Early Warning Models for Systemic Banking Crises: Can Political Indicators Improve Prediction?

Tran Huynh [1] Silke Uebelmesser [1,2]

[1]*Friedrich Schiller University Jena* [2]CESifo

Motivation

The repeated occurrence of systemic banking crises and their dire consequences increase the need:

- to understand the causes of such events, and
- to devise a mechanism that can help prevent them

⟶ **Early Warning Systems (EWSs)**

EWSs, however, often face a trade-off between missing crises and issuing false alarms.

⟶ **Efforts to improve prediction accuracy of EWSs**

Research Question and Empirical Strategy

Despite the plausible link between political environment and economic policy, political indicators have so far been neglected in EWSs for systemic banking crises.

→**RQ: Can incorporating political indicators in an EWS help improve its prediction?**

Empirical Strategy: Comparing the predictive performances of two logit EWSs – one ***with*** political indicators and one ***without*** political indicators.

Contributions

- The first attempt to evaluate political factors as early-warning indicators for systemic banking crises.
- Propose a relatively comprehensive set of macro-financial indicators.
- Propose a robust evaluating strategy that compares two logit EWSs with different numbers of indicators (e.g., we conduct several goodness-of-fit tests and likelihood statistics before performing both in-sample and out-of-sample performance comparisons).

Data

The dataset used in the paper covers 32 advanced economies, including 24 European countries and 8 non-European developed countries. The focus on advanced economies leads to a more homogeneous setting as there are considerable differences between advanced and emerging economies regarding their macroeconomic and political environments.

The dataset is yearly and covers the period 1975-2017. It can be divided into three parts:

- **systemic banking crisis events**
- **macro-financial indicators:** e.g., house price index, credit growth rate, inflation rate, GDP growth rate, US treasury rate, etc.
- **political indicators:** e.g., election time, time in office of chief executives, left/right/center governments, government majority.

Methodology

Early Warning Setup

- 3 years prior to a crisis are defined as pre-crisis episodes, taking binary value of 1.
- Crisis years and the 3 years after each crisis are excluded to avoid the so-called ***"post-crisis bias"***.
- Others: tranquil or "normal" time, taking binary value of 0.

Two comparative logit EWSs

EWS with political indicators

$$Prob(Y_{it}=1|Econ_{it},Pol_{it}) = F(Econ'_{it}\alpha + Pol'_{it}\beta) = \frac{e^{Econ'_{it}\alpha+Pol'_{it}\beta}}{1+e^{Econ'_{it}\alpha+Pol'_{it}\beta}} \quad (1)$$

EWS without political indicators

$$Prob(Y_{it}=1|Econ_{it}) = F(Econ'_{it}\gamma) = \frac{e^{Econ'_{it}\gamma}}{1+e^{Econ'_{it}\gamma}} \quad (2)$$

- $Prob(Y_{it}=1)$: pre-crisis probability of country (i) in year (t)
- $Econ$ and Pol: vectors of macro-financial and political indicators, respectively
- α,β,γ: corresponding vectors of coefficients
- $F(.)$: cumulative logistic distribution function

Measures of Predictive Performance

Table 1. A contingency matrix

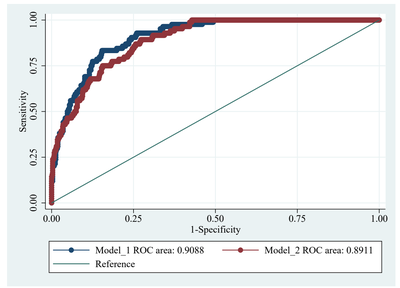
		Actual class	
		Pre-crisis period	**Tranquil period**
Predicted class	**Signal**	Correct call *True positive (TP)*	False alarm *False positive (FP)*
	No signal	Missed crisis *False negative (FN)*	Correct silence *True negative (TN)*

Main Results

1. Political indicators help improve EWSs' predictive performance.
2. The improvement, albeit small, is statistically significant and consistent through:
   - different predictive performance measures
   - several robustness tests
3. Negative correlation between the time in office of chief executives and the likelihood of crises.
4. Crisis probability tends to be lower when left-wing governments are in office.

Comparison on In-sample Predictive Performance

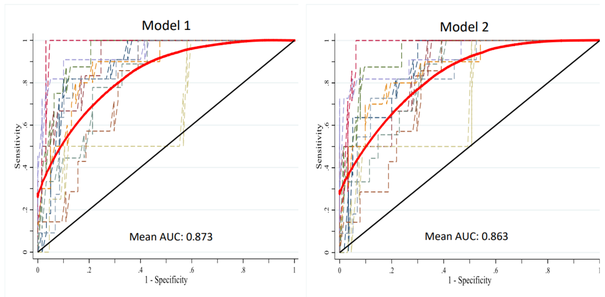
Figure 1. ROC Curves for in-sample estimation



Notes: Model 1 and Model 2 correspond to EWSs with and without political indicators, respectively. The reference line is the line of no-discrimination. ROC area or Area under the ROC Curve (AUC) is a measure of predictive performance, with values ranging from 0.5 to 1. While an AUC of 0.5 can be achieved by a random classifier (e.g., a coin toss), AUC equaling 1 means that the model is a perfect classifier. Accordingly, a good EWS should have AUC closer to 1 than to 0.5, and the higher the AUC, the better the model is.

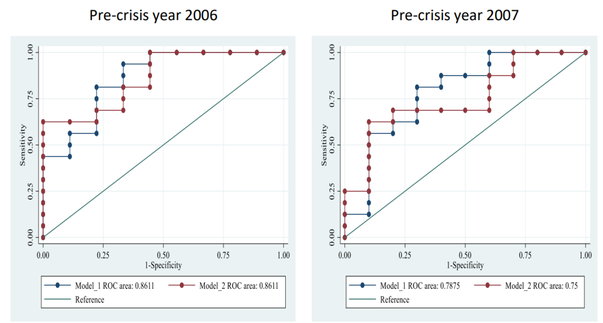
Comparison on Out-of-sample Predictive Performance

Figure 2. ROC curves for the 10-fold cross-validation exercise



Notes: Model 1 and Model 2 correspond to EWSs with and without political indicators, respectively. For each model, the solid red curve represents the mean ROC curve whereas dashed curves represent the 10-fold ROC curves. See also Figure 1 for notes on AUC.

Figure 3. ROC curves for the quasi real-time exercise



Notes: Model 1 and Model 2 correspond to EWSs with and without political indicators, respectively. The reference line is the line of no-discrimination. See also Figure 1 for notes on AUC.