Off-site liquidity supervision tool

BANQUE CENTRALE DU LUXEMBOURG

EUROSYSTÈME

Stefan Rychtárik
Franco Stragiotti

April 28, 2010

1

Content

Background and motivation

Liquidity supervision in Luxembourg:

- New mandate for the BCL (Loi du 24 octobre 2008 portant amélioration du cadre législatif de la place financière de Luxembourg)

- Luxembourg banking sector is rather complex and heterogeneous in terms of business activities as well as regards liquidity risk

- 146 credit institutions, 25 countries, majority of institutions listed as large and complex banking groups by the ECB

Supervisory off-site tool to allocate efficiently the analytical resources

Information about the liquidity situation of the local institutions

Methodology: Concept

Starting point:

- Liquidity risk has several facets:
  - Idiosyncratic (e.g. bank-run/behavioural phenomena)
  - Structural (e.g. maturity mismatch)
  - Market-related (e.g. flight-to-quality)

- Difficult to link to bank's capital and to profit and loss (but we know liquidity may cause a bank's default…)

- Difficult to link liquidity risk to a bank's default Difficult to set any thresholds to define liquid and illiquid banks (from a supervisory point-of-view)

General approach:

- As regards each bank <u>liquidity position</u>, we are only able to say if a <u>selected bank</u> is, at each point in time, better or worse than…

1.	Other comparable banks	"Peer score" (from 1 to 9)
2.	The bank itself in the past	"Time score" (from 1 to 9)

4

Methodology: Risk factors selection

How to define the liquidity position?

- Built on available reporting data
- Be consistent with the BCBS recommendations
- Rely on the existing literature and research
- Address specificities of the Luxembourg banking sector (through PCA, questionnaires, …)

Balance and off-balance risk factors

Freeze of interbank market
Capital markets crash
Retail run in Luxembourg
Private banking run
Corporate run
Withdrawals by invest. funds
Issuance problems
Custodian operational issue
Committed credit lines
Foreign exposures
Fiduciary deposits
Off-shore centres
Eurosystem refinancing
Group liquidity

Market risk factors

Consumer Confidence Index of LU
Euribor-Eurepo spread
Reference stock market index
ESI of the parent undertaking country
SDR of the parent undertaking country
Stock price of the parent undertaking
Stock price volatility moving average

Methodology: Risk indicators definition

- Risk factors are translated into risk indicators (balance sheet stress ratios and market variables)

  - <u>EXAMPLE</u>: Household run in Luxembourg: the withdrawal of the retail deposits is one of the most common liquidity risk channels. In this indicator we assume the liquid assets to be used to face an outflow of deposits by Luxembourg households.

$$\frac{LA - \alpha_i^b D_h^{LU}}{h(TA - \alpha_i^b D_h^{LU})}$$

- Balance sheet indicators share common features:

  - The concept of liquid assets: $LA = T + C_{cb} + {}^{1Y}C_b(1 - v_{{}^{1Y}C_b}) + {}^{1Y}_{rp}C_b(1 - v_{{}^{1Y}_{rp}C_b}) + \sum_{d=1}^{K}\left[S_d(1 - v_d)\right] - D_{cb}$

  - Use of the Herfindahl-Hirschmann concentration index (h)

  - Values are normalised by the balance sheet total (TA)

- The values of risk indicators are calculated for every bank (146), period (16) and risk factors (21)

- As a result, the liquidity position of every bank in every period is defined by a set of risk indicators

Methodology: The matrix

Different relevance / importance of risk factors as regards individual banks

- Not every bank is sensitive to all of the 21 risk factors:
  - Balance/off-balance sheet risk factors: in case a bank is not active in the business line corresponding to the reference risk factor
  - Market risk factors: in case the bank is not listed, thus no stock price data is available

- The importance of different risk factors to individual banks is different:
  - Heterogeneity is spread across the sample as regards business activities
  - This heterogeneity is addressed by using different weights for different risk factors for individual banks.

