

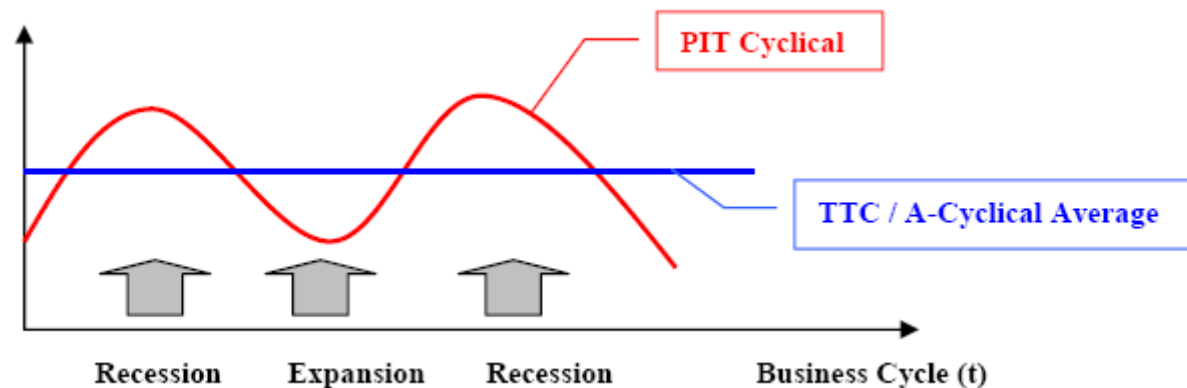
# Danske Bank Group's TTC PD Transformation Process

Paul Avery Benjamin Hodges, M.S. econ  
Senior Analyst - Danske Bank A/S  
May 20, 2008

# Challenge & Business Relevance

‘The Challenge’:

Danish CRD requires that Danske Bank Group use long-term, or Through-the-Cycle (TTC) PD's in Pillar I. This poses a challenge as the preferred rating philosophy in Danske Bank Group is Point-In-Time (PIT) PD, which follows the Business Cycle.



# Summary

---

The Danske Bank Group solution is the TTC PD Transformation Process.

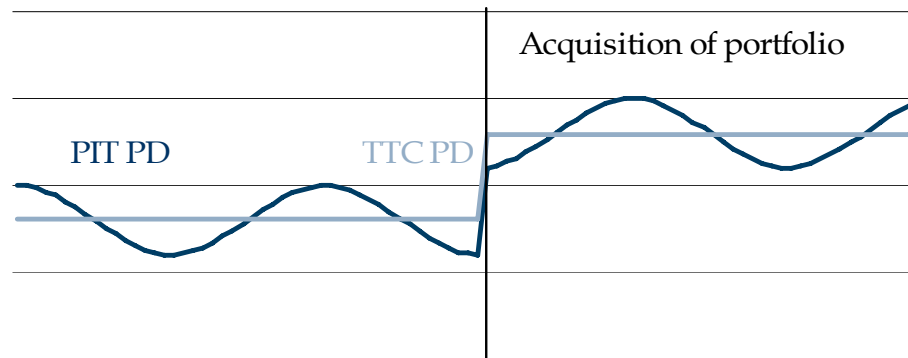
- It is an advanced-internal ratings based (A-IRB) parameter approved by Danish financial regulators. Similar methods is also approved by the UK FSA.
- It builds on existing PD parameters by applying an 'Odds-Ratio' scalar. This preserves the ranking order generated by score-based models and ensures that no final PD's are over 100%.
- Is theoretically grounded in Nordic/Irish macroeconomic and financial data.

## Summary (continued)

---

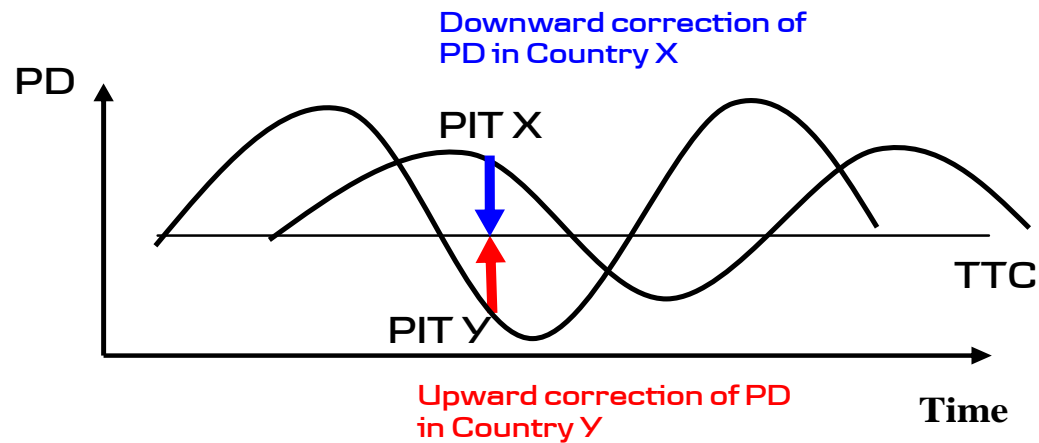
It produces results resilient to changes in portfolio quality (not related to the business cycle) and modifications of default definitions.

