Sector concentration risk: a model for estimating capital requirements

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The 2004 Basel Committee on Banking Supervision Accord (known as Basel II) provides a common framework for banks when determining their minimum capital requirements for solvency purposes. For credit risk (the most important one for banks activity) Basel II uses an asymptotic single risk factor (ASRF) model and, as we demonstrate in the paper, assumes two fundamental hypotheses: Firstly, there is only one risk factor, common for all banks; and secondly, the number of creditors in bank portfolios is highly enough to ensure no significant influence of an isolated creditor's behaviour on the portfolio value. This allows that capital requirements can be estimated by using a model based on the percentage of defaulted creditors ($x$).

The model only requires values for two variables: the probability of default and the loss given default. Using a 99% likelihood and assuming that all sectors are equally correlated, the model estimates $x$ through the cumulative distribution function for the Gaussian distribution.

But many bank portfolios violate those hypotheses and therefore the ASRF model underestimates the actual capital requirements. Thus, a surcharge for concentration risk is required.

There are two kinds of concentration risk (sector and name concentration risk), each one corresponding to the violation of one of the abovementioned hypotheses. Nowadays supervisory authorities are developing models to incorporate that surcharge into the banking solvency rules. In Spain, the Spanish Central Bank bases its surcharge proposal for sectoral concentration on the Herfindahl Hirschman Index (HHI). In this paper we demonstrate that HHI treats all sectors as equally risky ones. That’s why we propose an alternative index (CI) where sectors have been weighted by risk. Moreover our index also introduces the relationship among each pair of sectors (in the HHI framework no sectoral relationship was considered). Our proposal is based on an adjusted variance covariance matrix, where negative covariances have been equalled to 0. We show how HHI is a particular case of our proposed index, with simplifying hypotheses.

As we demonstrate the proposed index has two fundamental properties: it is lower and upper bounded; and it decreases as concentration and/or risk decreases. These properties allow the index can be incorporated in bank risk management models. By this way, bank estimations can improve those based on the supervisory model and, according to banking rules, can also be used for determining the capital surcharge for sectoral concentration.