



Stress Testing for Credit Risk

Stress testing based on macro-economics

Rick Vedder

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Introduction

- Stress testing is the assessment of exceptional but plausible scenarios and the impact on the credit portfolio
- With a stress testing framework for credit risk banks can:
 - Report macro-economic scenarios and resulting losses to the Managing Board
 - Indicate what scenarios can give a certain loss (reverse stress testing)
 - Comply with regulation regarding new stress testing framework
 - Assess vulnerabilities of local portfolios and define mitigating actions
- Requirements:
 - Basel requirements
 - Sound, intuitive and transparent model

Scope

- Stressing the credit risk → stressing credit risk components

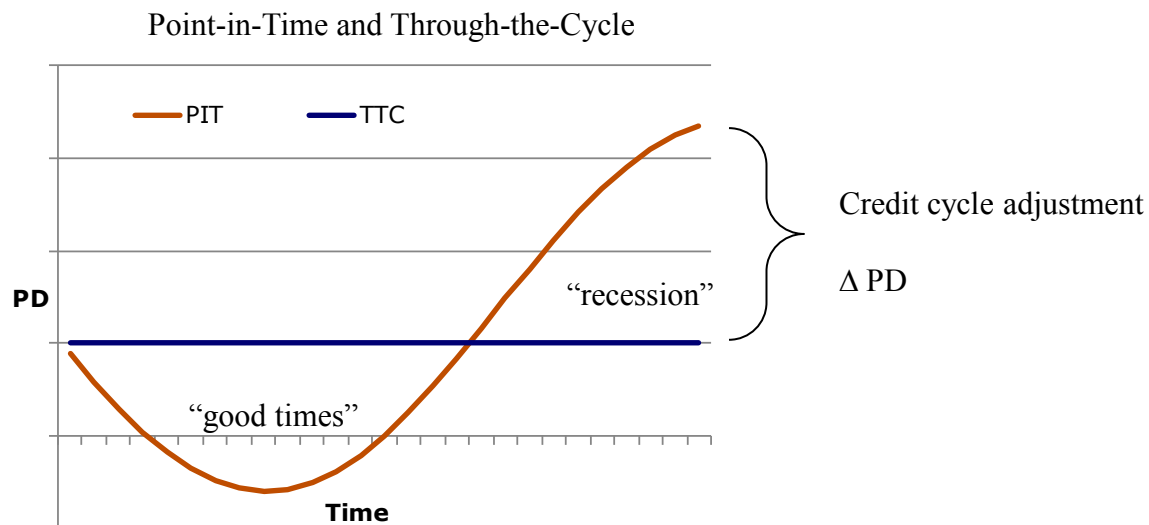
		<i>Stress</i>	
		PD	LGD
<i>Clients</i>	Performing	✓	✓
	Non-performing	NA	✓

An arrow points from the 'Performing' row to the text 'Model'.
 An arrow points from the 'Non-performing' row to the text 'Expert based'.

