

Revisiting the dualism of point-in-time and through-the-cycle default risk models

Bernhard Eder

Department of Banking and Finance
University of Innsbruck

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- 4 Credit risk models
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Introduction

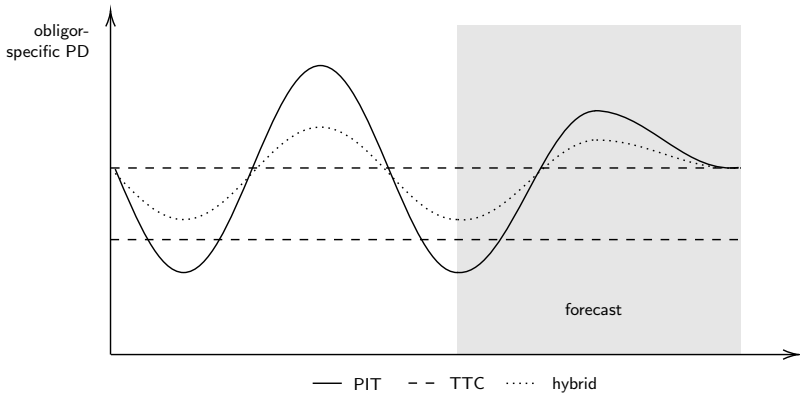


Figure: A common graphical representation

No consensus

- "There is no consensus on the details of the implementation of the through-the-cycle methodology" (Altman and Rijken 2004, 2681)
- "Despite the ubiquity of the term "through the cycle" [...] there seems to be no consensus on precisely what is meant."
(Gordy and Howells 2006, 406)
- "'through-the-cycle' has begun to take on multiple meanings"
(Breedon et al. 2012, 136)
- "interviews with a subsample of 12 banks illustrate that there is still plenty of room for clarification on the PIT and TTC approaches"
(EBA 2013, 28)
- "still no agreed definition of PIT and TTC models exists"
(Mayer and Sauer 2017, 202)
- ...

Motivation

Problem

- No uniform definition of these terms
- Dualism no longer applied solely to ratings
- Mathematical definitions sometimes even contradictory
- Increasingly used in regulatory standards

Related literature

- Heitfield (2004, 2005) examines the link between rating philosophies and default probabilities
- Varetto (2018) provides a comprehensive overview of the literature on PIT and TTC ratings

Research question and contribution

Research question

How has the usage of the dualism evolved since the first appearance in Treacy and Carey (1998)?

Gaps and contributions

- Merging various interpretations into a common framework
- Examine and contrast the multiple meanings in detail
- Explore the dualism in regulation and accounting

Rating systems

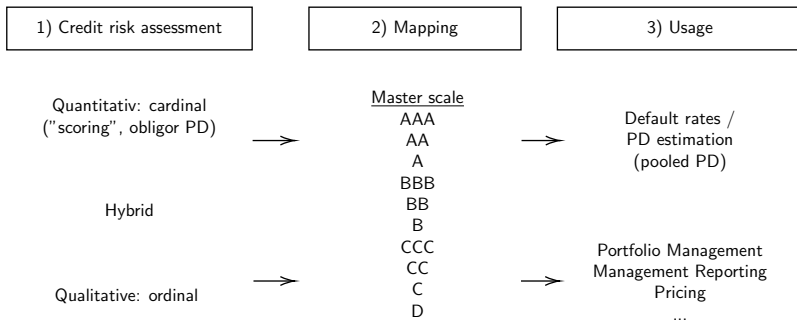


Figure: A prototypical rating system

Rating agencies' TTC definitions

*“Standard & Poor’s credit ratings are meant to be forward-looking; that is, their **time horizon** extends as far as is analytically foreseeable. Accordingly, the anticipated ups and downs of **business cycles** — whether industry-specific or related to the general economy — should be **factored into the credit rating all along**. [...] The ideal is to rate ‘through the cycle’”*

S&P 1998, 105

- Emphasizes time horizon
- Treatment of business cycles ambiguous

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*“[Moody’s changes its] ratings only when it believes an issuer has experienced what is likely to be **enduring change in fundamental creditworthiness**. For this reason, ratings are said to ‘look through the cycle.’”*

Cantor et al. 2003, 4

- Emphasizes prudential migration policy
- No separation of systematic and idiosyncratic risk factors

