Failure Risk: A Comparative Analysis of Islamic and Conventional Banks

Vasileios Pappas, Marwan Izzeldin
Lancaster University Management School

Ana-Maria Fuertes
Cass Business School, London

IFABS 2012 Conference, Valencia
Objectives

• The paper addresses the following questions:
  • Failure risk of IBs – is it comparable to that of conventional banks (CB)?
  • What is the IBs impact on the stability of financial system?

• Resilience of Islamic Banks (IB) in the late 2000s – high profitability & asset growth

• IBs are not allowed to trade in financial risk - debt instruments, derivatives and short-sales are precluded.

• IBs use equity-based and purchase-resale contracts.
  • Niche market - little standardization, high costs, focused on the low-risk large-size projects (real estate, infrastructure)

• Depositors are similar to preferred stockholders (Ebrahim, 1999)

• Given recent defaults, we compare and contrast the likelihood of default in the two banking systems using:
  • Survival analysis with random effects
  • Accounting Statement Data.
  • Macroeconomic Data.
Relevant Literature

  - Macroeconomic environment and stability of the financial system
  - Impact of concentration on financial stability

- **Cihak and Hesse (2008, IMF)**
  - Small(<$1m) IBs are less likely to face insolvency than small CBs.

- **Hasan and Dridi (2010, IMF)**
  - Credit and asset growth of IBs higher than CBs during the financial crisis.
  - IBs add to financial and economic stability.

- **Aziz and Yilmaz (2009)**
  - Close link between financial transactions and productive flows contributed to IBs’ viability and resilience.
  - Lower leverage in IB financial products.

- **Chapra and Saddy (2009, IBF)**
  - Excess liquidity ensured that IBs weathered the crisis.
  - Limited access to liquidity had an effect in the "second round" of the financial crisis when property markets were affected.
Methodology

• We adopt survival analysis to test the hypothesis that Islamic banks are less prone to default. Lane et al (1986); Dabos and Escudero (2004), Sales and Pianto (2005)

• Control for differences in bank-level (micro) characteristics and system-wide observed and latent (macro) factors.

• Survival analysis deals with: a) censoring; b) non-normality of data; c) time varying hazard probability.

• We employ the unconditional Kaplan-Meier (1958) estimator of the survivor function.

• We proceed with the shared frailty Cox PH (1972) model

• The Cox does not rely on restrictive assumptions for the baseline survivor function

• The shared frailty (random effects) correct for latent country factors that are correlated with bank failure.
Data and Model Assumptions

• Banks from 20 countries.
  o 421 banks (CB:315/IB:106) with 96 failures.

• Accounting and Macroeconomic data.

• Databases: Bankscope, IMF.

• Cox Proportional Hazards (1972) model:

\[ h_{jc}(t) = h_0(t) \exp(x_j \beta + \nu_c) \quad j = 1,\ldots, N \quad c = 1,\ldots, C \]

• Where:
  • \( h_0(t) \) baseline hazard function (i.e. the constant).
  • \((x_j \beta)\) explanatory variables and coefficient vector
  • \( \nu_c \) a latent random effect with unit mean and \( \theta \) variance. a positive estimate: banks in country \( c \) higher hazard rate ceteris paribus.
Model Assumptions

- 3 sets of accounting variables:
  - Balance Sheet
  - Income Statement
  - Financial Ratios

- Enter separately:
  a) BS: stock / IS: flow of income
  b) different impact for CB/IB
  c) Isolate the impacts of failure

- 2 models:
  a) Restricted (CB and IB pooled and use Islamic Bank dummy)
  b) Generalised (CB/IB separately)

---

**Accounting Variables**

<table>
<thead>
<tr>
<th>I. Balance Sheet</th>
<th>II. Income Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans</td>
<td>Net Interest Revenue</td>
</tr>
<tr>
<td>Assets</td>
<td>Other Operating Income</td>
</tr>
<tr>
<td>Other Earning Assets</td>
<td>Net Income</td>
</tr>
<tr>
<td>Reserves for Impaired Loans/NPL</td>
<td>General Admin. Expenses (Overheads)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Deposits and Short term funding</td>
<td></td>
</tr>
<tr>
<td>Equity</td>
<td>Net Income</td>
</tr>
<tr>
<td>Liabilities</td>
<td></td>
</tr>
<tr>
<td>Liabilities</td>
<td>General Admin. Expenses (Overheads)</td>
</tr>
<tr>
<td>Liquid Assets</td>
<td></td>
</tr>
</tbody>
</table>

**III. Financial Ratios**

- Capital Quality
- Equity/Assets
- Equity/Net Loans
- Equity/Deposits and Short term funding
- Liabilities/Equity
- Earnings
- Net Interest Margin
- Return on Average Assets (RoA)
- Return on Average Equity (RoE)
- Cost to Income
- Asset Quality
- Loan Loss Reserves/Loans
- Tier 1 Ratio
- Liquidity
- Net Loans/Assets
- Liquid Assets/Deposits and Short term funding

**Macroeconomic Variables**

- Business Cycle
- Growth of Real GDP
- Inflation
- FX Rate Depreciation
- Financial structure
- Banking Sector Concentration
- Islamic Banks Share
- Sovereign Rating

The source for the accounting variables is Bankscope whereas the macroeconomic data are obtained from the IMF/World Bank databases. NPL denotes Non-Performing Loans.
Descriptive Statistics

• Means for selected variables from Balance Sheet (A,B), Income Statement (C,D) and Financial Ratios (E,F).

