

Multi-Period Efficiency Measurement and Performance Changes of Taiwanese Commercial Banks

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In measuring the overall efficiency of a set of decision making units (DMUs) in a time span covering multiple periods, the conventional approach is to use the aggregate data of the multiple periods via a data envelopment analysis (DEA) technique, ignoring the specific situation of each period. This paper proposes using a relational network model to take the operations of individual periods into account in measuring efficiencies. The overall and period efficiencies of a DMU can be calculated at the same time. Notably, the overall efficiency is a weighted average of the period efficiencies, and the weights are the most favorable ones for the DMU being evaluated. This model, together with two existing ones, the aggregate and the connected network, is applied to measure the efficiency of twenty-two Taiwanese commercial banks for the period of 2009 to 2011. The three-year multi-period analysis shows that the proposed model is more discriminative than the existing ones in ranking the performance of the banks. The period efficiencies for the three years increased steadily, indicating that the performances of the Taiwanese banks examined in this work were improving over this period. Moreover, the period efficiencies calculated from the relational network model have a similar theoretical basis to those calculated from the global efficiency frontier. The ratio between two efficiencies of different periods thus is a kind of global Malmquist productivity index (MPI), which indicates the performance change of a DMU during the two periods. This paper found that East Sun Bank, the one being evaluated as the best based on the overall efficiency, has MPIs less than one in two consecutive periods. This is a warning to this bank that its performance is declining, although it is doing well compared with other banks. If this situation continues, it may encounter operation difficulties in the future. The multi-period efficiency measurement thus help decision makes detect unforeseen problems.

Keywords: Data Envelopment Analysis; Efficiency; Malmquist Productivity Index; Banking; Parallel System.