Concept

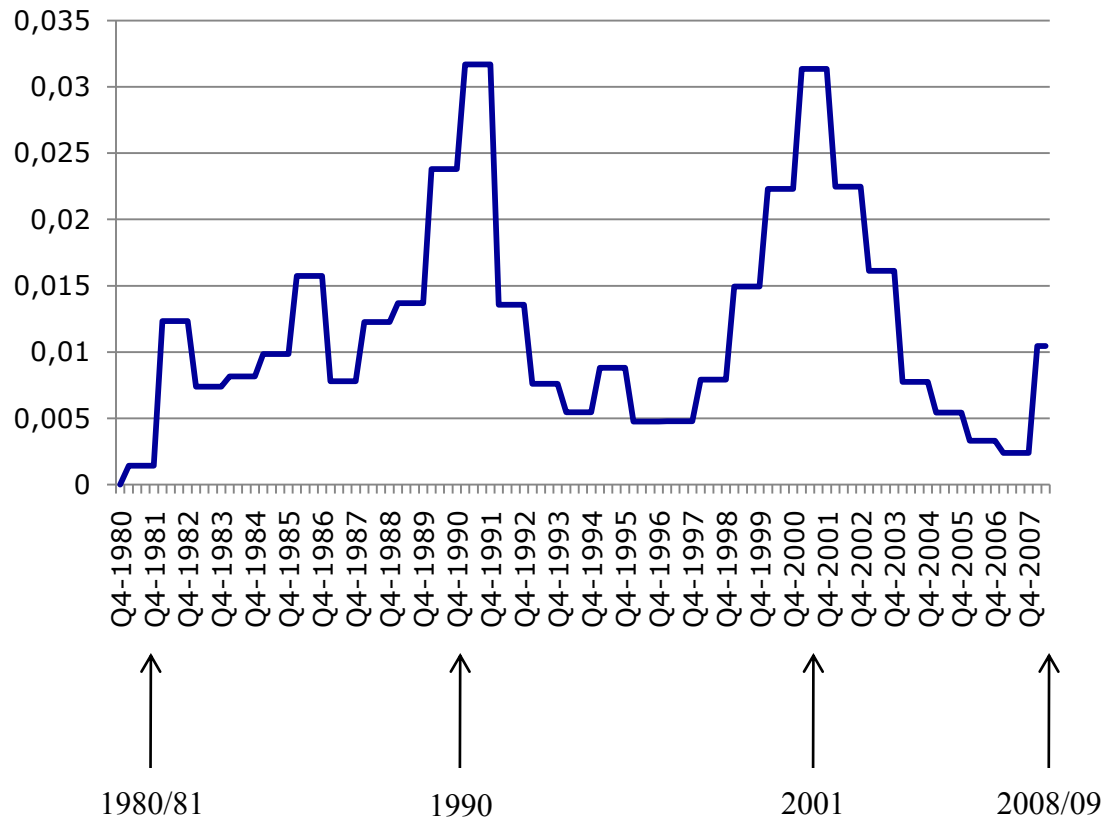
Point-in-Time and Through-the-Cycle

- We use Point-In-Time and Through-The-Cycle concept:
 - PIT default rates are cyclical