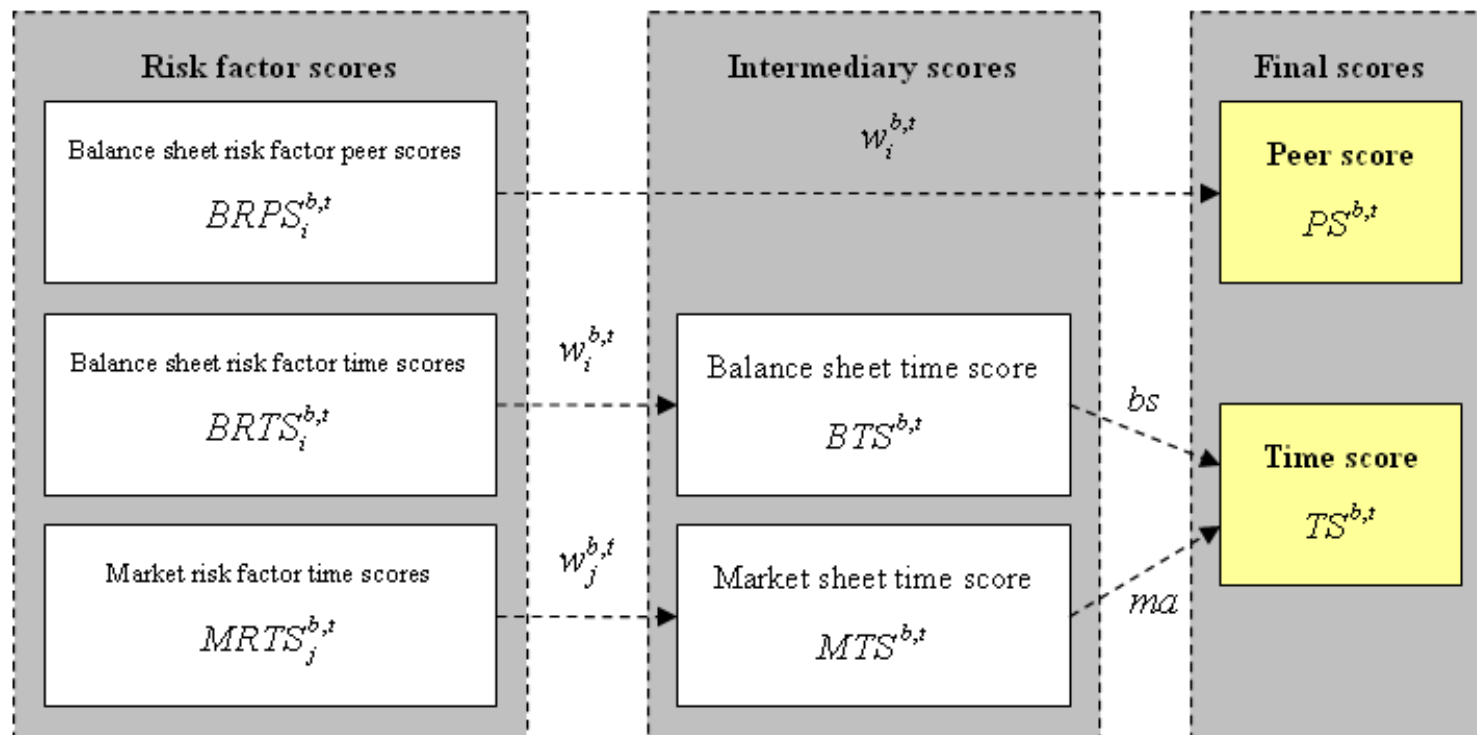## Determination of risk factor weights

- Balance sheet indicators
  - The weights are calculated for every bank and every period depends on the balance sheet importance and volatility of the risk parameter.

$$ w_i^{b,t} = \frac{iw_i^{b,t}}{\sum_{i=1}^{K} iw_i^{b,t}} \qquad iw_i^{b,t} = \frac{r_i^{b,t}}{LA^{b,t}} * \frac{stdev(r_i^b)}{\overline{r_i^b}} $$

