Regional Training on Micro Prudential Stress Testing

METAC
Beirut, Lebanon  20th – 24th Feb 2017

Day 2, Session 4
Introduction to the Cihak Model

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Introduction to the Cihak Model

1. Introductory Comments
Introduction to the Cihak Model

1. Introduction
2. Architecture
3. Usage
4. Modules
5. Demonstration
Architecture of the Cihak Model

Cihak Model

Data

Assumptions

Credit Risk
Interest Rate Risk
FX Risk
Liquidity Risk
Reverse Stress Tests

Scenarios

Bottom Up
Interbank

4
Framework/Layout of Cihak Model ... (2 of 4)

Sheets in Model:

- “Read me”: Navigation guide
- “Data”: Data and measures by bank
- “Assumptions”: Parameters and Shocks
- “Credit risk”: 4 shocks
- “Interest Risk”: 2 shocks (direct impacts)
- “FX Risk”: 1 shock (direct and indirect impacts)
- “Liquidity”: 2 shocks
- “Interbank”: 2 shock (before and after Scenarios)
- “Scenarios”: combination of shocks
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Architecture of the Cihak Model

Usage notes:
• Cells in the model are colour coded to indicate their use
• Percentages are in whole numbers

<table>
<thead>
<tr>
<th>NOTATION</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>Yellow denotes input data reported to and collated by the Central Bank (only in the Data sheet)</td>
</tr>
<tr>
<td></td>
<td>Yellow/white stripes denotes consistency check on the input data.</td>
</tr>
<tr>
<td>Green</td>
<td>Green denotes numerical assumptions (ie Parameters) for the stress test (only in the Assumptions sheet)</td>
</tr>
<tr>
<td></td>
<td>Green/white stripes denote numerical assumptions imported from the Assumptions sheet.</td>
</tr>
<tr>
<td>Blue</td>
<td>Blue denotes the assumed sizes of the shocks to the risk factors (all in the Assumptions sheet).</td>
</tr>
<tr>
<td></td>
<td>Blue/white stripes denote numerical assumptions imported from the Assumptions sheet.</td>
</tr>
<tr>
<td></td>
<td>No background (with black font) denotes linked cells or formulas.</td>
</tr>
</tbody>
</table>

• Users can add satellite modules that develop the parameters or shocks (ie the green or blue cells)
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Modules

Data Sheet
### Data Sheet – Table A1 Financials

**Total Assets**
- Cash and T-bills
- Long-term government bonds
- Total loans (net)
- Other assets (net)

**Total Funding**
- Deposits
  - Demand deposits
    - Domestic currency
    - Foreign currency
  - Term deposits
    - Domestic currency
    - Foreign currency

**Total Equity**

**Net income ("after-tax profit")**
- Net operating income (+)
- Net interest income (+)
- Interest income (+)
- Interest expense (-)
- Noninterest income (+)
- Provisions for loan losses (-)
- Noninterest expense (-)
- Securities gains/losses (+)
- Applicable income taxes (-)
- Extraordinary gains, net (+)

**No off balance sheet**

Source: Cihak WP/07/59
Data Sheet – Table A2 Prudential Indicators

- Regulatory capital and RWA
- Credit Risk
  - Breakdown by lending quality
  - Breakdown by industry sector
  - Largest exposures
  - Provisioning and collateral
- Interest Rate Risk
  - Time to maturity for assets and liabilities (on and off balance sheet)
  - Structure of bond portfolio
- FX Risk
  - Net open positions in foreign currency
  - Lending in foreign currency
- Income Risk
  - Historical data
- Contagion Risk
  - Interbank exposures (uncollateralised)
Data Sheet – Tables A3 to A6

**Table A3:** Selected Banking Sector Ratios
- Base-date metrics at Bank by Bank Level
  - Financial Soundness Indicators (FSIs)
  - Key ratios, Z scores

**Table A4:** Structure of Financial System
- Base-date metrics at System Level
  - Market shares
  - Relationship with GDP

**Table A5:** Basic Ratio Analysis - Ratings
- Base-date Bank Ratings / CAELs
  - Early warnings system (EWS) type measures (bank by bank)
  - Basedate / Baseline measures

**Table A6:** Basic Ratio Analysis – Generated PDs
- Base-date Probabilities of Technical Bank Failure
  - Step function and Back-testing of step function
Modules

Assumptions Sheet
Assumptions Sheet

This sheet contains all assumptions for the model.

• Assumptions enable sensitivity tests to be undertaken for each risk
• Charts appear alongside the assumptions allowing the user to see how
  changes in the assumptions impact the results.
• The scenarios assumptions enable the user to combine sensitivities tests
  into a single scenario

Table A:
• Set up for ratings and PD sections in Data sheet

Table B: Assumptions
• Credit Risk
• Interest Rate Risk
• FX Risk
• Contagion Risk
• Liquidity Risk
• Scenarios
Modules

Risk Sheets
Risk Sheets

Credit Risk

Table C1: summarizes the reported data on asset quality.

Table C2: shows the credit risk stress test. It consists of four components:

(i) a correction for under-provisioning of NPLs;
(ii) an aggregate NPL shock;
(iii) a sectoral shock, allowing different shocks to different sectors;
(iv) a shock for credit concentration risk (large exposures).

Interest Risk

Table D1: sorts assets and liabilities into three time-to-repricing buckets, using the input data provided by the NBB.

Table D2: shows the corresponding interest rate stress test. The test itself consists of two components:

(i) flow impact from a gap between interest-sensitive assets and liabilities; and
(ii) stock impact resulting from the repricing of bonds.
Introduction to the Cihak Model

FX Risk
- **Table E1**: contains information on the foreign exchange exposure of the banks and the direct exchange rate risk shock.
- **Table E2**: shows a basic calculation of the indirect foreign exchange shock (using FX loans to approximate impact on credit quality).

Interbank Risk
- **Table F1**: is a matrix of n.et interbank exposures.
- **Table F2**: uses the interbank exposure data to show “pure” interbank contagion, i.e., to illustrate what happens to the other banks when one bank fails to repay its obligations in the interbank market.
- Table F3 shows a “macro” contagion exercise, in which banks’ failures to repay obligations in the interbank market are not assumed, but rather a result of the “macro” shocks modelled in the sheet “Scenarios.”

Scenarios
- **Tables H1, 2 3 and 4**: Combines a selection of the Risk tests into a scenario
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- Demonstration on screen
- Exercises
Questions and discussion ...