Mapping the state of financial stability: discussion

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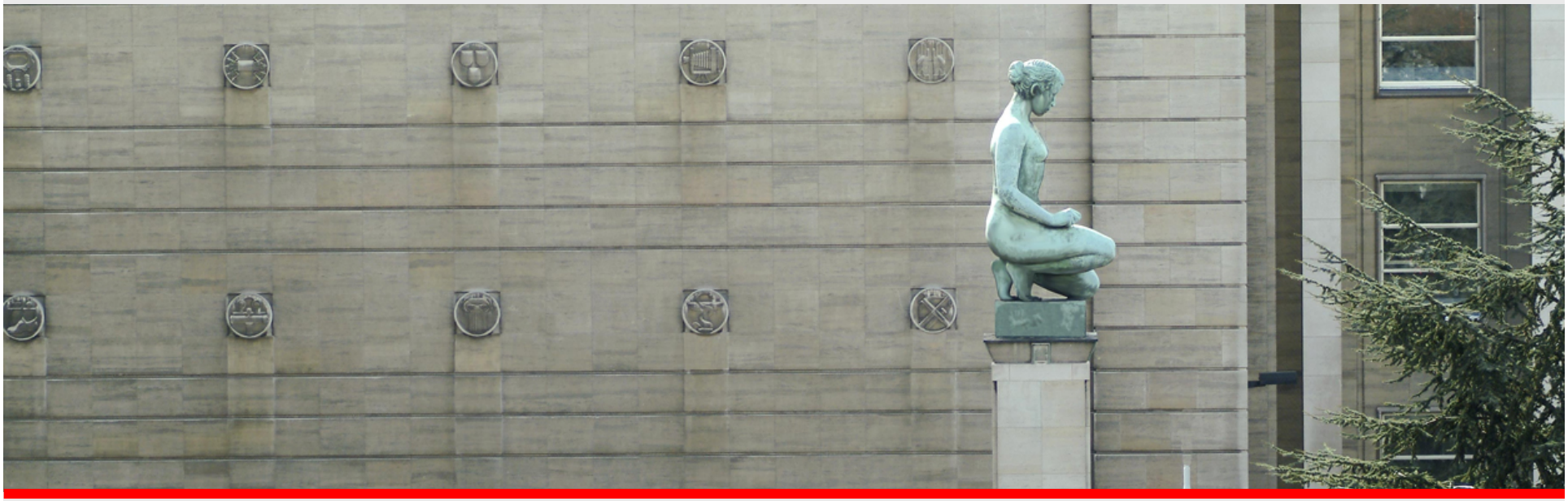

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Summary: components of SOFSM (1/2)

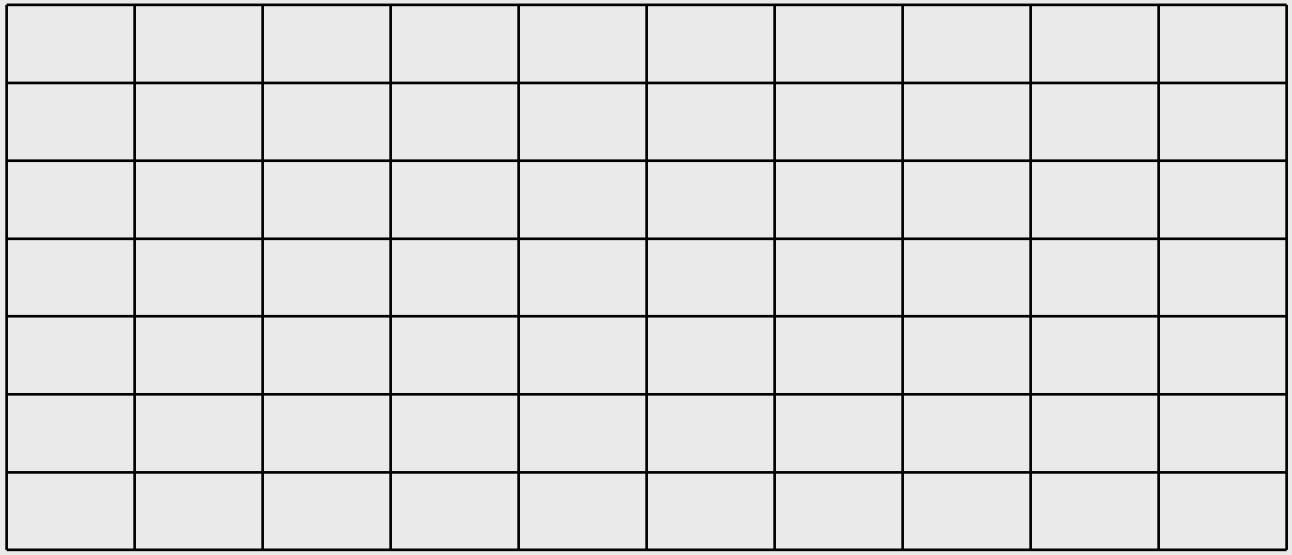
- Data

	country A			...	country Z		
	var 1	...	var N		var 1	...	var N
quarter 1							
...							
quarter T							

- **Data points** are *N-dimensional* vectors
- # data points = # quarters x # countries
- Variables include vulnerability indicators and class variables

Summary: components of SOFSM (2/2)