- Market indicators
  - The weights depends on the number of variables applicable for every bank
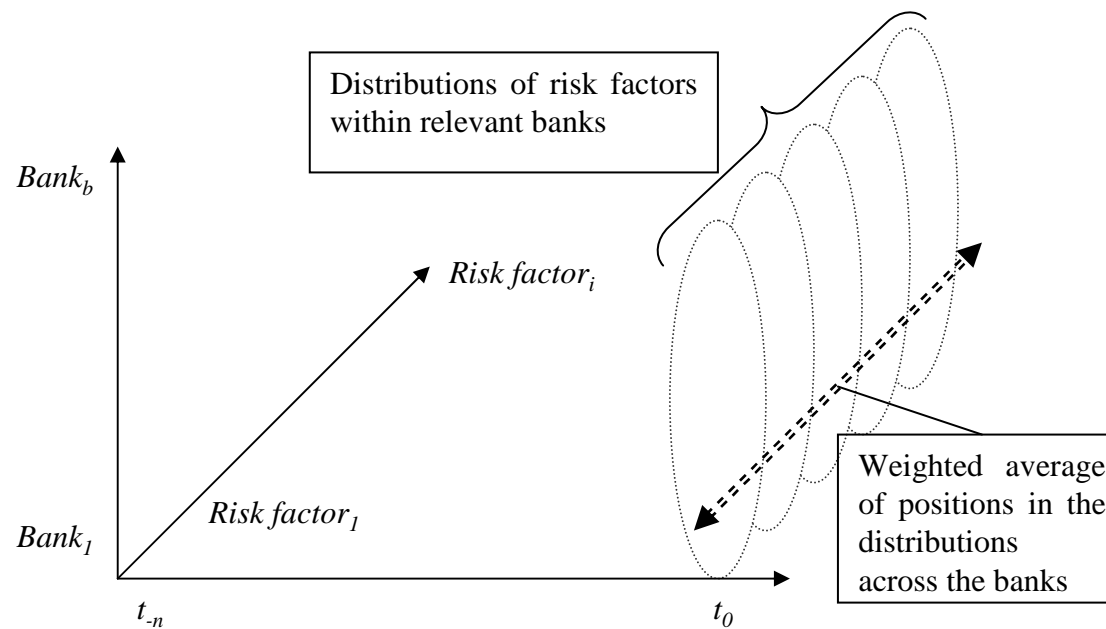
Methodology: Calculation of the scores

- The scores are assigned at risk factor level
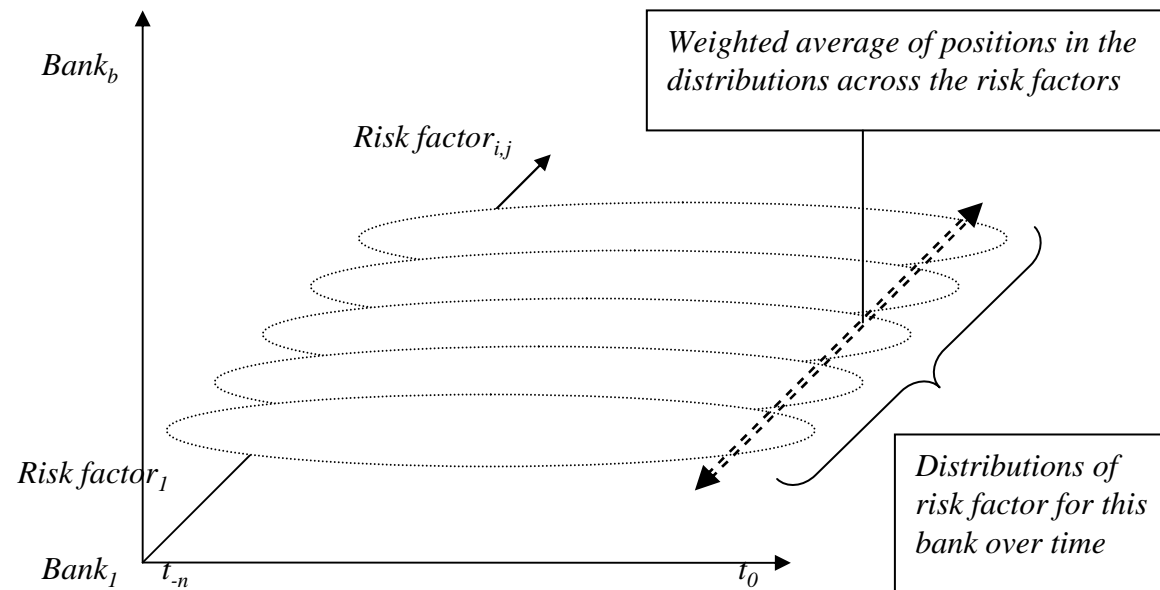- Final score is a weighted average of the risk factor level scores