**Effect of portfolio change**



# The Idea: Convert PIT PD's to the Steady-State

The idea is to multiply or transform the existing PIT PD to the TTC level using the Odds-Ratio Scalar Method.



## Scalar Method (Odds-Ratio)

---

Instead of scaling all PDs by a common factor or employing a common add-on, we scale the corresponding odds (= (1-PD)/PD) by a common factor Y:

$$odds_{adjusted} = Y \cdot \frac{1 - PD}{PD} \quad (1)$$

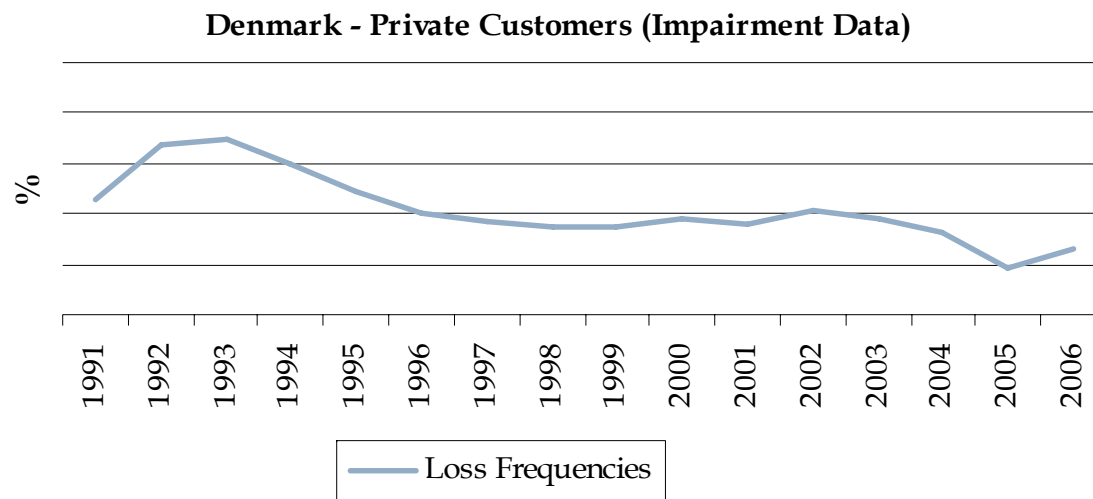
The new levels are then given by

$$PD' = \frac{1}{1 + odds_{adjusted}} \quad (2)$$

Y in (1) is chosen in such a way that the average PD' (cf. (2)) of the segment attains the desired level.

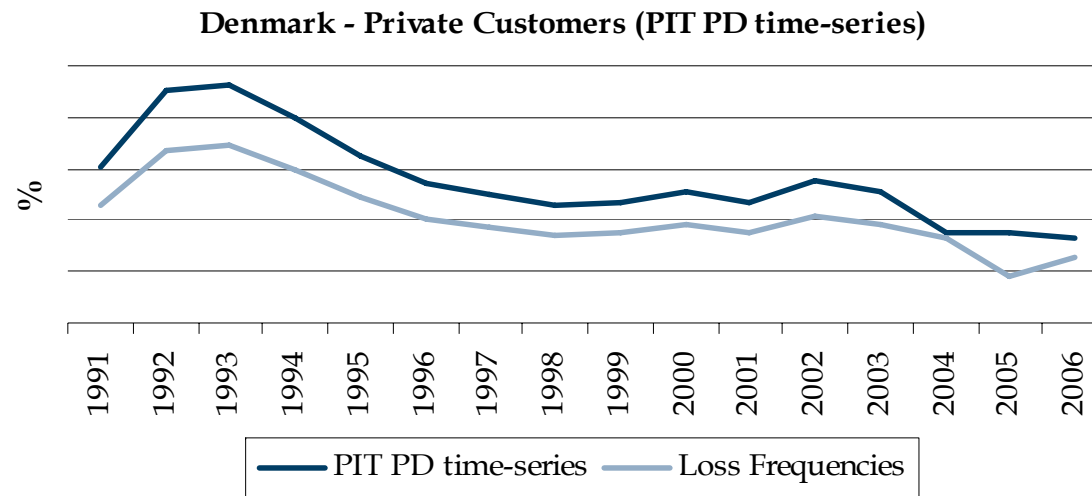
# Impairment data (follows the business cycle)

Historical loss frequency data covering the business cycle has been collected from the bank's systems. Alternatively, national bankruptcy data could be used.