- Map: grid of M nodes



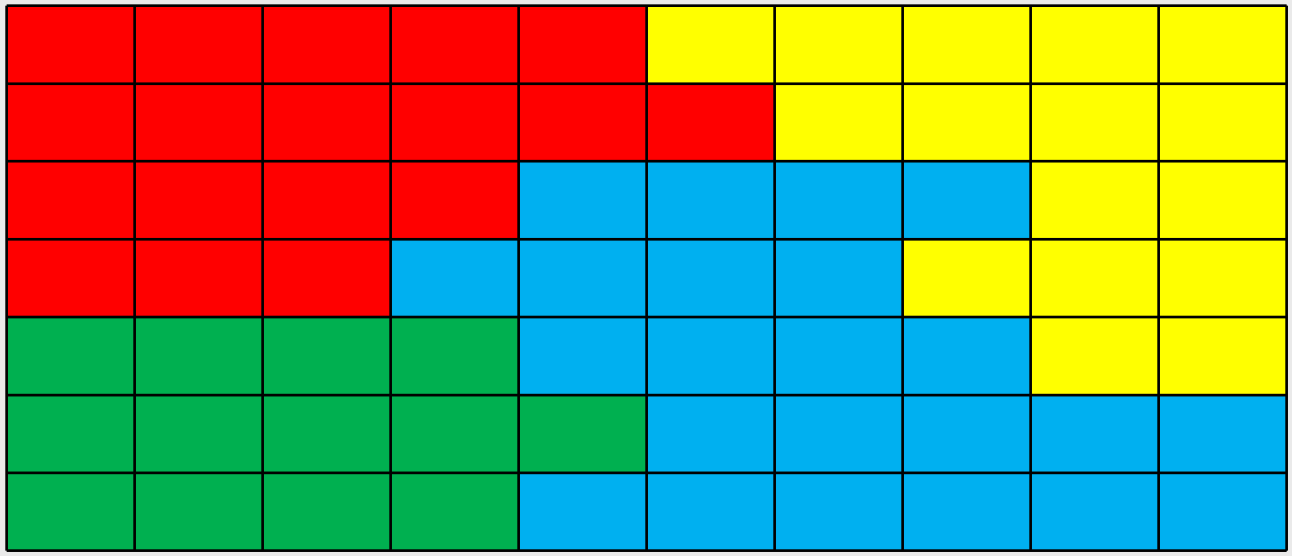
- Each node is characterised by *N-dimensional* **reference vector** and x,y position on the map
- Each of the N elements of a node's **reference vector** relates to one of the N variables in the data

Summary: training SOFSM (1/2)

- (1) Set *N-dimensional* starting values for the **reference vectors** of the different nodes in the map
- (2) Assign **data points** to node with "closest" **reference vector**
- (3) Update **reference vector** of node as "average" of **data points** assigned to the node and (with a lower weight) **data points** assigned to "neighboring" (in terms of x,y position on the map) nodes
- Repeating (2) and (3) a sufficient number of times results in a map where the different nodes' **reference vectors** are "closer" to the **reference vectors** of "neighboring" nodes than to the **reference vectors** of more "distant" nodes

Summary: training SOFSM (2/2)

- (4) Second-level clustering of nodes on the basis of elements of the nodes' **reference vectors** that refer to the class variables ("class clusters")



- Only for visual interpretation of the map, not affecting link between **data points** and **reference vectors**

Summary: applying SOFSM

- Financial stability cycle monitoring:
  - Match **data point** to node on the map with "closest" **reference vector** and see which "class cluster" it is assigned to
- Early warning/crisis prediction tool:
  - Identification of early warning indicators from feature planes (=distribution of values of individual elements of the **reference vectors** over the nodes of the map)
  - Early warning if **data point** is matched to node in the pre-crisis cluster
  - Crisis prediction when crisis variable-related element of the **reference vector** of the node to which **data point** is matched exceeds threshold

Comments: robustness (1/2)

- Visually attractive tool with useful applications
- However, for policymakers, SOM also needs to be
  - SEM
  - Robust
- While non-parametric, assumptions on e.g., shape of the neighborhood function (> comparison to k-means clustering?), learning rate, map selection criteria
- Map selection process:
  - Usefulness relative to logit model's usefulness?
  - Judgement on interpretability of the map
- How often to update/retrain the map? Robustness to new information?

Comments: robustness (2/2)

- Using class variables as associated attributes (Sarlin and Marghescu, 2011) vs using class information for training map?
  - Mapping similar macro-financial conditions vs early warning/crisis prediction?
  - Robustness of map?
  - Similar out-of-sample performance?

Comments: interpretation (1/2)

- Data transformation to country-specific percentile
  - x-th percentile of a country that never experienced crisis ≠ x-th percentile of a country that experienced crisis
  - x-th percentile of a country before crisis ≠ x-th percentile of that country after crisis

  (> absolute numbers?)
- Misleading interpretation of neighboring nodes in terms of financial instability contagion or propagation
  - Financial or trade linkages capture potential contagion through direct channels ≠ similar macro-financial conditions
  - Are neighboring nodes indeed "close"? (> "similarity map")

Comments: interpretation (2/2)

- Early warning indicators/sources of vulnerability:
  - Variable ranges in different financial stability states in Table 2? Significance?

    (> generate confidence intervals for centres using e.g., bootstrap)
  - *"SOFSM (…) allows disentangling the individual sources of vulnerability"* vs *"composite indices of leading indicators and predicted probabilities of EWS (…) fall short in disentangling the sources of vulnerability"*

    However, for SOFSM one also needs to look at underlying variables in the data point to see why the data point is assigned to a particular node + coefficient signs in logit

Conclusion

- SOFSM seems promising tool
- However, requires
  - Better explanation
  - More robustness checks
- Do not “oversell” compared to alternative tools