- The score depends on the position of the risk indicator in the percentile of the distribution of the indicators of relevant banks

Distributions of risk factors within relevant banks

$Bank_b$

Risk factor$_i$

Risk factor$_1$

$Bank_1$

t_{-n}

t_0

Weighted average of positions in the distributions across the banks

$$\forall t, b \rightarrow PS^{b,t} = \sum_{i=1}^{K} \left[w_i^{b,t} * BRPS_i^{b,t} \right]$$

Methodology: The time score

- The score depends on the position of the risk indicator in the percentile of the distribution of the banks' indicators over time
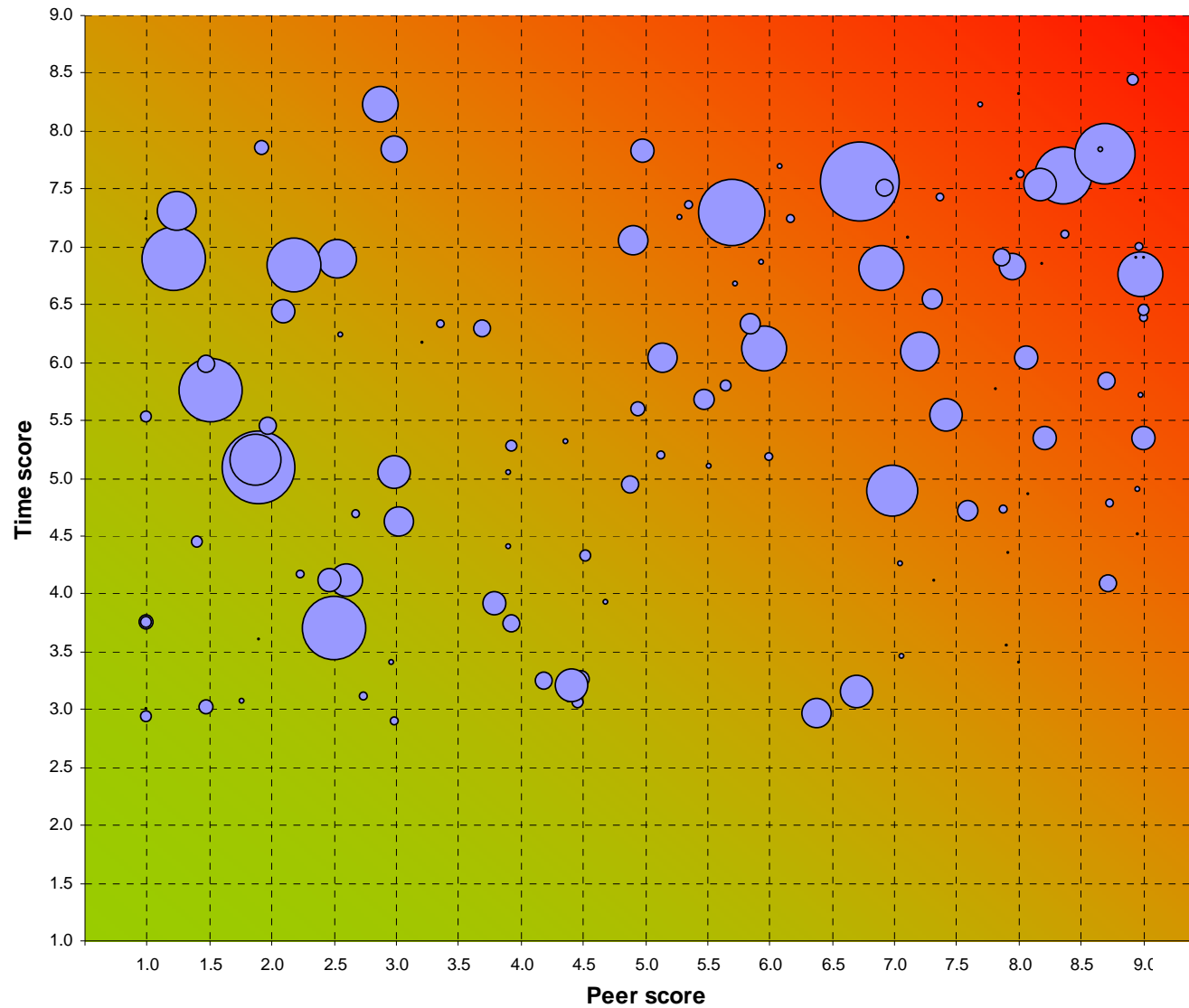

