Overview of Dual PIT/TTC Ratings Systems

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Overview – Dual PIT vs TTC Ratings

Agenda

- Key PIT/TTC Presentation Points Highlighted
- Credit Cycles Exist & Can Be Measured
- Background on ‘As Is’ Ratings Systems vs Dual PIT/TTC Ratings
- Using a PIT/TTC Ratings Framework to Develop a Portfolio-Wide Stress Test Approach Which is Based on Credit Cycle Behaviour
- Key PIT/TTC Presentation Points Summarized
Systematic Credit Cycles are real & they can be empirically measured – their existence motivates Dual PIT/TTC Ratings approaches.

Dual ratings support multiple business objectives – for credit ratings, ‘one size does not fit all’ – capital stability vs. ‘know your real risk’.

Current, legacy credit models do not incorporate empirical credit cycles, they assume systematic factors follow a random walk – moving to a dual rating approach represents a true ‘Kuhnian paradigm shift’.

Dual PIT/TTC ratings are a ‘framework’ – they can be implemented bank-wide.

Wholesale ratings implementation – requires enhanced risk culture, empirically better PD models, & leverages advanced ‘batch’ automation across risk & portfolio management functions.

Portfolio-wide stress testing capabilities are straight-forward to develop once you have developed the PIT/TTC credit-cycle framework.

Provides one consistent framework for stressing PIT PDs, LGD & EAD.
Global Credit Deteriorated Rapidly Starting in Mid-2007

Systematic Credit Cycles are Prominent in Corp Defaults, Losses & KMV EDFs

Various Credit Cycles Indices Derived from Various PD, Rating & Loss Measures
MKMV EDFs, S&P Default Rates & C&I Loss Rates

‘Z-Gap’

‘Good’ Credit Conditions

Neutral Credit Conditions

‘Bad’ Credit Conditions


Overview of PIT/TTC Ratings Systems
A Component of Credit Cycles is Predictable

Predicting Roughly 20% of the Systematic Cycle is the Foundation of PIT/TTC Ratings

Legacy Credit Models Are Blind (‘Empty Glass’) to the Predictable Systematic Component of Cycles

Current Models Assume Credit Factors Follow a Random Walk

Source: Moody’s KMV, RBS Research
Managing Real Risk vs Managing Capital Stability

Multiple Business Objectives Require Multiple Views of Credit Risk

- Dual ratings first developed in 2003/4 as preparation for Basel II – implemented in 2005 under the AIRB Waiver of a large UK Bank

- In most Banks today, internal ratings (PDs) are ‘hybrid’ indicators which are mostly calibrated to ‘Through-the-Cycle (TTC) credit conditions

- But successful Capital Management (Basel II) & Credit Risk Management requires multiple, well-defined views of default risk:
  - 1-Year expected loss prediction – 1-Yr PIT
  - Regulatory Capital under Basel II – 1-Yr TTC
  - Economic Capital (Aggregate) – 1-Yr TTC
  - Discretions/Limits – 1-Yr TTC
  - IFRS – ‘Life of the Loan EL Accounting Measures’ - PIT
  - Risk/Reward & Credit Pricing – PIT PD Term Structures (Including predicted credit cycles)

- A Dual-PD Approach including both ‘pure’ PIT & TTC measures is required to support the bank’s broad objectives:
  - Capital Stability not Pro-Cyclicality -- TTC
  - ‘Know Your True Risk’ -- PIT
Current Issues vs Objectives With Wholesale Credit Ratings

**Current Issues** -- At most banks, existing credit ratings are hybrid indicators:

- **No credit cycle** – understate or ignore the cycle & therefore they fail to track broad changes in risk over time,
- **Apples to Oranges** -- provide inconsistent measures, with the same grade implying different PDs for different asset classes,
- **Too Static & Not Dynamic Enough** -- get refreshed infrequently (‘fire and forget’) -- so can be late in signalling financial distress,
- **Less Accurate Empirically** -- show less counterparty-specific variability than other indicators with better track records
- **Multiple PDs Required for Multiple Objectives**. – almost all banks have one rating or PD measure

