# Predicting bank performance with financial forecasts: A case of Taiwan commercial banks

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## Abstract

Data envelopment analysis (DEA) has been used as a tool for evaluating past accomplishments in the banking industry. However, due to a time lag, the results usually arrive too late for the evaluated banking institutions to react timely. This paper makes advanced predictions of the performances of 24 commercial banks in Taiwan based on their financial forecasts. The forecasts based on uncertain financial data are represented in ranges, instead of as single values. A DEA model for interval data is formulated to predict the efficiency. The predictions of the efficiency scores are also presented as ranges. We found that all the efficiency scores calculated from the data contained in the financial statements published afterwards fall within the corresponding predicted ranges of the efficiency scores which we had calculated from the financial forecasts. The results also show that even the bad performances of the two banks taken over by the Financial Restructuring Fund of Taiwan could actually be predicted in advance using this study.
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## 1. Introduction

Over the past 30 years Taiwan has achieved high economic development while maintaining mild inflation and low unemployment. At the same time, the structure of its financial system has changed from a controlled system into a liberalized one. The financial system has played a key role in the process of Taiwan's economic development (Yu, 1999). The widespread relaxation of the financial system has resulted in a more efficient financial market and enhanced financial technology. On the down side, however, the keener competition in financial markets has had a huge impact on various kinds of operating risk encountered by financial institutions. Since the Southeast Asian financial crisis of July 1997, most of the countries in that region have suffered from its impact. One of the main factors in that financial crisis was excessive risk-taking, especially after the finance liberalization in Southeast Asia. The major cause leading to excessive risk-taking is the inadequate regulatory system (Mishkin, 1999). An efficient financial system must have a sound regulatory system, not only to help financial institutions achieve expected development but also to prevent them from relying on risk-taking.

The most effective way to enforce financial rules and regulations in the financial supervisory system is to conduct financial examinations. In Taiwan, the principal government agencies responsible for the supervision of financial institutions are the Central Bank of China, the Ministry of Finance, and the Central Deposit Insurance Corporation. These three bank regulators use the CAMELS rating system, which consists of six categories, including Capital adequacy, Asset quality, Management, Earnings, Liquidity, and Sensitivity to market risk, to evaluate the banks in Taiwan. This system relies on various financial ratios obtained from periodic reports of the entities under their jurisdiction. The ratios are also aggregated into performance indices based on various weighting or scoring schemes. The aggregation of the ratios can be a complicated process involving subjective judgment. The changing economic conditions have made such aggregations even more difficult, increasing the need for a more reliable way to express a bank's financial condition.

Data envelopment analysis (DEA) for efficiency measurement has seen extensive applications in the study of commercial banks (Bauer et al., 1998; Berger and DeYoung, 1997; Berger and Humphrey, 1997; Bhattacharyya et al., 1997; Elyasiani and Mehdian, 1990; Miller and Noulas, 1996; Rezvanian and Mehdian, 2002; Sherman and Ladino, 1995; Yeh, 1996; Yue, 1992). Several authors have also proposed that DEA efficiency measures be used as the evaluative information for the management component of CAMELS (Barr et al., 1993, 1994; Brockett et al., 1997; Siems, 1992; Siems and Barr, 1998). In most studies the DEA approach has been used as a tool for evaluating accomplishments in the past. The results highlight the status of the operational performance and are helpful for planning future activities for improving the performance. However, this ex post facto evaluation might be a little late for an unsuccessful unit to find its weaknesses and make the appropriate amendments. In this paper we predict the performance of the commercial banks in Taiwan based on the forecasted financial data via DEA. The results are regarded as forward-looking information, which can be used for planning management activities in ad-