Weighted average of positions in the distributions across the risk factors

$Bank_b$

$Risk\ factor_{i,j}$

$Risk\ factor_1$

$Bank_1$

t_{-n}

t_0

Distributions of risk factor for this bank over time

$$\forall b,t \rightarrow BTS^{b,t} = \sum_{i=1}^{K}\left[w_i^{t,b} * BRTS_i^{t,b}\right]$$

$$\forall b,t \rightarrow MTS^{b,t} = \sum_{j=1}^{K}\left[w_j^{t,b} * MRTS_j^{t,b}\right]$$
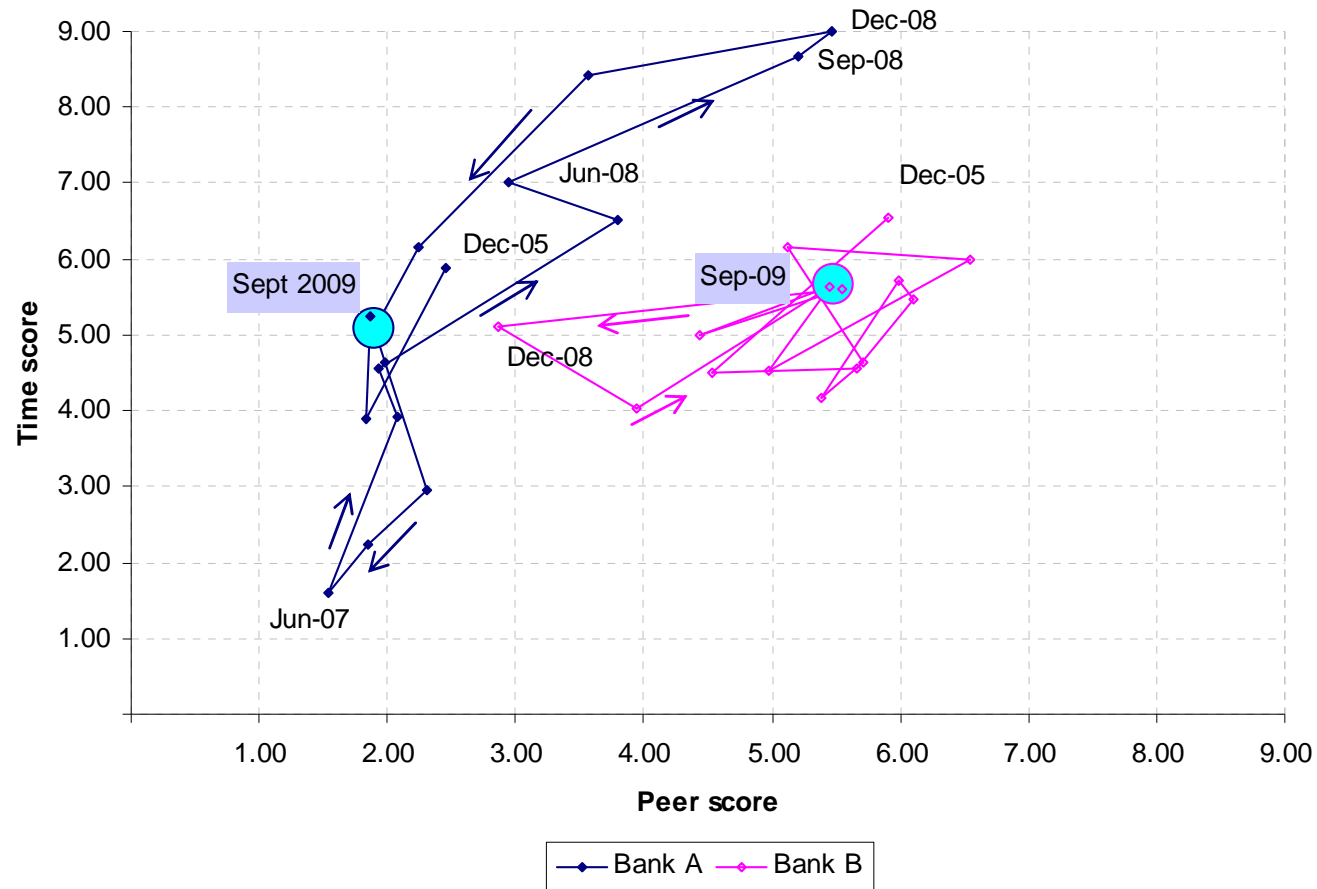
$$bs + ma = 1$$