The origin of the dualism

*“A common way of implementing a long-horizon, through-the-cycle rating philosophy involves estimating the borrower’s condition at the **worst point** in an economic or industry cycle and grading according to the risk posed at that point. Although ‘downside’ or ‘borrower stress’ scenarios are an element of many banks’ underwriting decisions, every bank we interviewed bases risk ratings on the borrower’s **current condition**.”*

Treacy and Carey 1998, 899

- TTC definition emphasizes (ex-ante) stress scenarios
- PIT definition concerned with current conditions

The origin of the dualism

*“In a point-in-time process, an internal rating reflects an assessment of the borrower’s **current condition** and/or **most likely future condition** over the course of the chosen time horizon. [...] In contrast, a ‘through-the-cycle’ process requires assessment of the borrower’s riskiness based on a **worst-case**, ‘bottom of the cycle scenario’, i.e., its condition under stress. In this case, a borrower’s rating would tend to stay the same over the course of the **credit/business cycle**.”*

BCBS 2000, 21

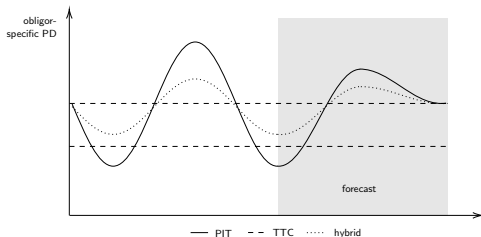
The origin of the dualism

Bottom line

Three competing aspects of TTC ratings

- Long-term horizon
- Stress scenarios
- Prudent migration policy

The "cycle" metaphor



- Which cycle? Business, credit, industry or life cycle?
- Sine-wave like cycles justified and necessary?
- Are TTC ratings independent of macro-economic variables?
- How to incorporate cyclicalities?

Basel II/III

Foundations of the IRB approach

- Rating systems
 - Basel II/III sets out requirements for internal rating systems
 - Deliberately not labelled as TTC, but often interpreted as such
- Probability of default
 - Ideally, the long-run average of a rating's class default rate
 - Hence, often called TTC PD as well

IFRS 9

“The Board also considered through-the-cycle approaches whereby an entity estimates impairment on a portfolio of financial assets using statistical parameters derived from historical credit loss data that cover a full economic cycle or several economic cycles.”

IASB, ED/2009/12, BC22

“The exposure draft clarifies that an entity should use point-in-time estimates (at the measurement date) rather than through-the-cycle estimates”

IASB, ED/2009/12, BC38

Common framework

Based on Heitfield (2004, 2005) and Crook and Bellotti (2010):

$$D_{i,t+h}^* = \begin{cases} 1 & \text{borrower } i \text{ defaults in } t+h \text{ if } D_{i,t+h} < 0, \\ 0 & \text{else} \end{cases}$$

$$D_{i,t+h} = \beta_{0,i} + \mathbf{W}'_i \beta_1 + \mathbf{X}'_{i,t} \beta_2 + \mathbf{Z}'_t \beta_3 + U_{i,t+h},$$

$$U_{i,t+h} = \omega V_{t+h} + \sqrt{1 - \omega^2} E_{i,t+h},$$

Exemplary contradictions

Carlehed and Petrov (2012, 7)

“The PIT PD [...] is the probability that the counterparty will default within the next twelve months if the systematic factor Z has the value z , all else being equal.”

“The TTC PD [...] is the average PIT PD. The average here is over all “states of the world””

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“The TTC PD [...] is the average PIT PD. The average here is over all “states of the world””

Aguais et al. (2006, 272)

“a PIT PD corresponds to the usual meaning of “probability of default” and is, in fact, unconditional with respect to unpredictable factors.”

“TTC PDs ”are conditional in the two cases above on credit conditions reverting to the historical average or to a particular level of stress.”

Comparability of capital requirements

“sometimes the EBA did not find large differences in the method of rating calibration or assignation between two banks even if one of those banks defined itself as TTC and the other as PIT”

EBA 2013, 28

Preliminary conclusion

- Heterogeneous interpretations of PIT and TTC now co-exist
- Mathematically sometimes even contradictory
- But the terms are used in policy debates as if a dualism exists
- Increasingly even used in regulatory standards
- The heterogeneity of credit risk models should also be reflected in the language we use to discuss them

How the dualism spread throughout the literature

- 1995: Studies on rating agencies' TTC methodology
- 1998: Studies on banks' internal rating systems
- 1999: Development of Basel II
 - Design and implementation of Basel II
 - Validation of internal rating systems
 - Concerns about (pro-)cyclicality
- 2009: Macro-prudential stress tests
- 2009: Impairment of financial instruments
 - Design and implementation of IFRS 9
 - Comparisons with Basel II/III
- 2014: Comparability of risk-weighted assets

References I






Aguais, Scott D., Lawrence R. Forest, Martin King, Marie C. Lennon, and Brola Lordkipanidze (2006). “Designing and Implementing a Basel II Compliant PIT–TTC Ratings Framework”. In: *The Basel II Handbook: A Guide for Financial Practitioners*. Ed. by Michael Ong. London: Incisive Financial Publishing Ltd, pp. 267–297. ISBN: 978-1904339557.



