A climate stress test of the financial system
by Battiston et al. (2016)

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Comments by Olivier de Bandt

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- summary of the paper
- questions for clarification and to further improve an already very interesting paper

Main points of the paper

Methodology

- A finer assessment of **climate sensitive** sectors by decomposing NACE rev 2 sectors at 4 digit level, as broader sectors mix very different sectors
- State-of-the-art Network analysis (Battiston et al, 2016 Debtrank approach) implemented in climate risk context to measure **second round effects**

Data

- BvD Orbis database on **equity holdings in EU and US listed companies**, to construct exposures by shareholders in the financial sector (Asset managers, banks, insurance) as well as others (govt, individuals)
- Sector level data based on BvD Bankscope database on **banks, interbank exposures** (network) «not publicly available are estimated using standard methods »

Main points of the paper

- **Findings** (1/2)
- A) **first round effect**
- Main results on equity holdings, for which detailed data are available
  - Investment funds are the most exposed through equity holdings
  - Similarity across types but heterogeneity within groups
- Bank loans : Exposure of euro area banks:
  - Fossil + utilities = 30% of banks' capital→ not likely to default
  - including loans to households = 208% of banks' capital
- B) **2nd round effect**
- Indirect transmission of shocks from investment fund to pension fund
- Volatility from climate risk

Main points of the paper

- **Findings** (2/2)

- Uses LIMITS data on impact of mitigation policies on market shares to derive VaR
- Brown (fossil fuel and fossil based utilities, <0 impact) vs renewable utilities scenario (>0 impact)- Fig 6

- **Main Take home message**

- Banks would be threatened neither by their equity holdings, nor loan exposures on fossil fuel and utilities, but by volatility and second round effect
- instability in the investment/pensions
- heterogeneity : important to look at individual exposures

Discussion

1- Identification of climate sensitive sectors : big issue in any climate risk analysis

- Transition risk only (physical risk excluded)
- **Little discrimination across sectors** : outcome from figure 1 indicates that all sectors are potentially sensitive, roughly 2/3? Pretty large?
- Authors proceeded with reallocation (figure 1 and table) on the basis of broadly defined mitigation policies, but **other alternative policies are possible**. Impact of carbone leakage?
- **Other Criteria would provide more concentration of sectors** : GHG emissions, in France, 86% produced by 20 sectors in NACE rev 2, level 3, 14% of value added of industrial sectors; ability of sectors to diversify energy sources
- **Companies** (industrial sectors; energy producers and energy intensive) and **households** (heating and transportation)- not clear what « housing » means? Is it construction? Or commercial properties? In addition Government sector matters.
- **Different scenarios possible**, given the likely mitigation policies involved (much uncertainty about it) → change in the climate sensitive sectors

Discussion

2- First round effect (1/2)

- Main questions:
  - **Loan exposures** for euro area banks, what is the uncertainty around this figure of 192 + 208% of capital ? Is there diversity across EU banks? Does it matter?
  - « Volatility » : what is the mechanism behind? Is it only heterogeneity? Is green scenario always positive ? What about a « green bubble »?
  - No account of **intersectoral propagation** of shocks, given ability to pass through the policy shock to customers (see CISL, 2016), partly based on expert judgment→ is it leakage?
  - No account of the macroeconomic impact associated with any transition risk scenario

Discussion

2- First round effect : what's the benchmark : 192+ 208% of capital?
(= 2/3 ou 6-700%)

It looks like 50% to two-third of exposures are affected

Domestic Banks (in euro billions)						
2015-12	Loans & Advances to NFCs	Loans & Advances to HHs	Loans & Advances to NFCs + HHs	Own Funds	Loans & Advances to NFCs / Own Funds	Loans & Advances to NFCs + HHs / Own Funds
France	1 145	1 521	2 666	375	305%	711%
Euro Area	4 436	5 130	9 566	1 600	277%	598%
EU	6 146	7 803	13 949	2 274	270%	613%
Source : ECB, Consolidated Banking Data, ACPR calculations						

Discussion

2- First round effect (3/3)

- Explain better the **use of the LIMITS** data in order to compute VAR – interesting way to compute shocks to equity from market shares, but useful to use further information on bank-firm relationships from credit register data
- More detailed questions:
  - Equity holdings by banks (figure 4 and 5): not the same EU banks, although it looks rather proportional to the size of the bank : Credit Agricole is 2nd in figure 5 (fossil and utilities) but not in figure 4 and no first round effect; Natixis in figure 5 and BPCE in figure 4
  - Figure 1 and 2 in Supplementary Information: explain better the Y-axis (sum = 100%?)

Discussion

3- Second round effect (1/3)

- **Debtrank** is state-of-the-art approach to second round effect (as opposed to Eisenberg and Noe) as includes market valuation in stress- although not very apparent
- Question is **whether the transmission channel should be specific to climate risk**
  - Probably Not in a higher volatility scenario,
  - But Yes for a progressive implementation of the climate mitigation policies, or for physical risk – only addressed in the conclusion
- Same question for Static (implicit assumption, even if market valuation of exposures?) vs Dynamic balance sheet: can we assume the stability of the network in the likely scenario of a progressive implementation of the climate mitigation policies?

Discussion

3- Second round effect (2/3)

- sensitive to the estimation method of the network? As well as to the size of the network (as banks have cross border exposures and mitigation policies are likely to diverge across areas, even in the COP context)

→ need to rely on actual data at a high frequency (datagaps)

- More technical issues : calibration of the valuation function (which links the shock to the value of assets), is it instrument or climate risk specific? Additional channels (fire sales)?

Discussion

3- Second round effect (3/3)

- Do results from K-S tests have an implication for second round effect?

one would expect that the more similar the exposures, the stronger the impact

Is it verified?

Conclusion

1. Very useful framework

2. Allows to test different scenarios, and even more!

3. Further research might be useful to assess in more details loan exposures for banks as opposed to equity holdings

4. Need to investigate further the first round impact itself, which requires expert judgment on the channels of transmission at the sector level