Comparing dissimilarity measures: A case of banking ratios

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After the Global financial crisis in 2007-2008 financial sector and especially banks gained much attention. A large number of the macro-level instruments were introduced and those are applied to all banks. However, banking sector is heterogeneous and some tools could be ineffective to some banks. It would be useful to find groups of banks which have similar characteristics and design or calibrate some macro-prudential instruments that would become appropriate for that group. Therefore, our first goal is to discuss a clustering of the banks. Our second goal is to consider various dissimilarity measures and apply them to a data under investigation. We exploited distance measures based on time series as well as on functional data properties. In addition to univariate clustering, where banks are grouped into clusters according to one bank-specific ratio, we applied multivariate clustering, where banks are clustered based on their several ratios.

In our study we used six ratios that reflect banks' profitability (return on average assets, return on average equity, net interest margin), efficiency (cost to income), stability (capital adequacy ratio) and portfolio credit risk (loan losses over loan portfolio). We applied twelve different dissimilarity measures. Ten of these measures are commonly used. We proposed two new distance measures, based on functional data properties, that, to our knowledge, were not used in the clustering literature. Furthermore, we extended two univariate distance measures to multivariate case. The results of the univariate clustering show that there is no dissimilarity measure, which would be the best to all ratios. However, in many cases clustering methods based on functional data properties outperfomed distance measures based on time series properties. The results of the multivariate clustering revealed that it is important to take into account not only how close banks' ratios are, but how similarly they change over the years.