLY-VULNERABLE to nonpayment. May be used where a bankruptcy petition has been filed.
C	D	D	d	An obligor has failed to pay one or more of its financial obligations (rated or unrated) when it became due.
e, p	pr	Expected		Preliminary ratings may be assigned to obligations pending receipt of final documentation and legal opinions. The final rating may differ from the preliminary rating.
WR				Rating withdrawn for reasons including: debt maturity, calls, puts, conversions, etc., or business reasons (e.g. change in the size of a debt issue), or the issuer defaults.
unsolicited	unsolicited			This rating was initiated by the ratings agency and not requested by the issuer.
	SD	RD		This rating is assigned when the agency believes that the obligor has selectively defaulted on a specific issue or class of obligations but it will continue to meet its payment obligations on other issues or classes of obligations in a timely manner.
NR	NR	NR		No rating has been requested, or there is insufficient information on which to base a rating.

— Investment grade —

— "Junk" or sub-investment grade —

Why is it difficult to assess the riskiness/probability of default (PD)?

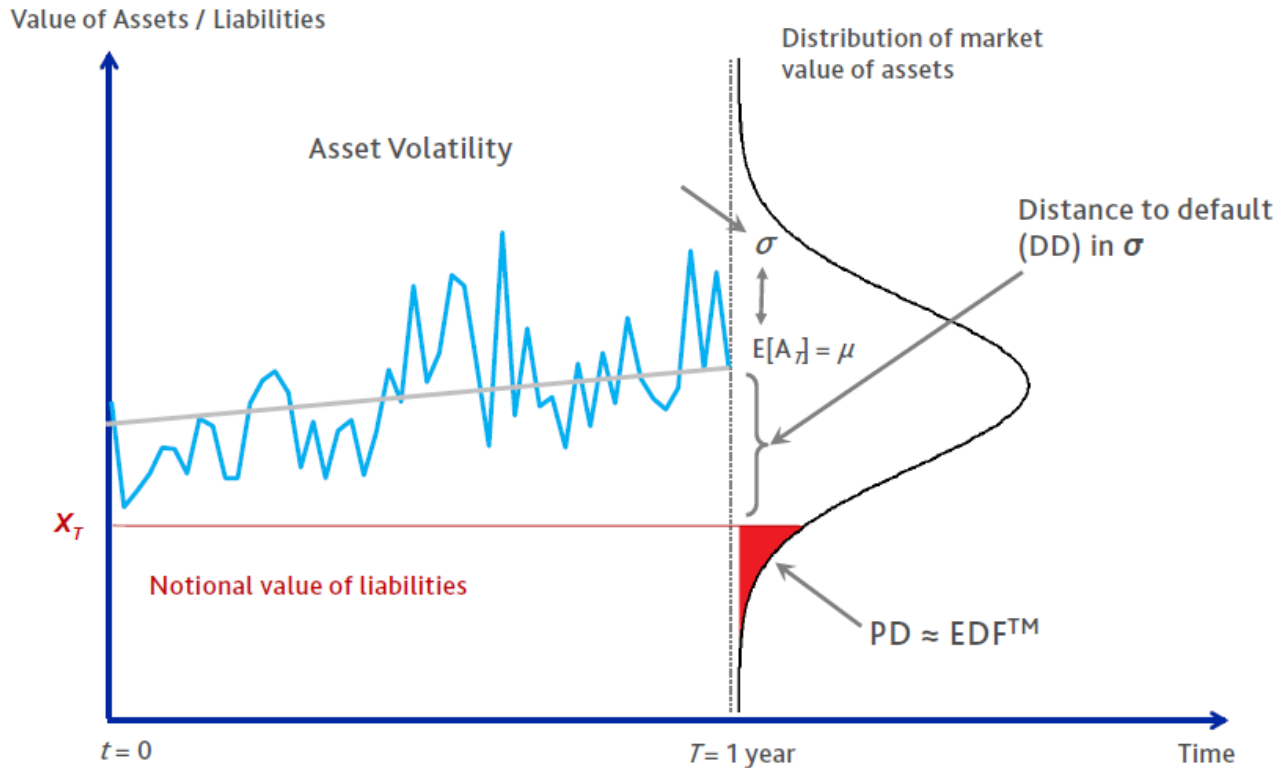


Source: S&P: Ratings Criteria, 2006

Most of the rating agencies try to smooth out the fluctuations:

- Point-in-time metrics: no smoothing at all
- Through-the-cycle metrics: removal of cyclicality

Structural model of EDF* (\approx PD) by Moody's:



Source: Moody's Analytics: Through-the-Cycle EDF Credit Measures

*EDF = Expected Default Frequency

Definition of Distance-to-Default (DD):

$$DD \approx \frac{\ln(A) - \ln(X)}{\sigma}$$

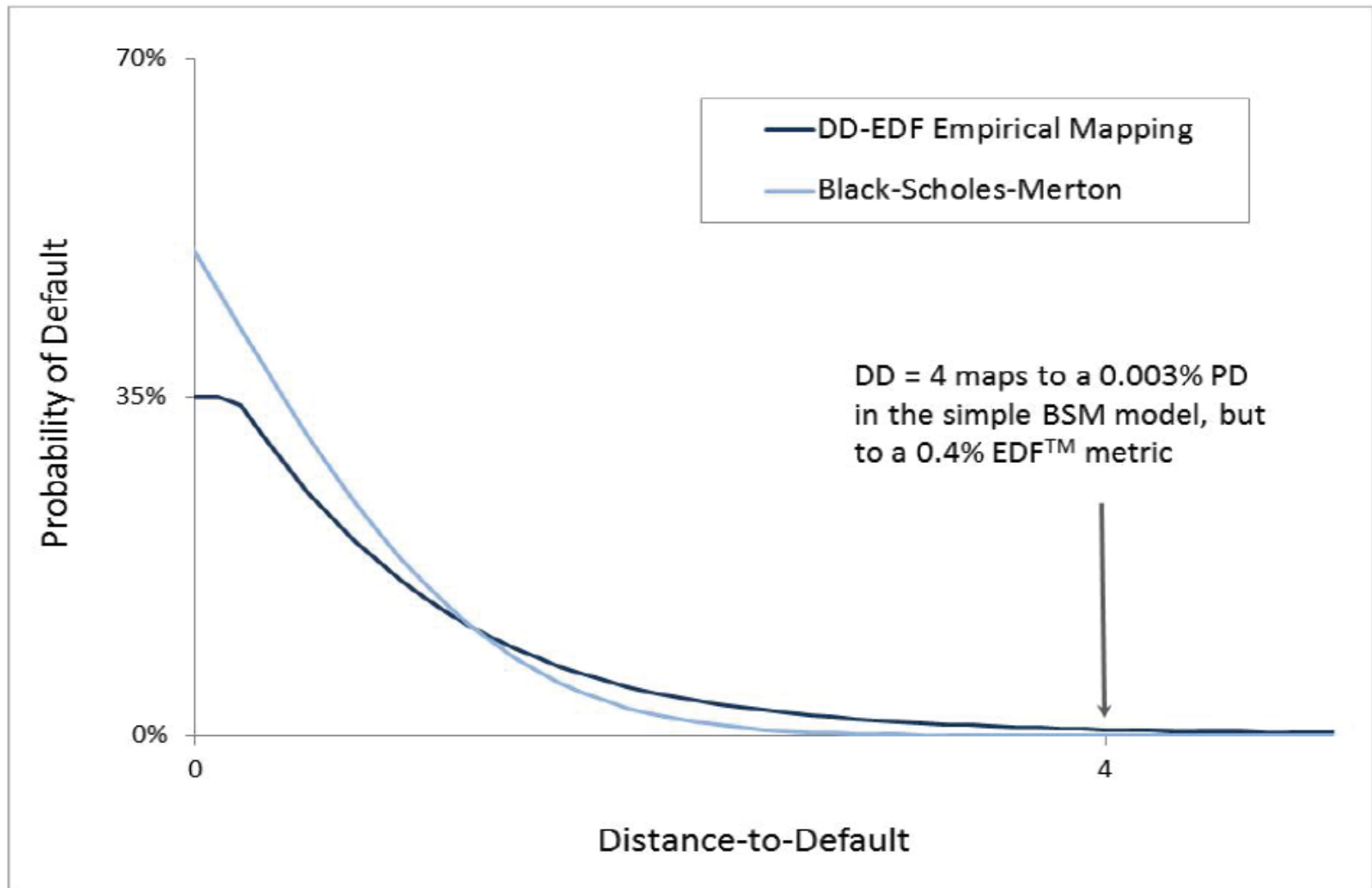
Where:

A = Asset value

X = Notional value of liabilities (default point)

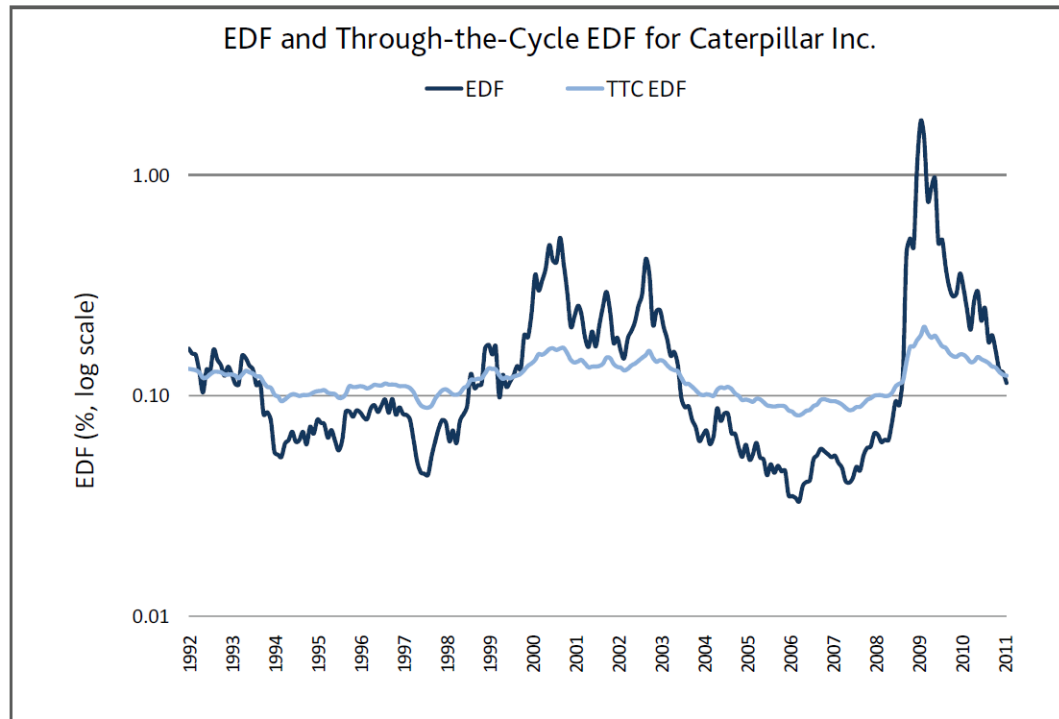
σ = volatility of the asset distribution

Relationship between EDF/PD and DD:



Source: Moody's Analytics: Through-the-Cycle EDF Credit Measures

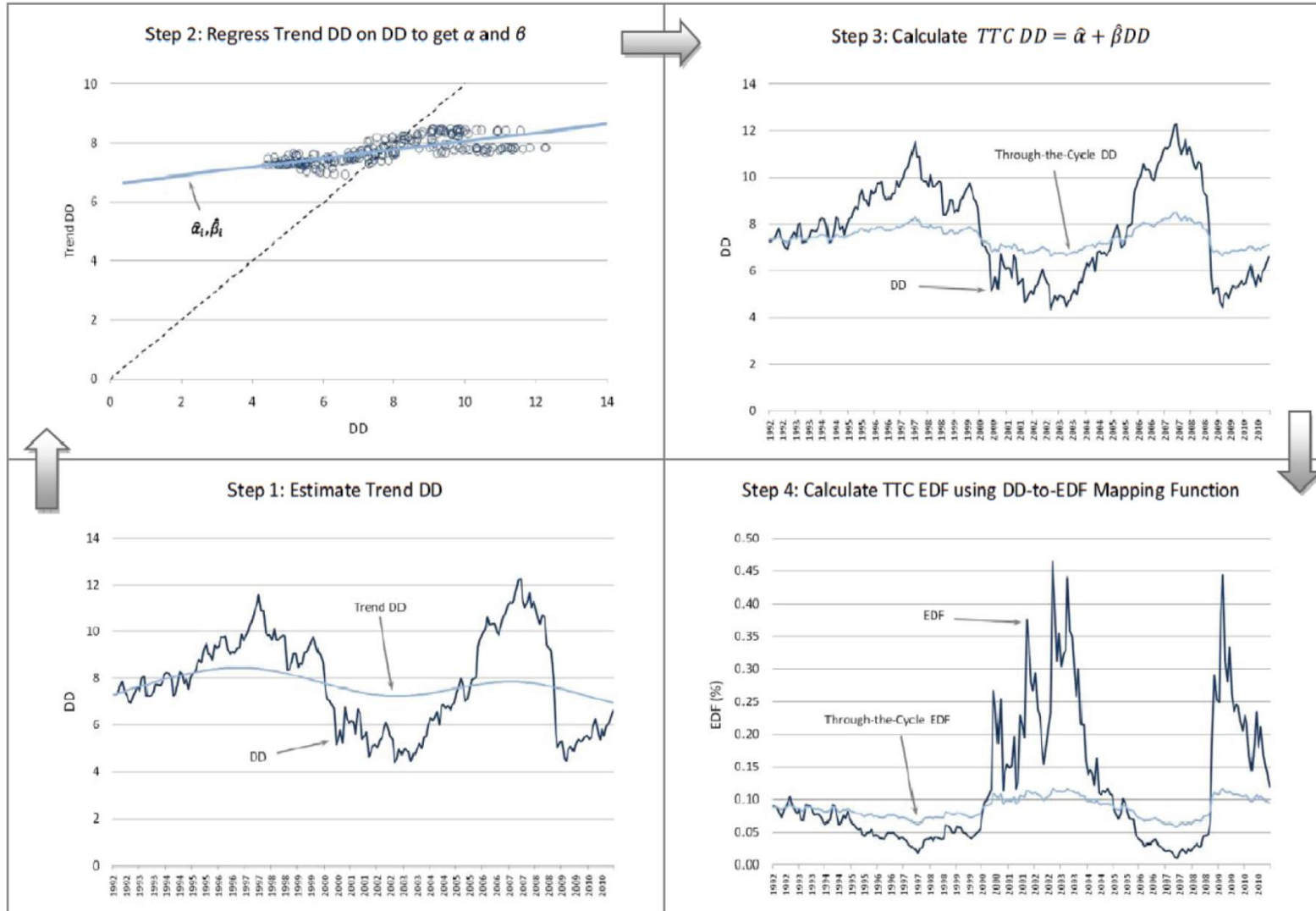
Our main purpose: getting TTC estimate from PIT one