**Objectives** -- Develop a Dual-PD Ratings approach to more accurately & timely PDs & grades on both a PIT and TTC basis:

- Consistently supports multiple regulatory, risk & portfolio management objectives
- Each PD model needs to be classified as PIT, TTC or Hybrid
- Requires reasonable granularity & spacing in a bank’s PD Master Scale
- Converts all current PD models in ‘batch mode’ to both 100% PIT & 100% TTC PDs -- creating apples to apples’ & ‘oranges to oranges’ comparisons
- Explicitly incorporates measureable credit cycles to perform the PIT/TTC conversions -- forecasts credit cycles going forward to form unconditional PD term-structures
Impact of Systematic Credit Cycles – PIT PDs Move Much More than TTC PDs

‘Point-in-Time’ vs ‘Through-the-Cycle’ PDs or Ratings:

- ‘PIT’ PDs over 1-year represent ‘current credit conditions’ & reflect movements in systematic credit cycles
- ‘TTC’ PDs over 1-year represent ‘average credit conditions’ & are developed using long-run average historical calibrations -- they are ‘conditionally neutral’ to systematic credit cycles

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Average PDs

- ‘Bad’ Credit Conditions
- ‘Good’ Credit Conditions
- Average TTC PDs

Impact of Systematic Credit Cycles

Average PIT PD

Overall Portfolio

Time

Measuring ‘Real Risk’ vs a ‘Conditional Fiction’ (TTC)
Empirical Evidence Supports PIT/TTC Ratings

Measuring Systematic Credit Cycles Has a Strong Empirical Foundation

Empirical Support for Believing in Systematic Credit Cycles – ‘20% Full Glass’

- Naked Eye!

- Unemployment rates, inflation rates, relative commodity prices, relative currency values & interest rates are often found to exhibit mean reversion – evidence also found in equity indexes

- Three empirical tests support the existence of credit cycles:
  1. Forecast equations for systematic Z credit factors show statistically significant mean reversion & momentum
  2. In-sample simulations across a naïve model (no credit cycles) & estimated Z models shows statistically significant MSE reductions
  3. Out-of-sample – out-of-time back-testing results also demonstrate the validity of credit cycles
Developing the Most Empirically Accurate PD Models Requires Credit Cycle Measures

Rated Corporate Defaults Exhibit Strong PIT Cycles

Annualized Quarterly DR: 3-qtr Moving Average - Corporates

Source: Moody’s & S&P
But Banks Use Primarily ‘Hybrid’ or Mostly TTC Ratings

Obligor-Specific PD Models Come in Various ‘Flavours’

**“100% PIT”**

MKMV EDFs

MKMV EDFs are the benchmark for 100% PIT because they reflect credit cycles immediately through equity prices & they closely track realized default rates.

**“Hybrid PIT/TTC”**

Most Bank Internal Grades

Agency Ratings

Agency Ratings have historically been 70% TTC & 30% PIT as the ratings do migrate somewhat due to credit cycle movements.

**“100% TTC”**

70/30 On Average

Scorecard PD models are generally 100% TTC by definition & they understate credit cycles because they place little weight on data that tracks temporal variations in default rates – for this reason they are relative indicators.

What Makes a PD Model PIT or TTC?
Applying Credit Cycle Adjustments to the Various Large-Corp PD Model

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<th>‘Hybrid’</th>
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<td>Use MKMV EDFs</td>
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Credit Cycle Adjustments Yield Two Views of Risk

Focus on Large-Corp Ratings – Credit Cycle Indices Lead to ‘Pure’ PIT & TTC Ratings
Modelling Systematic Credit Cycles

Systematic Factors for Industry Sector & Region are Combined to Credit Cycle Indices

Industry Sector $Z_S$

Aerospace & Defence  
Banking  
Chemicals & Plastic Products  
Construction  
Consumer Products  
Oil & Gas  
Finance, Real Estate & Insurance  
Hotels & Leisure  
Basic Industries  
Machinery & Equipment  
Media  
Medical  
Steel & Metal Products  
Mining  
Motor Vehicle & Parts  
Retail & Wholesale Trade  
Business & Consumer Services  
Technology  
Transportation  
Utilities  
Commercial Real Estate