$$\forall b,t \rightarrow TS^{b,t} = bs * BTS_i^{t,b} + ma * MTS_j^{t,b}$$
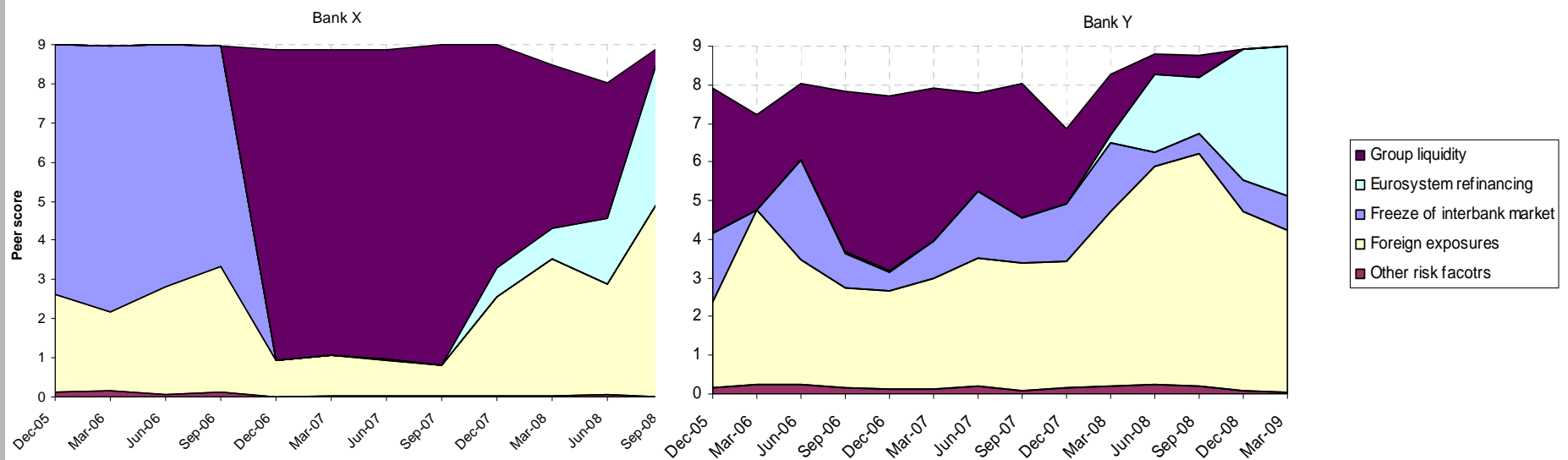
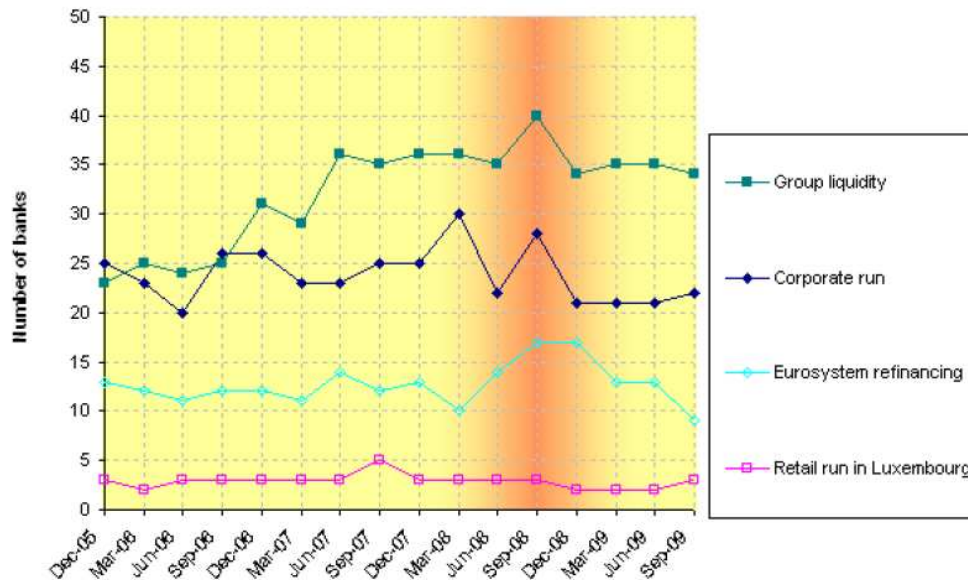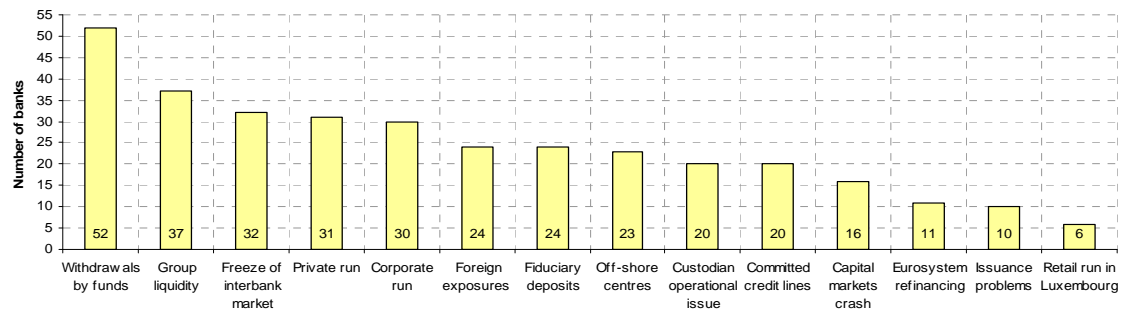# Results: Individual scores over time