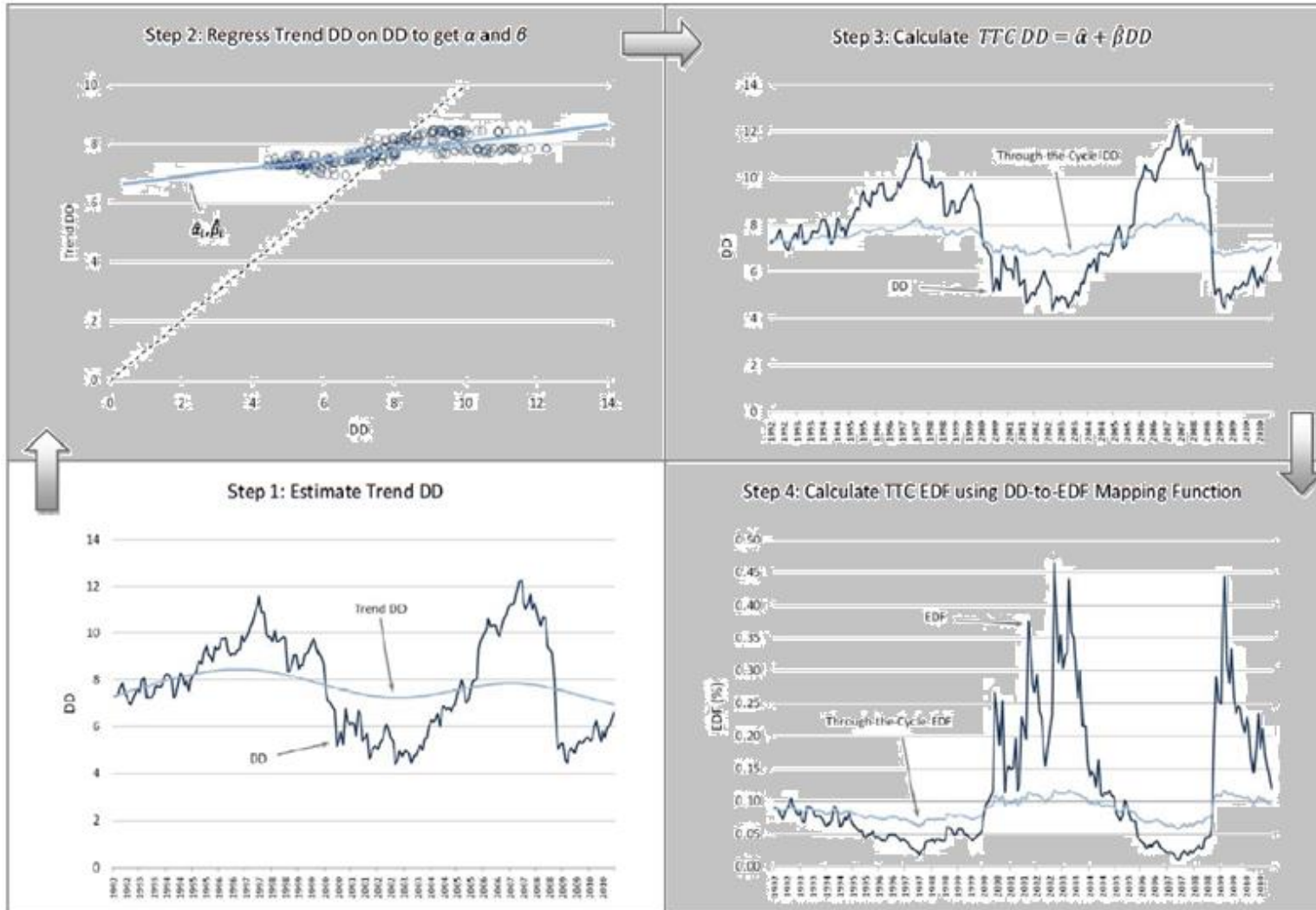
Removal of: *Source: Moody's Analytics: Through-the-Cycle EDF Credit Measures*

- Business cycles (measured by aggregated output of the economy, like GDP)
- Credit cycles (fluctuations in loan supply, etc)

Planned estimation process:



Step 1 - Estimate Trend DD:



Source: Moody's Analytics: Through-the-Cycle EDF Credit Measures

Hodrick-Prescott (HP) filter:

Observations contain a trend (τ) and cyclical (c) component:

$$y_t = \tau_t + c_t$$

We need to minimize the following expression:

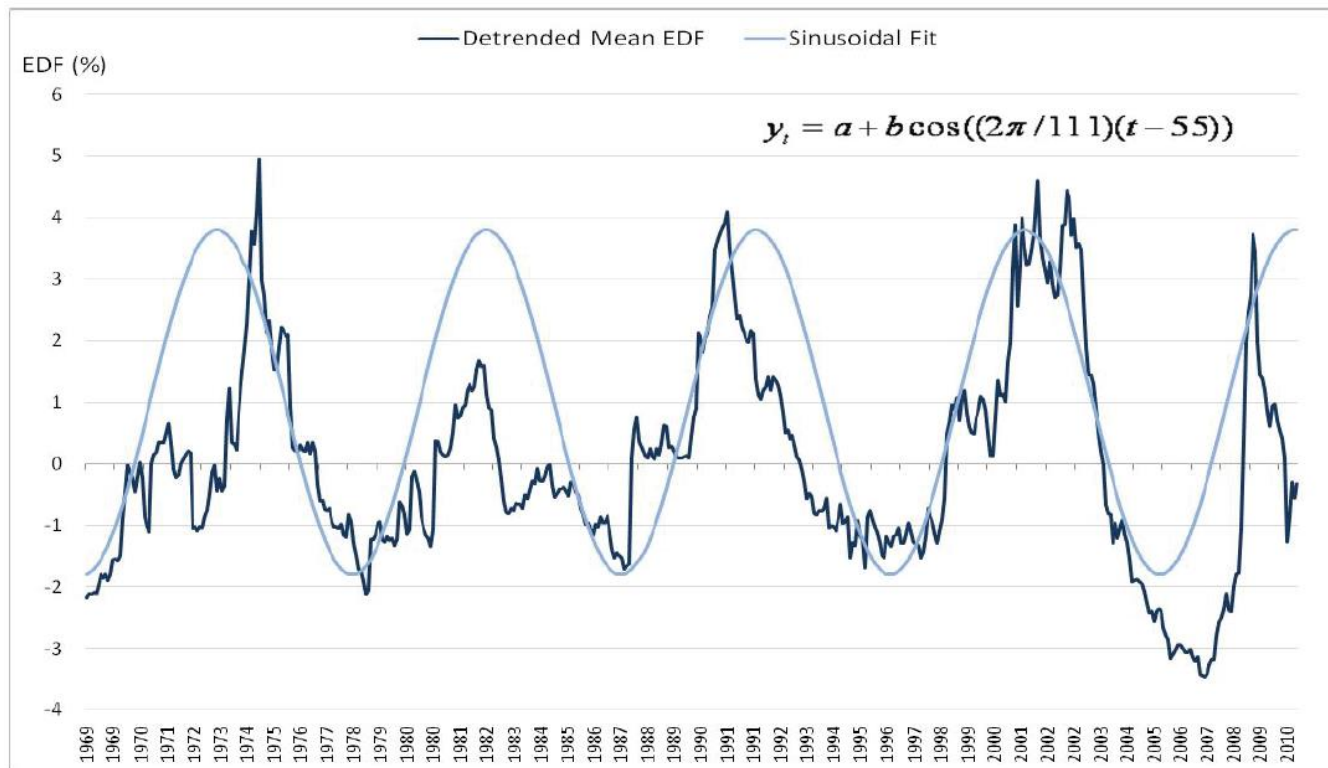
$$\min_{\tau_t} \sum_{t=1}^T (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} [(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2$$