Concept

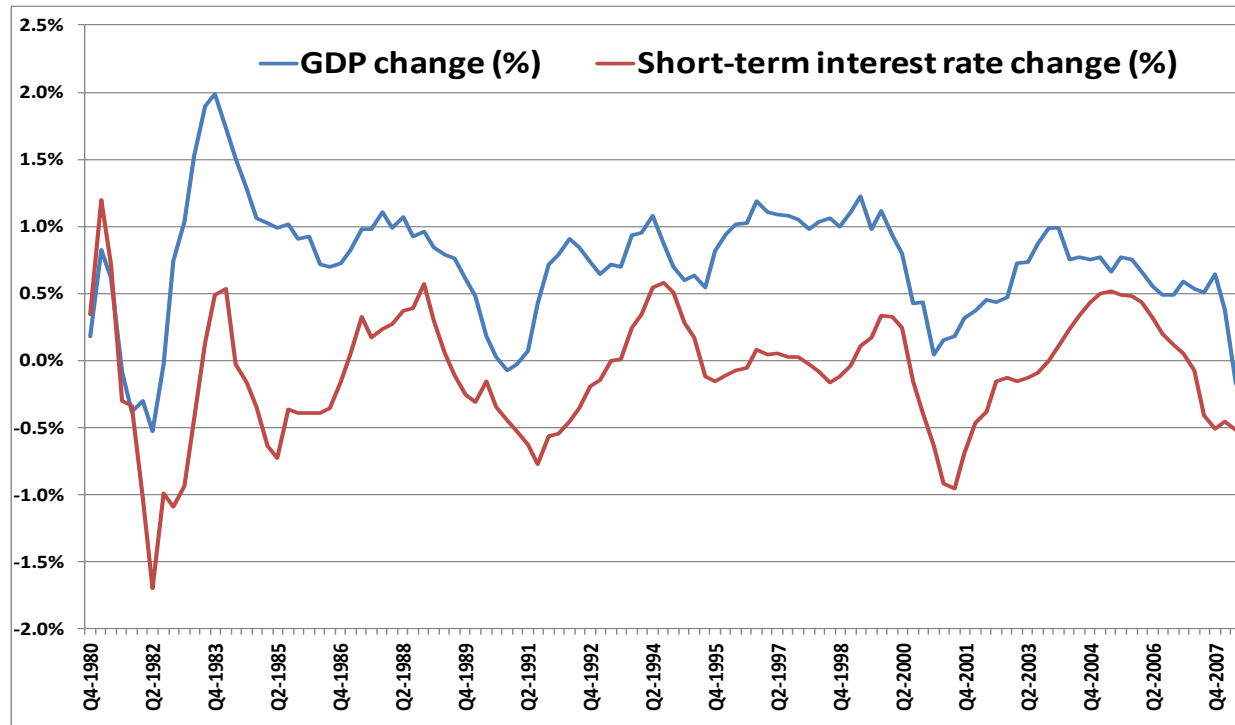
Default rates



Source: S&P Credit Pro

Concept

Macro-economic figures



GDP declining
 →
 default rates
 increasing

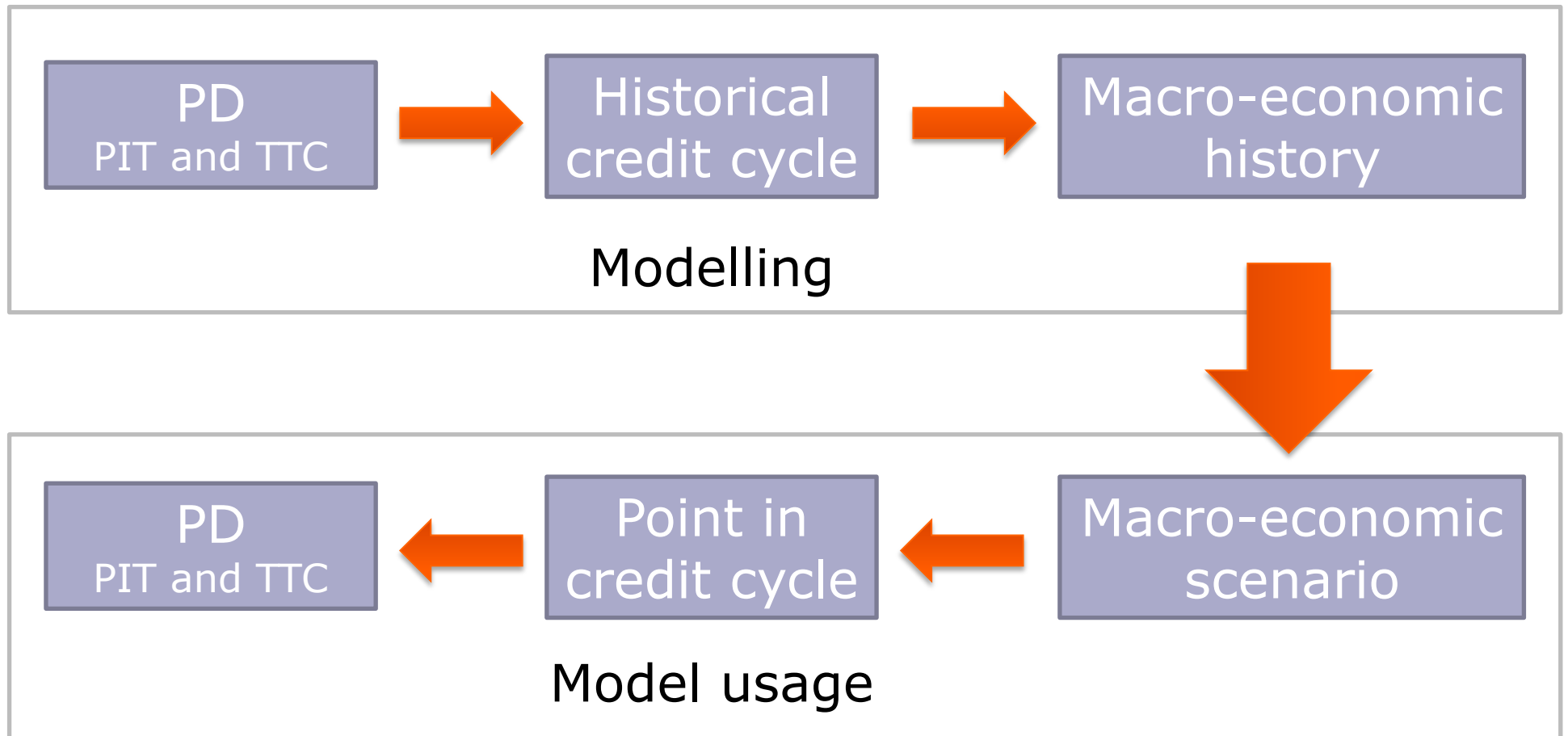
↑
1980/81

↑
1990

↑
2001

↑
2008/09

Concept



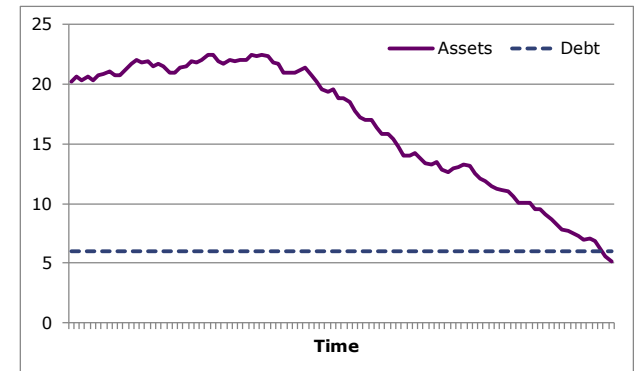
Modelling

Theoretical framework

- Merton theoretical framework
 - When assets fall below the level of debt, the client defaults
 - Distance between asset and debt value, based on volatility measure
 - Distance-to-default (DD):

$$PD = N(-DD)$$

- Credit cycle is represented by one systematic factor
 - Consistency with other models, e.g. Vasicek model
 - Counterparties are sensitive to this systematic factor
 - The TTC DD is adjusted with this credit cycle adjustment factor to arrive at a PIT DD