Results: Decomposition of the scores

- Common patterns for troubled banks
- Liquidity dependence on parent banking group vs. Eurosystem
- The change of the composition occurred in Dec-07 and March-08

Bank X

Bank Y

Legend:
- Group liquidity
- Eurosystem refinancing
- Freeze of interbank market
- Foreign exposures
- Other risk facotrs

■ Relevance of the risk factors based on the constant contribution of 0.05

Benefits for the central bank

Analysis of individual banks

- Spot the outliers (peer score)

- Assess bank's individual position in relative terms (time score)

- Analyse the evolution of the scores over time

- Identify the most important risk factors for different banks

- Look for patterns in the composition of the scores

Analysis of the Luxembourg banking sector

- Identify the most relevant overall risk factors (stress scenario)

- Assess the relevance of each risk factor over time

15

Follow up work

- Calibration of the model:
    - Haircuts applied on securities for liquid assets calculation:
        - New reporting may increase accuracy of applied haircuts
    - Threshold of relevance for the peer score distribution
    - Stress parameters
    - Adapted to new business models of Luxembourg banks

- Time and peer score accuracy:
    - Determine the weights of the market components:
        - How is the peer score affected by systemic (i.e. monetary aggregates, central bank FX reserves, interest rates...) and idiosyncratic (i.e. CDS Spreads, stock prices) economic variables?
        - To which extent it is possible to forecast the evolution of the scores (time and peer) by investigating the macro economic determinants of liquidity in financial markets?
    - Evaluate the impact of the business model on liquidity
        - How does the weights associated with each bank influence the peer score : is it the business model or are the market conditions to determine the liquidity score of each bank?