Parameter λ determines the smoothing intensity:

- If $\lambda \rightarrow \text{Inf}$: linear regression
- If $\lambda = 0$: original time series will be kept

Determination of the λ parameter (1)

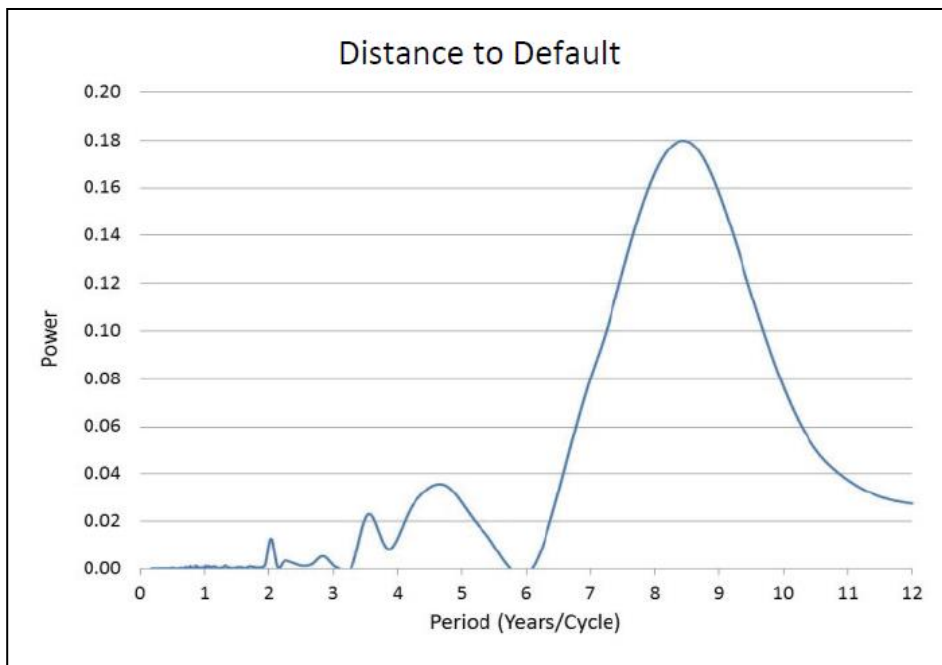
With empirical analysis on the average de-trended (linear trend is removed) avg EDF figures of North-American firms:



Source: Moody's Analytics: Through-the-Cycle EDF Credit Measures

Determination of the λ parameter (2)

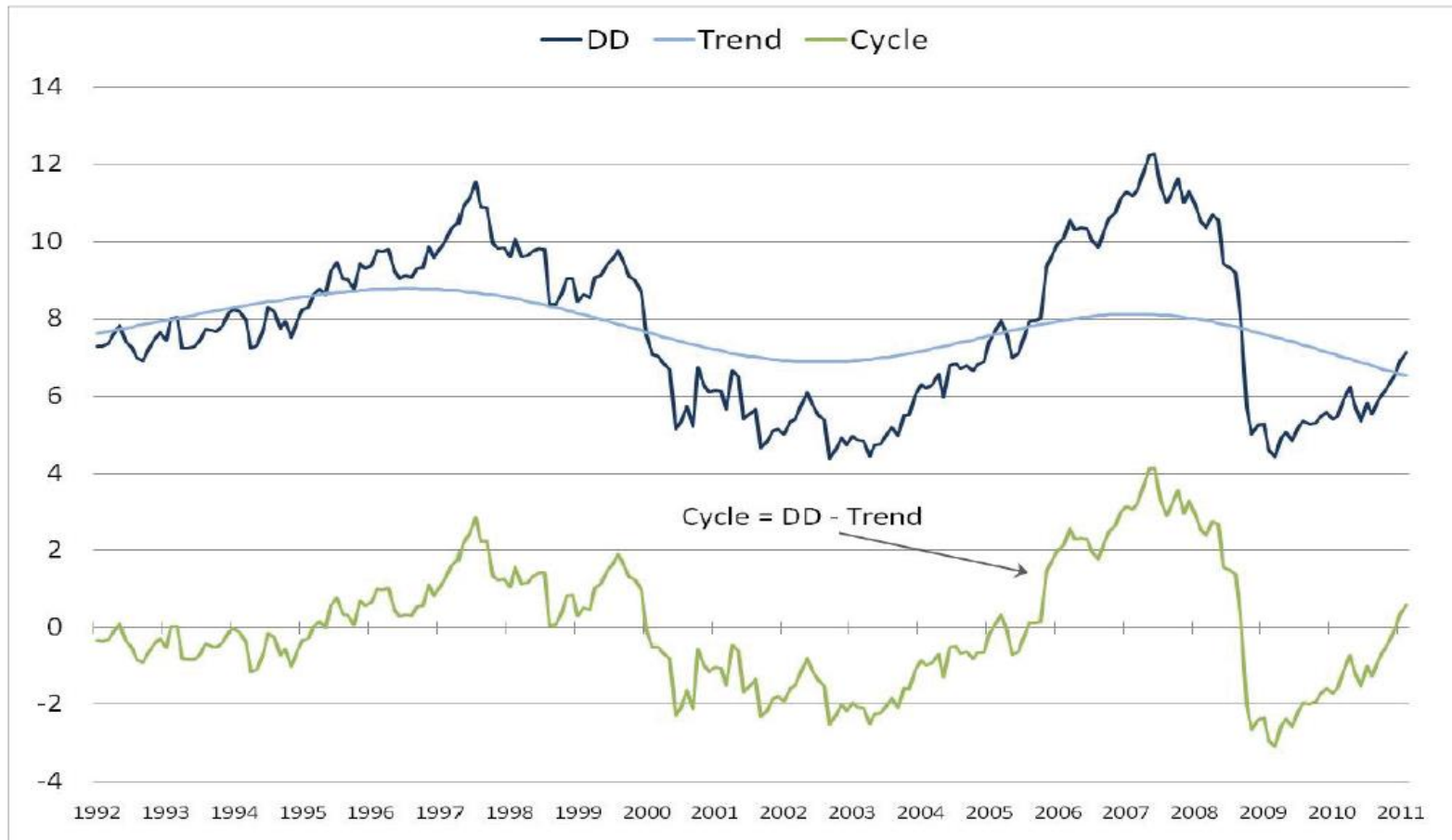
With spectral analysis - periodogram



- Primary peak at 9 years: NBER major cycle
- Secondary peak at 4.5 years: NBER minor cycle