Spot Median $Z_{S/R}$ Gap  
LR Median $Z_{S/R}$ Gap

Regional $Z_R$ (Corp/FI)

Asia  
Continental Europe  
United Kingdom  
Latin America  
North America  
Pacific

Overview of PIT/TTC Ratings Systems
Credit Cycle Behavior (Z or Z-Gap) is Driven by Two Competing Influences – Mean Reversion & Momentum

Most Data Exhibiting Credit Cycles Shows Two Competing Empirical Influences
**Systematic vs Idiosyncratic Changes in Credit Risk**

**Relationship Between PIT vs TTC Default Distance**

- For an obligor, TTC change is synonymous with idiosyncratic (company-specific) variation

\[
PIT = CYCLE + TTC \Rightarrow \Delta PIT = \Delta CYCLE + \Delta TTC
\]

- TTC PDs Impacted by Only the Borrower Idiosyncratic Factor
- PIT PDs Impacted by Both the Systematic & Idiosyncratic Factors
Examples of Industry Credit Cycle Index Z-Gaps

Banking, & Finance, Insurance & Real Estate

Source: Moody’s KMV, RBS Research

Overview of PIT/TTC Ratings Systems
Examples of Industry Credit Cycle Index Z-Gaps

Basic Industries, Mining, Oil & Gas, Steel & Metal Products, Utilities

Source: Moody’s KMV, RBS Research
Examples of Industry Credit Cycle Index Z-Gaps

Hotels & Leisure, Media, Technology, Transportation, Retail & Wholesale Trade

Source: Moody’s KMV, RBS Research
Examples of Region Credit Cycle Index Z-Gaps

Corporates – Asia, Europe, UK, Latin-America, North-America, Pacific & South Africa

Source: Moody’s KMV, RBS Research
Examples of Industry Credit Cycle Index Z-Gaps

EDFs for BBB Rated S&P Companies Move Substantially

MKMV EDFs for S&P BBB Rated Companies (Non-FIs)
-- NA, EU&UK and APAC

Source: S&P, Moody’s KMV, RBS Research
Predicted Credit Downturn in the Hotel/Leisure Sector Occurred Later But Was More Rapid When it Did Occur

Industry Z – Hotel/Leisure Sector – Rapid Declines in Z Behaviour Caught up With the Ex Anta Forecast

Source: Moody’s KMV, PIT/TTC research
Utilizing PIT PD Framework for Portfolio-Wide Stress Testing:

- Developed & applied portfolio-wide or more narrowly for industries, regions or obligor types
- Approach is Banking-Book-centric with simplified Trading-Book assumptions until a full integrated market & credit risk factor structure is completed
- Converts ‘unconditional’ PIT PDs into ‘conditional’ PIT PDs to most accurately stress PDs
- Utilizes forecasts of macro risk factors (currently GDP & Equity Indexes) to summarize implications of a ‘stress’ macro scenario on portfolio credit conditions broadly
- Estimates statistical models between ‘Macro-Z’ factors & Z-industry/regions
- Applies a ‘Macro-Merton’ approach – therefore it is consistent with corporate PD modelling
- Develops conditional, ‘stress’ PIT PD term structures on a multi-year basis
- Implemented in ‘batch mode’ – sits right on top of the normal PIT PD batch process
Additional Components of the Credit-Cycle Based Stress Test Approach

(1) Develop credit-cycle based, systematic stress scenarios for EAD & LGD:

- EAD & LGD models estimated to include Z-Gap credit cycles
  - Stress LGD = f( LGD risk factors, region/sector Z-Gap)
  - Stress EAD = f(EAD risk factors, region/sector Z-Gap)
- Applying deterministic, stress scenarios to EAD & LGD provide stress values consistent with the stress PIT PD scenarios – all drive off the same Macro Z drivers

(2) Develop Qualitative Overlay to statistical models:

- Bridge from actuarial view to provision/accounting view – match stress default rates by setting some counterparty PDs to 100% and all the rest to zero
- Apply ‘add-factor’ approach to industry or region losses
- Solicit Credit Officer input by region, sector or counterparty