Altman, Edward I. and Herbert A. Rijken (2004). “How rating agencies achieve rating stability”. In: *Journal of Banking & Finance* 28.11, pp. 2679–2714. DOI: 10.1016/j.jbankfin.2004.06.006.

References II

-  Basel Committee on Banking Supervision (2000). *Range of Practice in Banks' Internal Ratings Systems. Current Practices and Applications*). Discussion Paper. Basel. URL: <http://www.bis.org/publ/bcbs66.pdf> (visited on 2016-08-18).
-  Breeden, Joseph L., Robert Parker, and Carsten Steinebach (2012). "A through-the-cycle model for retail lending economic capital". In: *International Journal of Forecasting* 28.1, pp. 133–138. DOI: 10.1016/j.ijforecast.2011.01.005.
-  Cantor, Richard, Christopher Mahoney, and Christopher Mann (2003). *Are Corporate Bond Ratings Procyclical?*
-  Carlehed, Magnus and Alexander Petrov (2012). "A methodology for point-in-time-through-the-cycle probability of default decomposition in risk classification systems". In: *The Journal of Risk Model Validation* 6.3, pp. 3–25.

References III






Crook, Jonathan and Tony Bellotti (2010). “Time varying and dynamic models for default risk in consumer loans”. In: *Journal of the Royal Statistical Society: Series A* 173 (2), pp. 283–305. DOI: [10.1111/j.1467-985X.2009.00617.x](https://doi.org/10.1111/j.1467-985X.2009.00617.x).



European Banking Authority (2013). *Summary report on the comparability and pro-cyclicality of capital requirements under the Internal Ratings Based Approach in accordance with Article 502 of the Capital Requirements Regulation*. London. URL: <https://eba.europa.eu/documents/10180/15947/20131217+Summary+report+on+comparability+and+pro-cyclicality+of+the+IRB+Approach.pdf> (visited on 08/26/2020).

References IV

-  Gordy, Michael B. and Bradley Howells (2006). “Procyclicality in Basel II: Can we treat the disease without killing the patient?” In: *Journal of Financial Intermediation* 15.3, pp. 395–417. DOI: <https://doi.org/10.1016/j.jfi.2005.12.002>.
-  Heitfield, Erick (2004). *Rating system dynamics and bank-reported default probabilities under the New Basel Capital Accord*. Washington.
-  – (2005). “Dynamics of rating systems”. In: *Studies on the Validation of Internal Rating Systems*. Basel, pp. 10–27.

References V






International Accounting Standards Board (2010). *Expert Advisory Panell - Summary of all EAP meetings*. London. URL: <http://archive.ifrs.org/Current-Projects/IASB-Projects/Financial-Instruments-A-Replacement-of-IAS-39-Financial-Instruments-Recognitio/Impairment/Expert-Advisory-Panel/Documents/EAPsummaryJuly2010.pdf> (visited on 10/14/2020).



Mayer, Manuel and Stephan Sauer (2017). “Are Through-the-Cycle Credit Risk Models a Beneficial Macro-Prudential Policy Tool?” In: *Monetary Policy, Financial Crises, and the Macroeconomy: Festschrift for Gerhard Illing*. Ed. by Frank Heinemann, Ulrich Klüh, and Sebastian Watzka. Cham: Springer International Publishing, pp. 201–224. ISBN: 978-3-319-56261-2. DOI: 10.1007/978-3-319-56261-2_10.

References VI

-  Standard & Poor's (1998). *Corporate Ratings Criteria*.
-  Treacy, William F. and Mark S. Carey (1998). "Credit risk rating at large US banks". In: *Federal Reserve Bulletin* 84, pp. 897–921.
-  Varetto, Franco (2018). "Point-in-time vs. through-the cycle: filosofie di rating a confronto". In: *Working Paper IRCrES* 4 (11), pp. 1–83. DOI: 10.23760/2421-7158.2018.011.