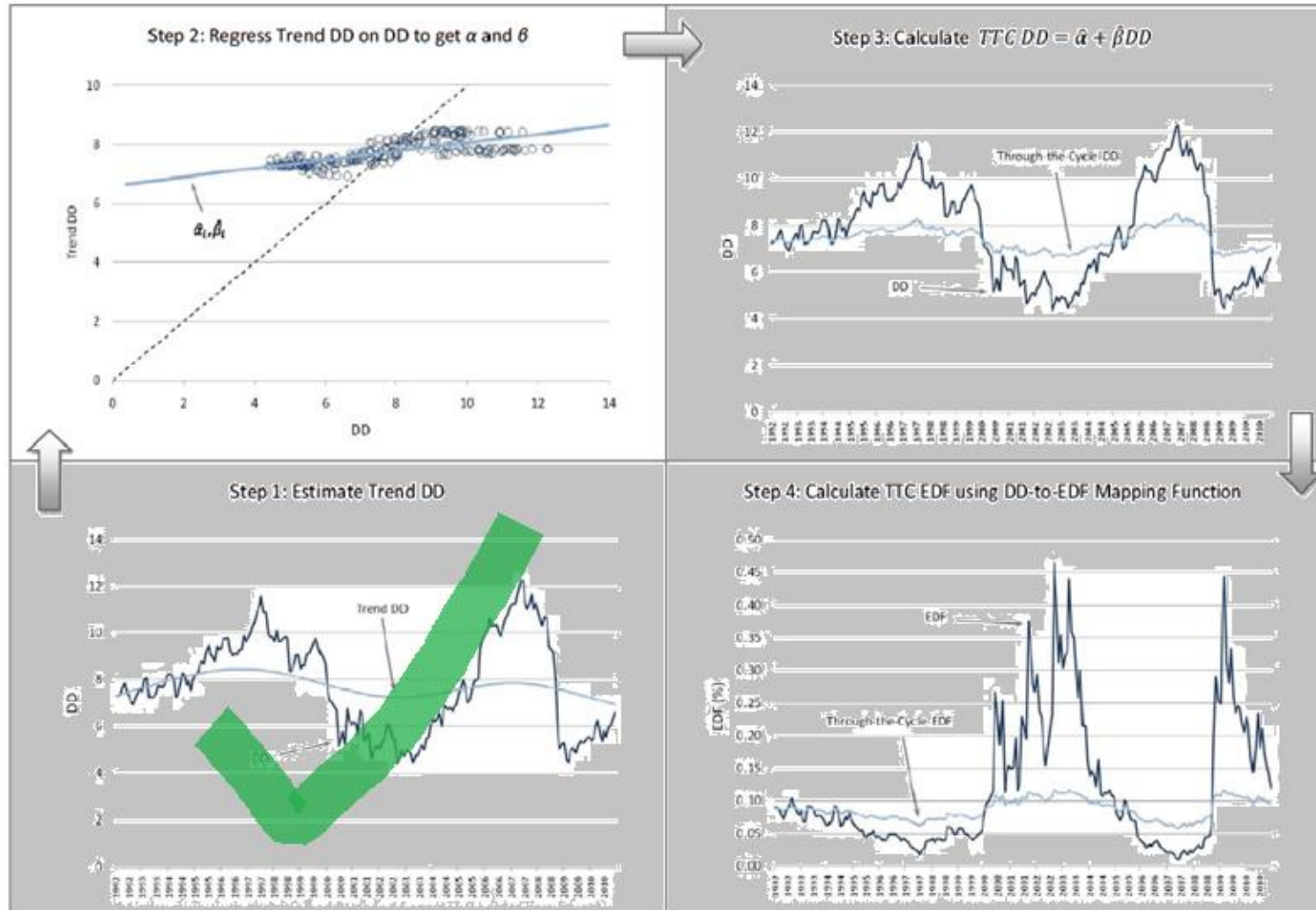
Determination of the λ parameter (3)

After application of the (confidential) λ parameter:



Source: Moody's Analytics: Through-the-Cycle EDF Credit Measures

Step 2 - Regress Trend DD on DD:



Source: Moody's Analytics: Through-the-Cycle EDF Credit Measures

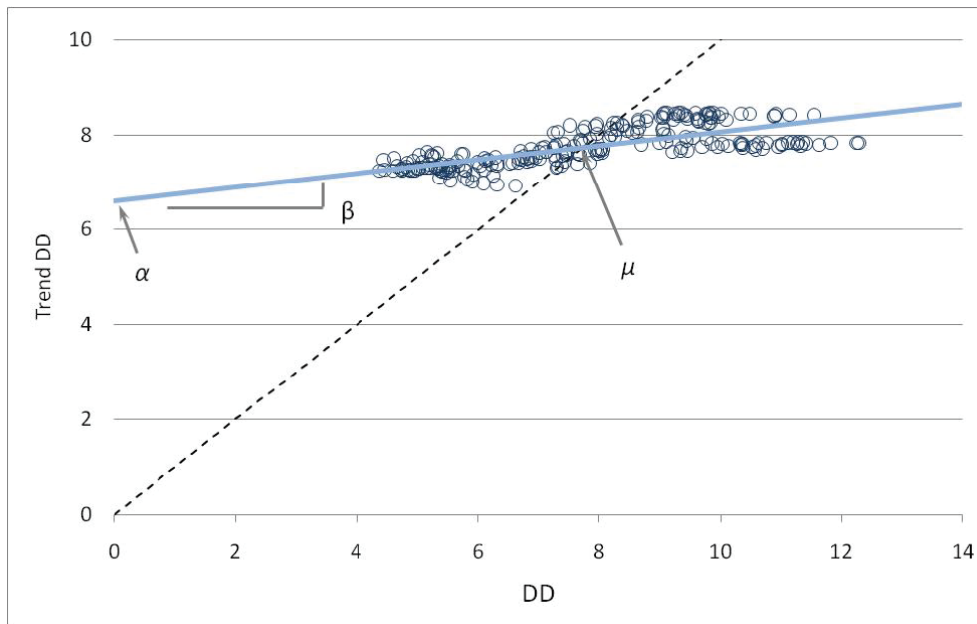
Linear regression for long history firms:

For each firm i , we identify two parameters $\hat{\alpha}_i$ and $\hat{\beta}_i$ such that

$$DD_{it}^{TTC} \equiv \hat{\alpha}_i + \hat{\beta}_i DD_{it}, \quad t = 1, 2, \dots, T$$

where the parameters are estimated from the following regression equation

$$DD_{it}^{trend} = \alpha_i + \beta_i DD_{it} + \epsilon_{it}, \quad t = 1, 2, \dots, T$$



Linear regression for short history firms:

$$DD_t^{trend} = \alpha + \beta DD_t$$

If we introduce the following notation:

$$\mu = \alpha / (1 - \beta)$$

Let us refer to this μ as crossover point going forward. With this notation we will get:

$$DD_t^{trend} - \mu = \beta(DD_t - \mu)$$

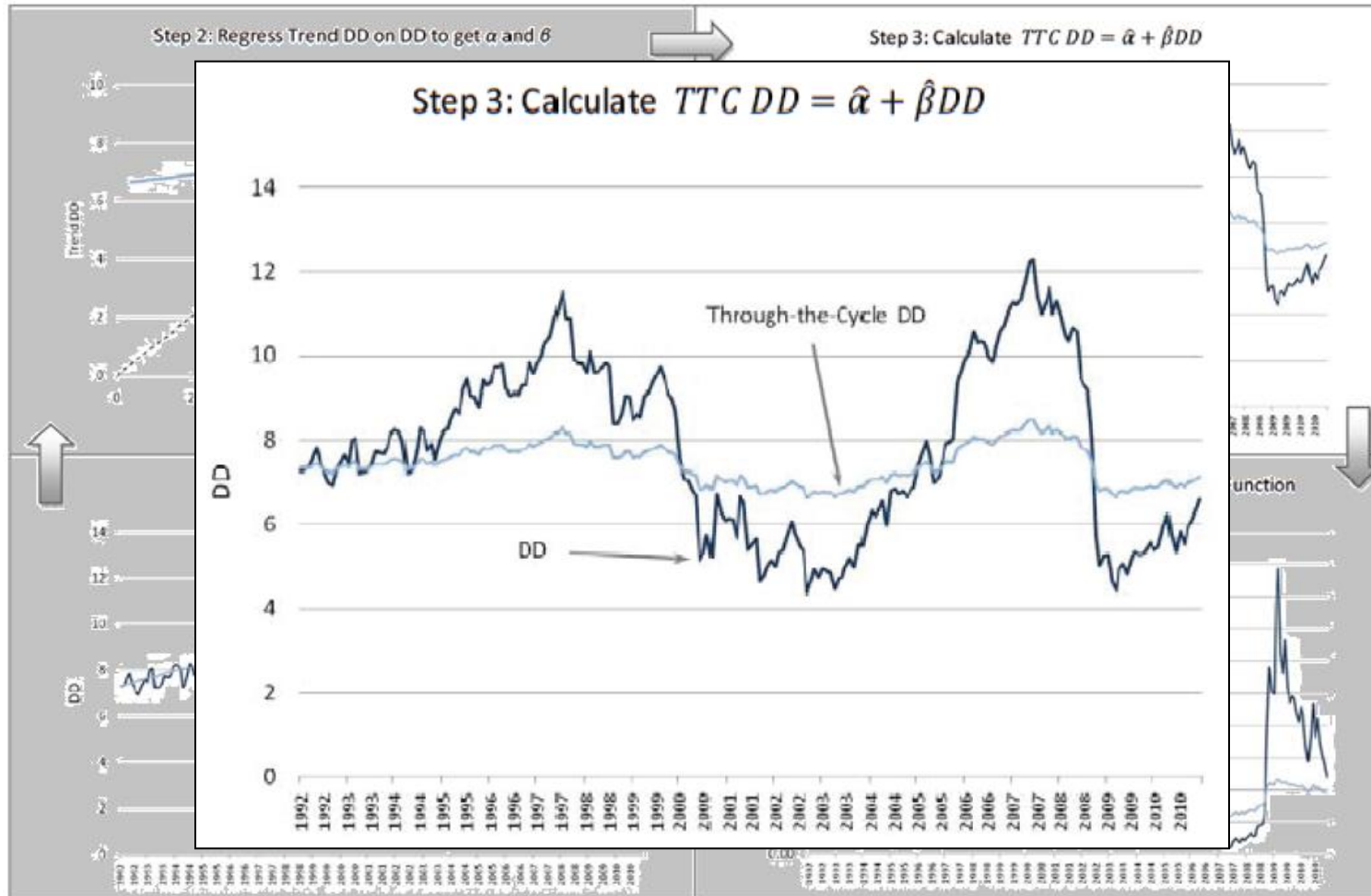
Linear regression for short history firms:

Instead of regressing α and β , we will regress β and the crossover point with the following regression:

$$xover_i = \theta_0 + \sum_{k=2}^{17} \theta_k sector_{ik} + \theta_{18} size_i + \theta_{19} vol_i + \theta_{20} lev_i + \epsilon_i$$

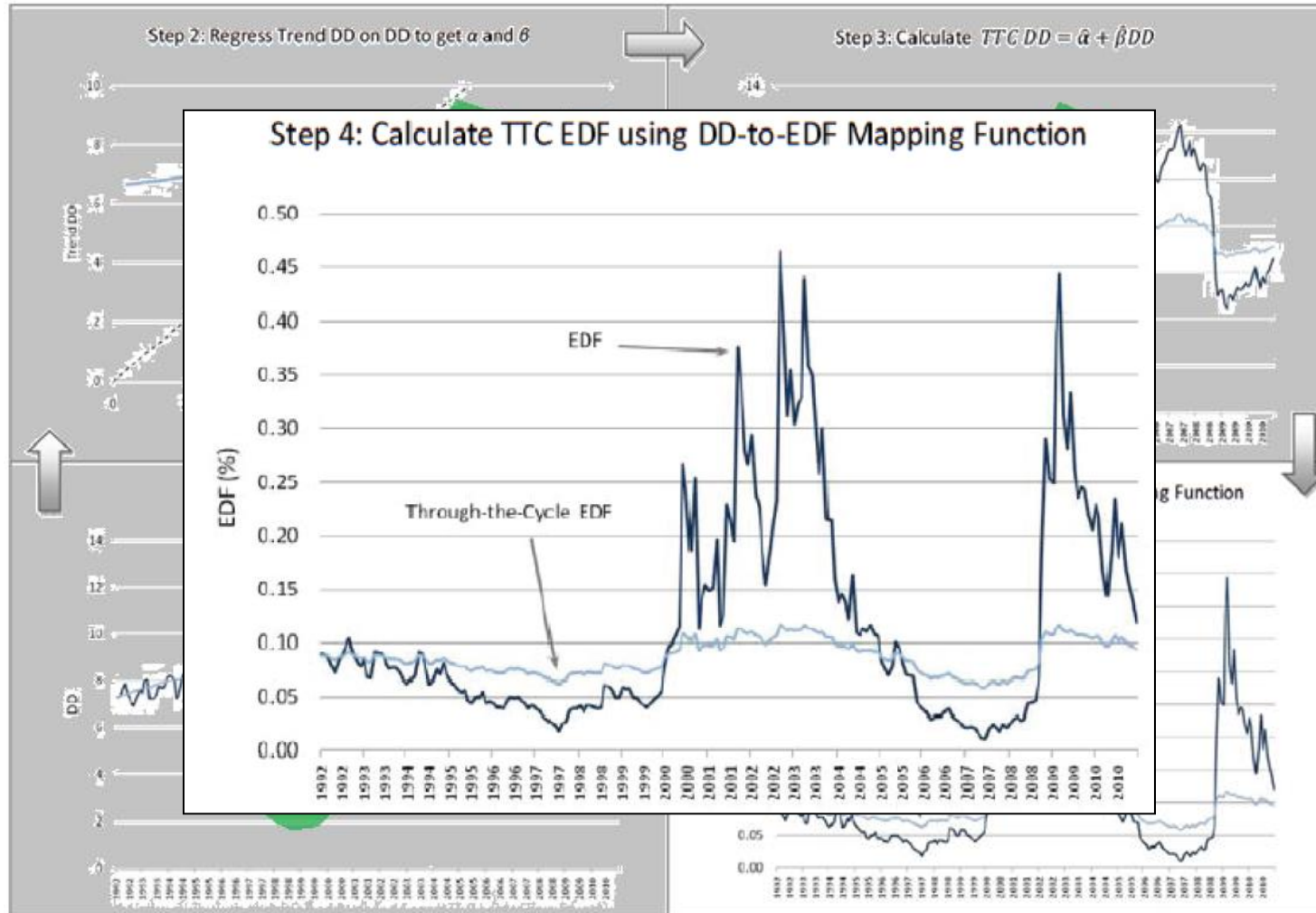
where $xover_i$ is the crossover point for firm i , and $sector_{ik}$ is the dummy variable set to 1 if firm i is in sector k . To avoid multicollinearity among the dummy variables, dummies are set only for sectors 2 to 17. So θ_k captures the incremental impact of sector k relative to sector 1. $size_i$ is the time-series average rank of firm i 's market capitalization, vol_i is the time-series average rank of firm i 's asset volatility, and lev_i is the time-series average rank of firm i 's degree of leverage, defined as the ratio of the firm's default threshold value

Step 3 – Calculate TTC DD with help of the regression model:

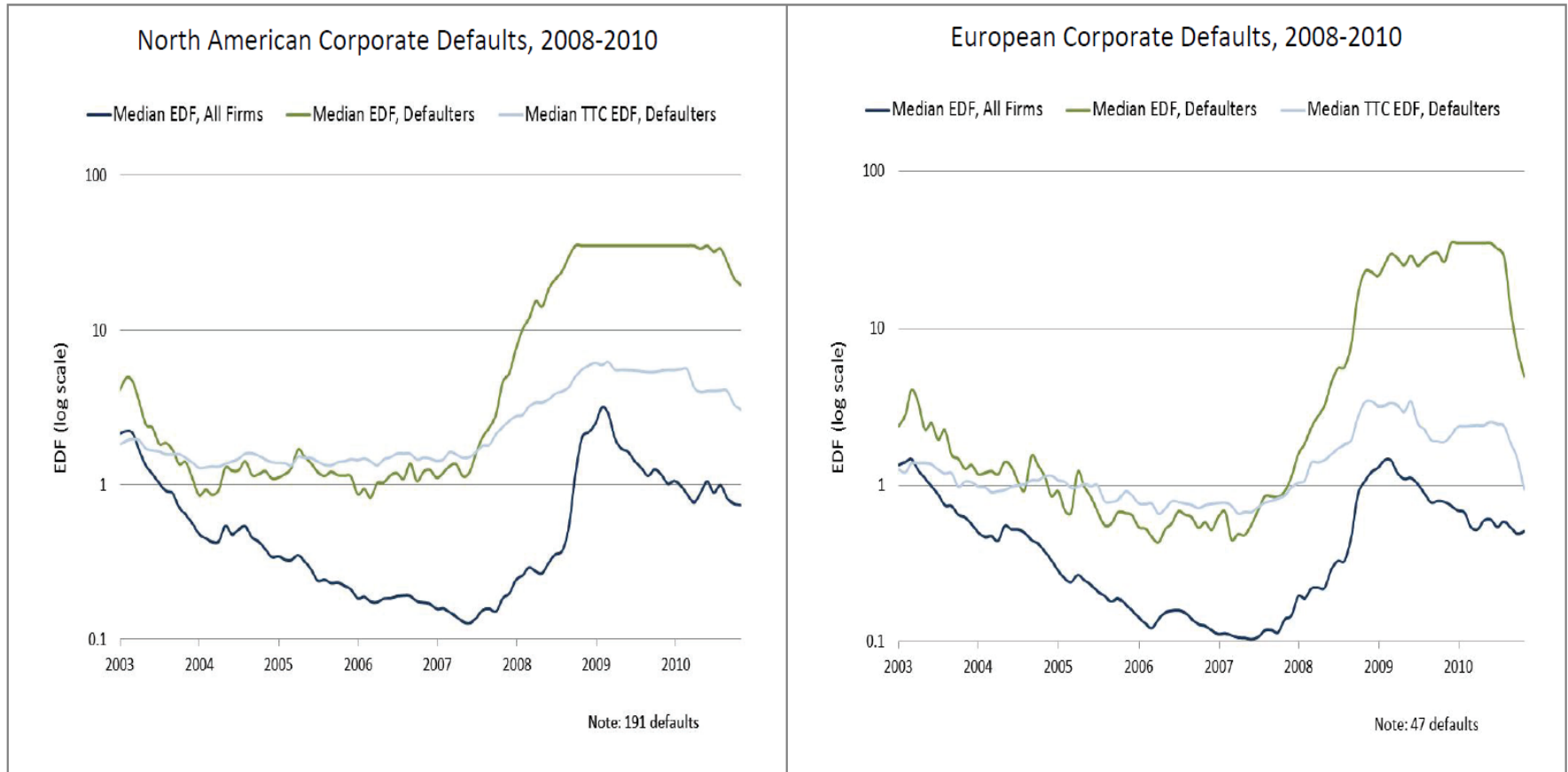


Source: Moody's Analytics: Through-the-Cycle EDF Credit Measures

Step 4 – Rescale TTC DD to TTC EDF:

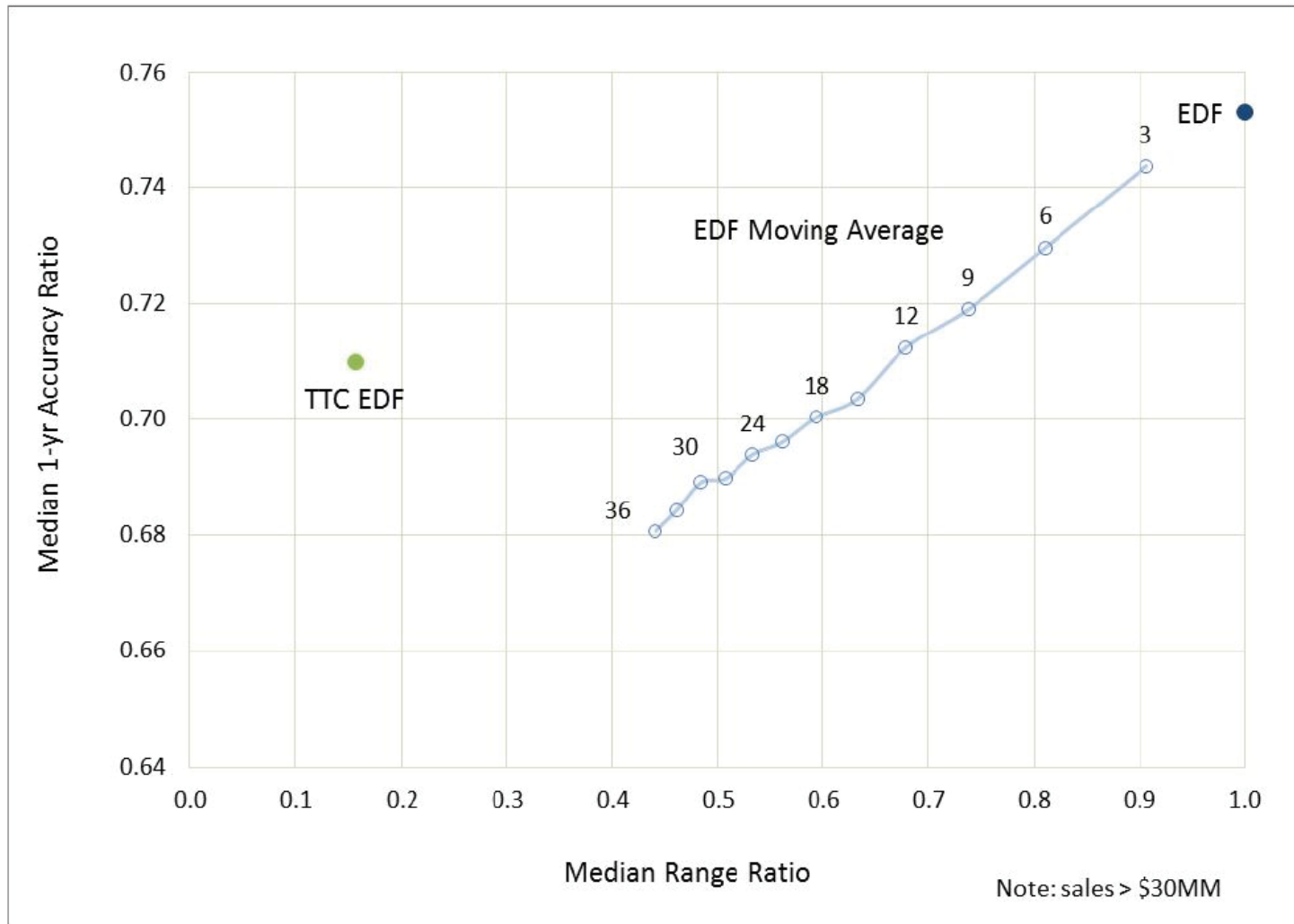


Results – predictive power:

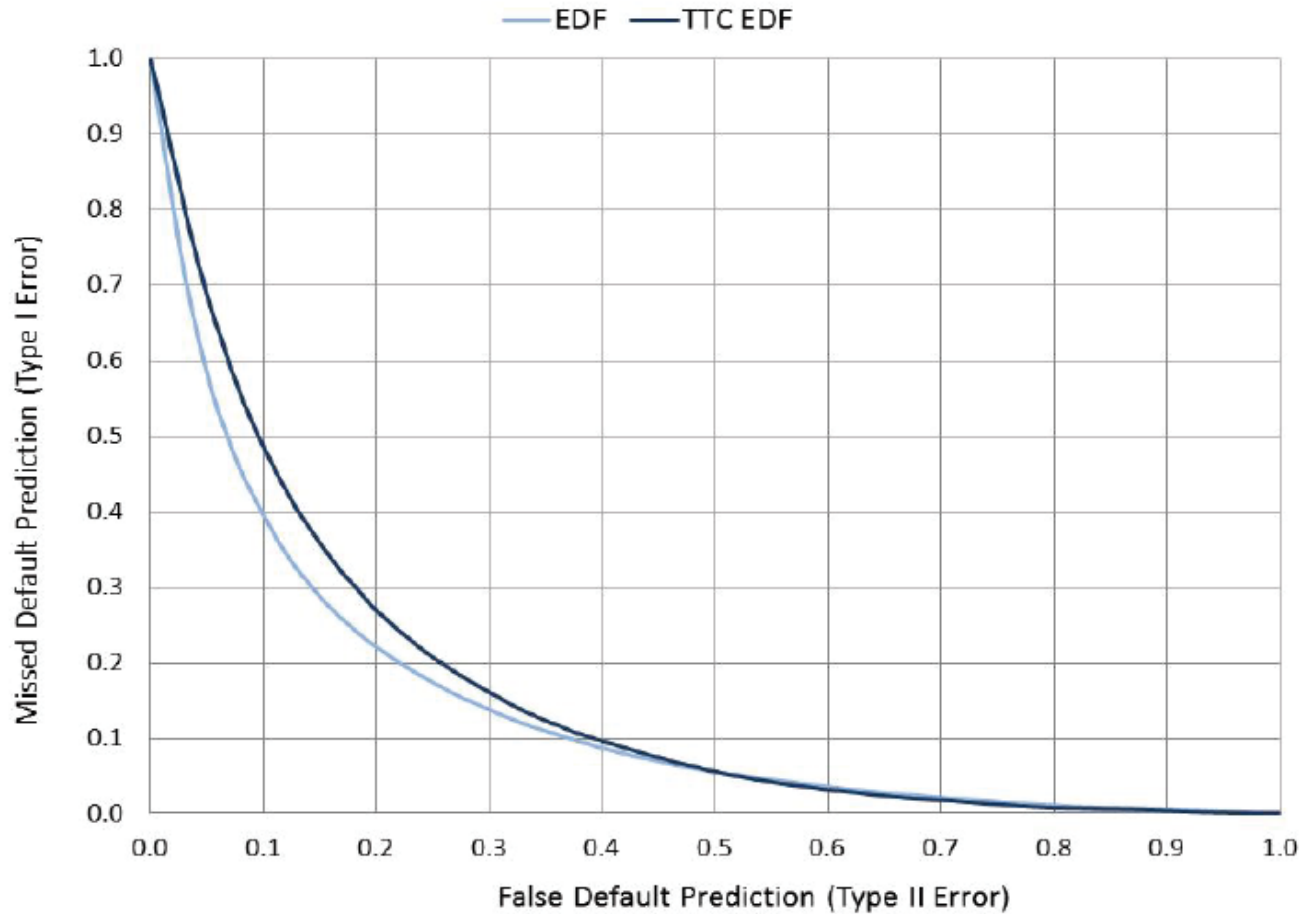


Source: Moody's Analytics: Through-the-Cycle EDF Credit Measures

Results – Overall stability and model power:

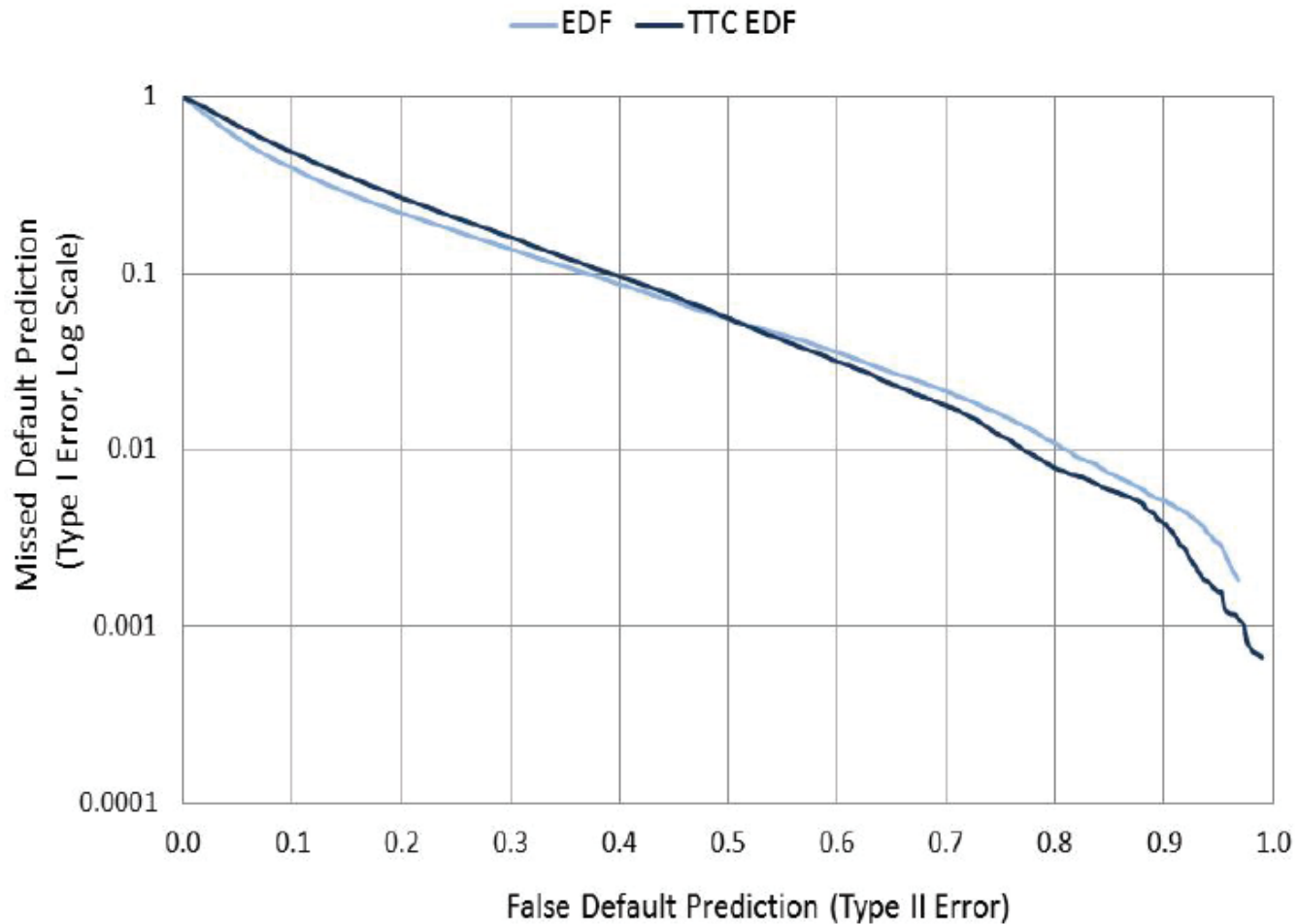


Results – Type I and Type II Errors:



Source: Moody's Analytics: Through-the-Cycle EDF Credit Measures

Results – Type I and Type II Errors:



Source: Moody's Analytics: Through-the-Cycle EDF Credit Measures

Conclusions:

TTC EDF provided a risk metric, which:

- Shows lower volatility/fluctuation than the usual metrics
- Its accuracy ratio is also on an acceptable level (not significantly worse than PIT metrics)
- Its error profile is also acceptable

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