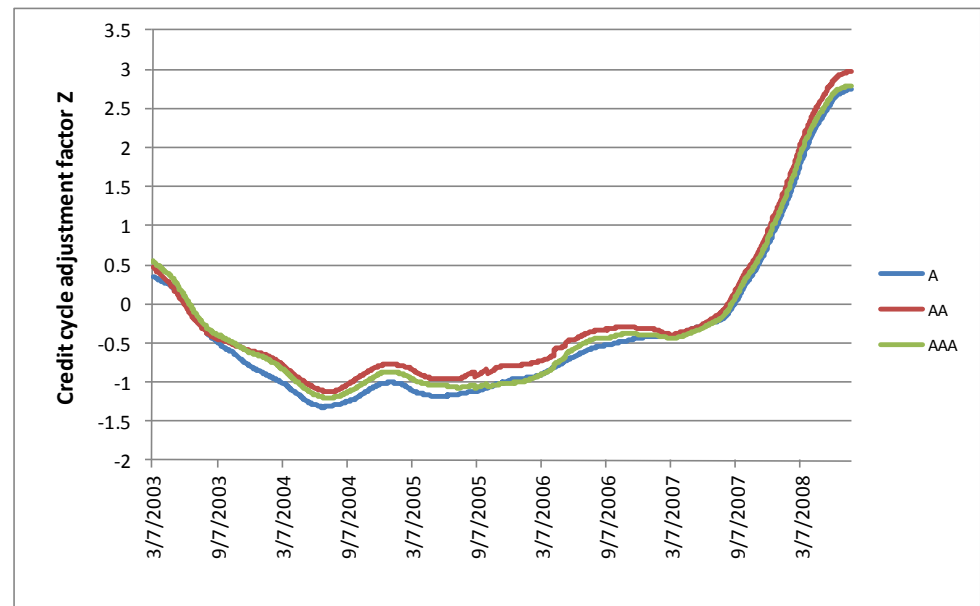
Modelling

- Historical PIT and TTC default rates available → historical credit cycle
 - Bond spreads as proxy
 - Long (TTC) and short (PIT) term averages
 - Compare difference in DD

$$Z = N^{-1}(\text{PD}_{\text{PIT}}) - N^{-1}(\text{PD}_{\text{TTC}})$$

$$Y = \frac{Z}{\sigma(Z)}$$

- Estimate this with macro-economic history



Modelling

Results

- Relation between credit cycle and macro-economic figures
 - Simple regression model

$$Y = a + bX + \varepsilon$$

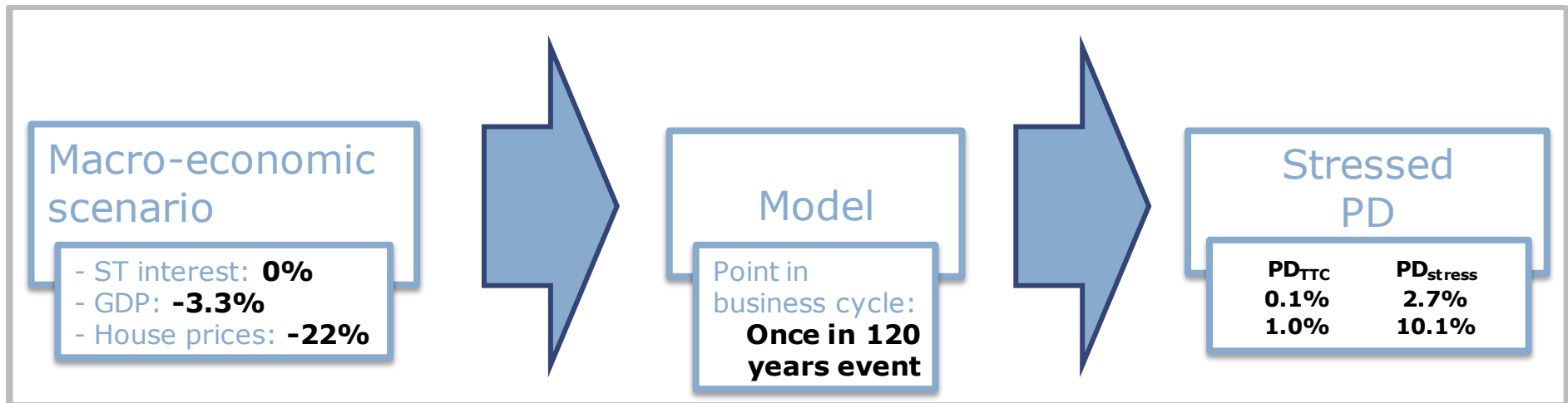
- Most important factors are
 - Basic stress
 - Change in short term interest
 - Change in GDP
 - Change in house prices

$$PD_{PIT} = N(N^{-1}(PD_{TTC}) + \alpha \hat{Y})$$

Modelling

Usage

- Every individual client is affected by the state of the economy and will be stressed with this model



Reporting

- Reporting stress tests on regular basis
 - Management involvement
 - Identification of scenarios
 - Compare scenario losses with historical losses or loss estimates
 - Additional analysis for vulnerabilities
- Reverse stress testing
 - Given a loss, what is the scenario?

Questions



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