Consistent Stresses Applied Across PD, LGD & EAD
Systematic Credit Cycle Factors Utilised to ‘Bridge’ From Macro Risk Factors to ‘Conditional’ PIT Measures

- View GDP & equity measures as asset-value proxies
- Project macro debt on the basis of trends in asset-value proxies
- Treat Debt/GDP & Debt/Equity as leverage measures
- Derive macro DDs (‘Default-Distance’) as ratios of leverage to historical, leverage volatility
- Convert macro DDs to macro Zs (by normalising mean & variance)
- Use ‘bridging’ relationship to derive industry-region Zs from macro Zs
- Enter industry-region Zs into the PD, LGD, and EAD models and derive stress losses

Macro Scenarios (GDP, Equity)

Macro DD = L/V = f₁ (GDP, Equity)
Macro Z = f₂ (Macro DD)
Industry/Region Z = f₃ (Macro Z)

Conditional Stressed PIT PD = f₄ (Obligor’s internal assessment, Stress Industry/Region Z)
Stress Test Approach Focus is on Portfolio Losses

Macro Stress Scenarios Drive Systematic ‘Conditional’ PIT PD Stresses

- **Stress Case EL** uses ‘Stressed’ PIT PD (1-5 yrs)
  “Reflects stressed credit conditions in the client’s primary Region & Sector”

- **Base Case EL** uses PIT PD (1-5 yrs)
  “Reflects normal credit conditions in the Client’s primary Region & Sector”

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**Overview of PIT/TTC Ratings Systems**

**Time**

- **Actual**
- **Forecast**

**PD**

- **Bad Times**
- **Good Times**

**Avg Portfolio TTC PD**

**Macro Scenarios**
Components of the US Equity Macro Z

On the right see historical values of leverage and leverage volatility, which has larger proportional swings.

Leverage (inverted) = \( \ln((\text{MtM equity plus debt})/\text{debt}) \).

US equity ‘Macro Z’ tracks North American Corp, EDF-derived Z quite closely.

\( \text{DD} = \frac{\text{Lev}}{\text{Lev-Vol}} \);
\( Z = \text{DD normalized (mean = 0, std dev = 1)} \)

Source: Moody’s KMV, RBS research
Bridging From Macro to Region/Industry Risk Factors

Components of the US GDP Macro Z

On the right see historical values of leverage and leverage volatility, which has larger proportional swings.

Leverage (inverted) = \ln((\text{GDP}/\text{debt})).


DD = \text{Lev}/\text{Lev-vol};

Z = DD normalized (mean = 0, std dev = 1)

Source: …….Moody’s KMV, RBS research
Historical & Forecasted US GDP Growth Rates

Historical GDP < > Forecasted GDP
FSA Anchor III
2008/09 Replication

Historic & Forecasted US Equity S&P 500 Index Growth Rates
Annual growth rates
Historical Equity < > Forecasted Equity
FSA Anchor III
2008/09 Replication

Source: S&P, FSA, US Govt, RBS Research
FSA Anchor Scenario vs ‘Replay of 08/09’ Scenario

US -- ‘Macro-Z’ for GDP & S&P 500 -- History & Scenario Forecasts

Source: S&P, FSA, US Govt, RBS Research
Overview of PIT/TTC Ratings Systems
Summary – Dual PIT vs TTC Ratings

Key Points in the Presentation

- Systematic Credit Cycles are real & they can be empirically measured – their existence motivates Dual PIT/TTC Ratings approaches
- Dual ratings successfully support multiple business objectives
- Legacy credit models vs Dual PIT/TTC ratings – represent a substantial & positive paradigm shift going forward
- Dual PIT/TTC ratings are a ‘framework’ – they can be implemented bank-wide
- Wholesale ratings implementation – E2E models ‘batch mode’ capability using a ‘Model Server’ architecture is a substantial step forward
- Portfolio-wide tress testing capabilities require ‘conditional’ PIT measures – these flow naturally from the PIT/TTC ratings ‘unconditional’ view of risk
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