• IB: Higher growth of assets (B).
• IB: Smaller industry than CB (A,C,D).
• IB: More liquid (E).
• IB: Better capitalized (F).
Non-Parametric analysis

Unconditional estimator
Observed failures in the sample
IB less hazardous

Table 4
Log-rank test for equality of survival functions

<table>
<thead>
<tr>
<th>Bank Type</th>
<th>Log-rank test</th>
<th>Events</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Observed</td>
<td>Expected</td>
</tr>
<tr>
<td>Conventional</td>
<td>89</td>
<td>82.11</td>
<td></td>
</tr>
<tr>
<td>Islamic</td>
<td>8</td>
<td>14.89</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>97.00</td>
<td></td>
</tr>
</tbody>
</table>

χ² value 3.87
p-value (0.049)

Note: Null hypothesis is the equality of the survivor functions.
Negative coefficient: ↑variable ⇒ ↓hazard. Results based on the Generalized Models

- **Islamic bank dummy**: Lower failure probability for IBs.
- **Assets**: Larger banks more fragile. No significant difference between CB/IB.
- **Net Interest Revenue**: Significant for CBs only (fee-based contracts preferred by IBs).
- **Liquidity**: ↑hazard IB ↓ significantly: IBs need to be more liquid than CB – limited access to secondary markets.
- **Capitalization**: ↑hazard CB ↓ but hazard IB ↑: lower leverage is beneficial for CBs. IBs already low-leveraged; non-utilized capital; less investment choices; costly investment contracts.

**Note I**: **Bold** coefficients are significant at conventional sign. levels. **Note II**: Numbers in graphs show the estimated coefficients.
Positive coefficient: ↑variable → ↓hazard.

- Macroeconomic variables add information relating to the economic environment.

- Real GDP: Significant for CB.
- Inflation: Significant for CB/IB. IB more affected. IB contracts & inflation adjustment.
- Concentration: Significant only for CB; M&A wave in Malaysia & Indonesia (-ve coefficient).
- No significant evidence that a rise in concentration would be beneficial for IB.
• Estimates of the country’s contribution to the bank’s risk over and above the observable macroeconomic variables.
1) Country rankings according to how favorable the banking environment is (in terms of bonus reduction in hazard functions).
2) In terms of banking environment.
• Jordan, Qatar and Kuwait have the best. Turkey, Brunei, Indonesia the worst.

Note: Hazard Estimates for the same bank operating in different countries. 1 is the reference level. Jordan is the safest, Turkey is the least safe.
Conclusions

- This paper confronts Islamic banks and conventional commercial banks from the viewpoint of failure risk.
- Analyze the main drivers of default risk using bank-level and macro indicators accounting for unobserved factors.
- Islamic banks are about 55% less hazardous than commercial banks.
- The different profile can be attributed to different business models.
- Higher capitalization decreases (increases) the hazard of failure in CB (IB) banks.
- Higher liquidity is associated with lower (higher) risk of failure in CB (IB).
- Macroeconomic variables are of more significance to IBs.
- There is a "country effect" which shows the "opportunity cost" in hazard terms of a bank operating in country A rather than country B.
Stratified Cox Model

- Including the Islamic dummy we assert that risks have the same shape and they are proportional to each other.
- What if the hazards have different shape?
  - Best models differ between bank types
  - Graphic analysis suggests the hazards might be shaped differently.
- We want a model which gives efficient estimates of the covariates by allowing the hazards to have their own shape.
  - Modelling separately the two bank types gives two estimates for every covariate and the best models are different.
- We want a single, efficient measure which can be used to explain banking fragility that takes into account:
  - CBs and IBs operate alongside
  - Hazards might be shaped differently
- A stratified Cox PH model can address these issues.
Shared Frailty Cox PH

- Shared frailty is used to model a latent variable (random effect) that affects multiplicatively the baseline hazard function.
- Subgroups $i$ are defined and estimates of within group correlation can be obtained.
  - $h_{i,j}(t) = h_0(t) \exp(\beta_0 + x_j \beta_x + \alpha W_i)$
  - $h_{i,j}(t) = h_0(t) \nu_i \exp(\beta_0 + x_j \beta_x)$, where $\nu_i = \exp(\alpha W_i)$

- $W_i$ is the frailty term for the subgroups
  - $W_i \sim iid G(0, 1)$ where $G$ any probability distribution
  - $\nu_i \sim iid G'(1, \theta)$ where $G'$ [gamma, inverseGaussian, log-normal]
- The better the model, the less significant the frailty (Zorn, 2000)
- Countries, Islamic dummy are used as frailty variables
- The estimated log-frailties ($\nu_i$) can be thought of as an "opportunity cost" in hazard terms.
Shared Frailty Cox PH

- ve values of $v_i$ indicates lower hazard for the country in question
- The most negative $v_i$ signifies the least frail banking background/The most positive the worst.
- $v_i = \log(a_i) \leftrightarrow -2 = \log(a_i) \leftrightarrow \exp^{-2} = a_i \leftrightarrow a_i = 0.13$
- $v_i < 0 \equiv a_i < 1 \leftrightarrow$ hazard ↓
- $v_i > 0 \quad a_i > 1 \leftrightarrow$ hazard ↑