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Cost efficiency analysis of Swedish financial enterprises: An empirical investigation

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ABSTRACT

In this paper, our research question that could analyze how efficiency in Swedish financial enterprises has changed since the banking crisis in 1993. We estimate the time-invariant and time-variant efficiencies of Swedish financial enterprises with four different estimators. These estimators are the Pooled Model (Aigner et al., 1977), the fixed effects model (Schmidt & Sickles, 1984), the random effects model (Battese & Coelli, 1995) and the TRUE fixed effects model (Greene, 2005) efficiency estimators. We predict cost function by employing panel stochastic frontier approach. These allow us to construct cost efficiency.

1. Introduction

Before 1980, financial markets were highly regulated in Sweden. Much credit flowed outside the regulated market and challenged the traditional role of banks. In response, banks tried to bypass interest rate regulations by establishing their own finance companies, which formed an important part of the gray credit market (Berg et al., 1993). The term 'gray economy', however, refers to workers being reimbursed under-the-table, without paying income taxes or contributing to such public services as Social Security and Medicare. It is sometimes referred to as the underground economy or "hidden economy" in Sweden (Biljer, 1991).

As the regulations were increasingly considered to be largely ineffective, the authorities initiated a financial liberalization process in the late 1970s that proceeded through the 1980s. Credit and bond markets were deregulated first; regulations on international transactions were removed next. The system of liquidity ratios for banks was abandoned in 1983 and the ceilings on commercial bank lending were removed in 1985. At the same time, restrictions on lending rates were lifted. By 1989, all remaining foreign exchange restrictions had been removed (Dress & Pazarbasioglu, 1998).

The *immediate impact* on consumption and investment appears to have been limited. Expressed differently, the rationing effects of the abolished regulations do not seem to have been quantitatively important to the real decisions of households and corporations. On the other hand, financial flows were undoubtedly affected in an important way (Ahmet et al., 2011). Credits were increasingly channelled by financial institutions, such as banks and mortgage institutions, rather than directly between firms (for example trade credits) and households (for example seller financed housing loans). Loans were also increasingly used for high-leverage financial investments. These effects on financial flows may, if their impact on asset prices is any indication, have affected the banking crisis (Fig. 1) (Englund, 1999).

We estimate the time-invariant and time-variant efficiencies of Swedish financial enterprises. These estimators are the Pooled Model (Aigner, Lovell, & Schmidt, 1977), the fixed effects model (Schmidt & Sickles, 1984), the random effects model (Battese & Coelli, 1995) and the TRUE fixed effects model (Greene, 2005). We predict cost function by employing the panel stochastic frontier approach. This allows us to build cost efficiency.

In this research, the cost measure was estimated for the panel data utilising six different financial enterprises from 1996 to 2011. These financial enterprises comprise banks (including commercial banks, branches of foreign banks in Sweden and saving banks), credit market companies, housing credit institutions, other mortgage institutions, other credit market companies and securities

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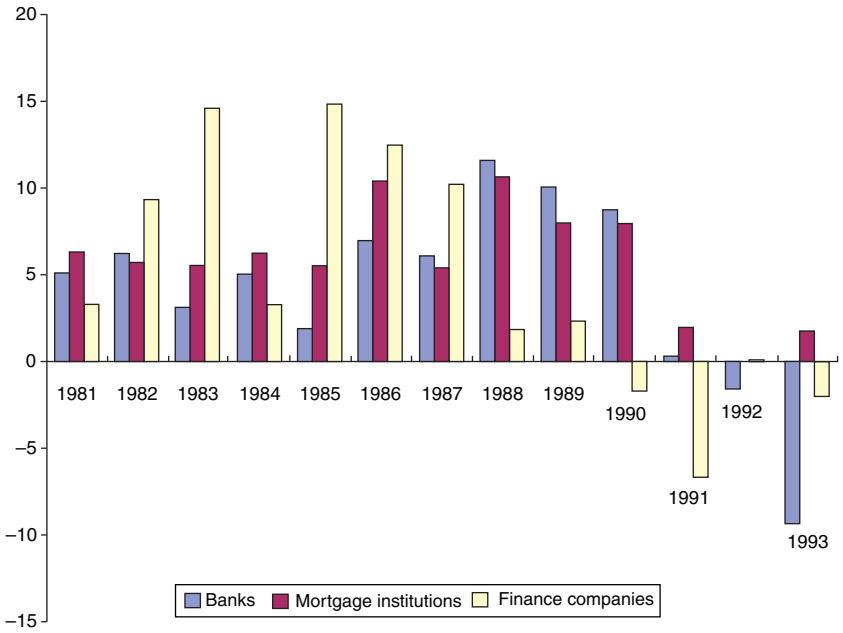