# PIT PD time-series

Internal observed default frequency data has been collected from Backtest & Validation (seen in red). This is spliced to the observed loss frequency data.



# Translation Model

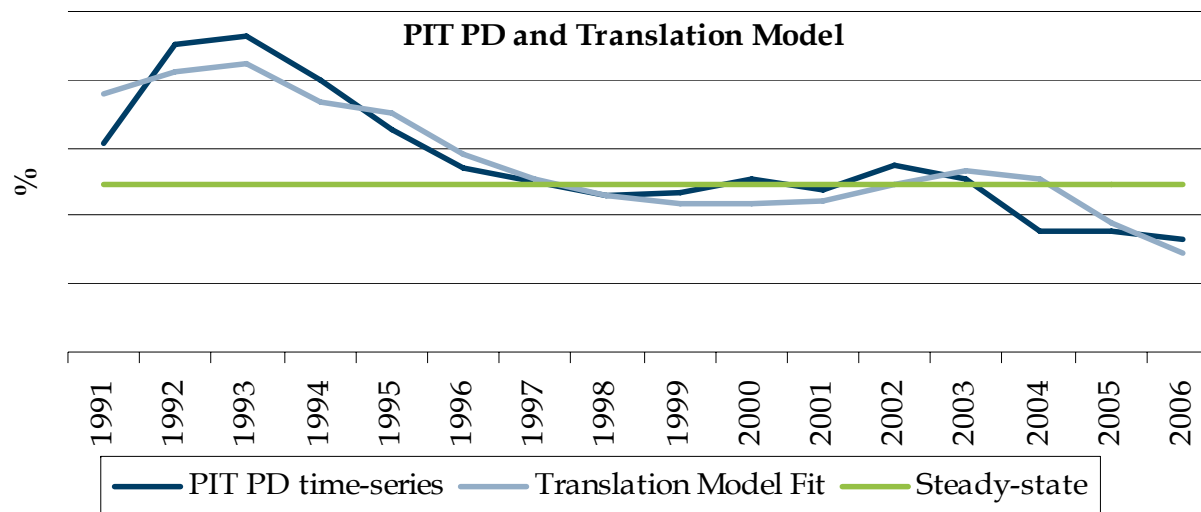
---

The PIT PD time-series is then regressed upon macroeconomic and financial data. Significant and economically reasonable variables are chosen:

- Output Gap
- GDP Growth
- Unemployment levels
- Interest-Rate levels (3-month, 12-month and 10-year)
- Interest-Rate spreads (difference b/w 3-month and 10-year)
- House Prices

# Steady State

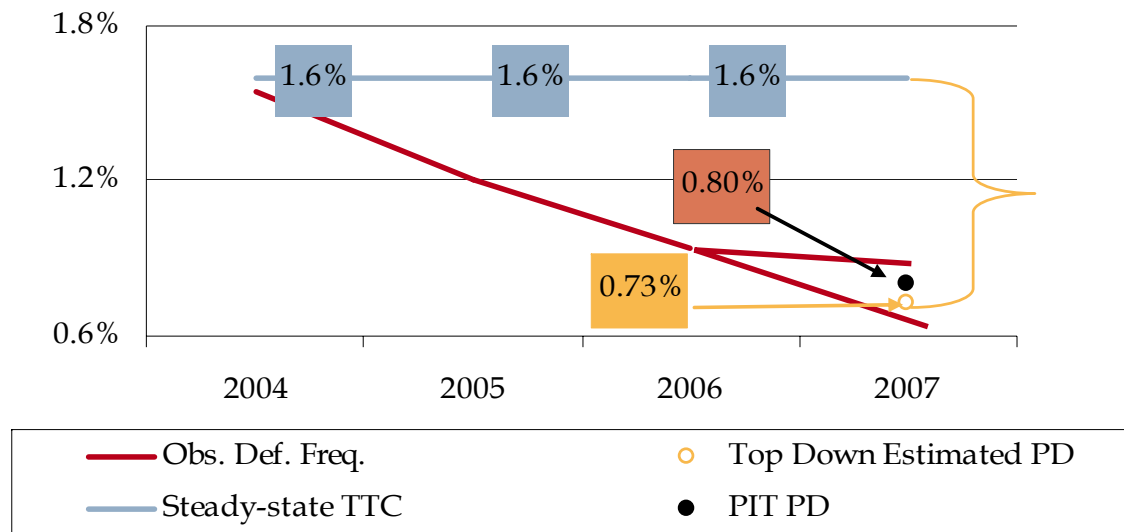
Example of Household Model:



# PD Push Calculated: 125%.

Example of Corporate Model:

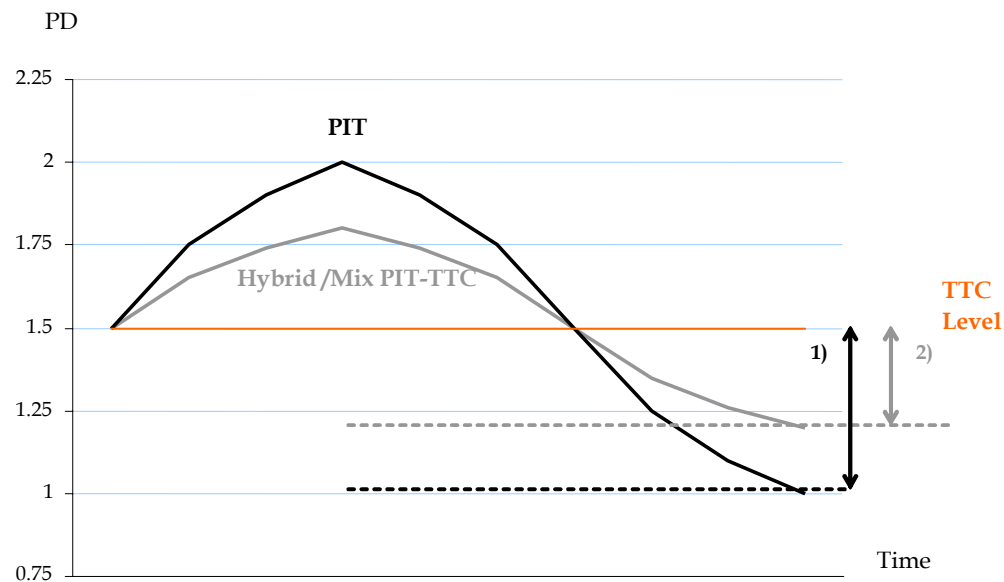
PD Push is the difference b/w Forecast and TTC PD



# PIT Grade (Model Cyclicity Adjustment)

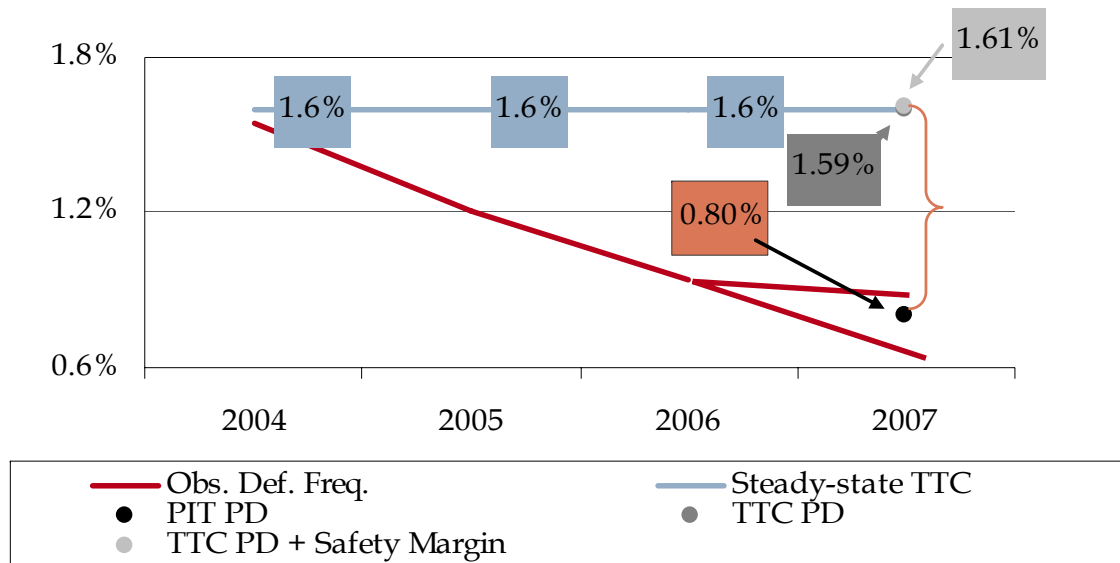
The degrees of cyclicity is calculated and used in formula:

$$\text{Final PD-Push on Mean} = (\text{PIT Grade}) \times (\text{Translation Model Generated PD-Push on Mean})$$



# PD Push Application

Final PD-Push is 100% = 125% × 80% (PIT Grade)  
This is applied to the PIT PD.



## Odds-Ratio for model above = 0.4683

---

- Final PD-Push of 100% is implemented in Model Administration System using Odds-Ratio Value
- Solvency is then calculated
- Consequence Results showed a 20% increase in Q3 2007

# Danske Bank Group's TTC PD Transformation Process

---

Questions / Comments?