Fig. 1. Lending from banks, mortgage institutions and financial companies (percentage changes).

brokerage companies. In the next section, we conduct a literature review of the stochastic frontier approach and related banking. Section 3 describes the stochastic frontier methodology. Section 4 provides data and empirical results of the Swedish banking case. Finally, Section 5 makes conclusions.

2. Literature review

The stochastic frontier approach (SFA) pertains to the theoretical literature on productive efficiency that began in the 1950s with the work of Koopmans (1951), Debreu (1951) and Shephard (1953). Koopmans provides a definition of technical efficiency: a producer is technically efficient if and only if it is impossible to produce more of any output without producing less of some other output or without using more of some input. Debreu and Shephard introduce distance functions as a way of modelling multiple-output technology and – more importantly, from our perspective – as a way of measuring the radial distance of a producer from a frontier in either an output-expanding direction (Debreu) or an input-conserving direction (Shephard). The association of distance functions with technical efficiency measures is pivotal in developing the efficiency measurement literature.

Farrell (1957) was the first to measure productive efficiency empirically (drawing inspiration from Koopmans and Debreu but clearly not from Shephard). He also provides an empirical application for U.S. agriculture, although he did not use econometric methods.

Aigner et al. (1977) (ALS hereafter) propose a model in which errors were allowed to be both positive and negative but in which positive and negative errors could be assigned different weights. Ordinary least squares emerge as a special case of equal weights, and a deterministic frontier model emerges as another special case. They consider estimation for the case in which the weights are known and for the more difficult case in which the weights are unknown and are to be estimated with the other parameters in the model. They do not estimate the model and, to our knowledge, no one else has done so either. Nonetheless, there is a short step from the Aigner, Amemiya and Poirier model (with larger weights attached to negative errors) to a comprised error stochastic production frontier model. The step took a year. SFA originated with two papers published nearly simultaneously by two teams on two continents. The ALS paper is in fact a merged version of a pair of remarkably similar papers: one by Aigner and the other by Lovell and Schmidt. The ALS and Meeusen and van den Broeck (MB hereafter) papers are themselves very similar. Both papers were three years in the making and both appeared shortly before a third SFA paper by Battese and Corra (1977), the senior author of which had been a referee of the ALS paper. These three original SFA models share the comprised error structure mentioned previously, and each was developed in a production frontier context.

Schmidt and Sickles (1984) apply fixed effects and random effects models to estimate the efficiencies of the firms. In their study, the efficiencies of the firms are assumed to be time-invariant, which might not be a proper assumption for long panel data. Accordingly, they consider estimating a stochastic frontier production model, given panel data. They provide various estimators that depend on whether one is willing to assume that technical inefficiency (the individual effect, in panel-data jargon) is uncorrelated with the regressions and whether one is willing to make specific distributional assumptions for the errors. They show how to test these assumptions.

Battese and Coelli (1995) propose a model for technical inefficiency effects in a stochastic frontier production function for panel data. Provided the inefficiency effects are stochastic, the model allows for the estimation of both technical change in the stochastic frontier and time-varying technical inefficiencies.

Greene (2005) proposes extensions that circumvent two shortcomings of fixed and random effects estimator approaches. The conventional panel data estimators assume that technical or cost inefficiency is time invariant. Second, the fixed and random effects estimators force any time invariant cross unit heterogeneity into the same term that is being used to capture the inefficiency. Inefficiency measures in these models may pick up heterogeneity in addition to or even instead of inefficiency.

Berger and Mester (1997) survey 130 studies that apply frontier efficiency analysis to financial institutions in 21 countries. They do this to summarise and critically review empirical estimates of financial institution efficiency and to try to arrive at a consensus view. They find the various efficiency methods do not necessarily yield consistent results and suggest some ways that these methods