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Integrating bank profit and risk-avoidance decisions for selected European countries: A micro–macro analysis

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ABSTRACT

A two-equation integrated model is developed to capture bank profit and risk-avoidance decisions. Output is limited to customer loans. The profit function is based on output and selected inputs. Risk-avoidance (using the capitalization ratio) depends on micro and micro∗macro interactive variables. The SUR method is used to test the hypothesis that the two functions are interdependent. Also, a single reduced-form equation is derived from the SUR model to analyze the volatility of the capitalization ratio. Five European countries and their banks for the period 1991–2001 are used to run the regressions and to test the hypothesis. The individual statistical results were generally consistent with similar results found in the literature. The Breusch–Pagan test of independence was rejected. A key finding from the volatility analysis suggests that bank profit rates are inversely related to the volatility of the banks' capitalization ratios as measured by their variances.

1. Introduction

It is common knowledge today (2011) that the financial condition of the commercial banks in Europe, particularly in regard to their capital accounts, is strained, so they are deleveraging rapidly (Wall Street Journal, November 11, 2011). Given this present-day financial situation, the immediate question is, How did this come about? The best way to answer this question is to take a step back and examine the financial behavior of the banks during a period of relative economic calm. The time period 1991–2001 was selected for this examination. The examination lays the economic foundation for later research to answer the question.

To set the stage for the examination, bank financial and economic behavior is conceived of consisting of two types of related behavior, profit and risk avoidance (or risk management or risk protection). The profit behavior relates to the bank's output (customer loans) and the risk avoidance behavior relates to the composition of the bank's assets, in particular its capital account, to protect against the consequences of risk taking. The two behaviors are represented by two functions which form an integrated model. The assumption (hypothesis) is that the two functions are interdependent.

The primary purpose of the paper then is to estimate the model and test the integrated behavior hypothesis, using Zellner's (1962) Seemingly Unrelated Regression (SUR) method. The two functions form the two equations of the SUR model. The motivation for the SUR model is the theory of bank behavior. The micro theory of bank behavior is simplified to consist of a profit-guided output production activity where the output is limited to the production of customer loans and a risk avoidance activity where risk avoidance is indexed by its capital/asset ratio. In other words, the bank produces customer loans on the one hand (related to the profit statement) and selects an appropriate capital ratio on the other hand (related to the composition of its balance sheet) to provide for customer loan losses.

To test the interdependence hypothesis, a select number of European countries and their commercial deposit banks over the period of time 1991–2001 are used. The five countries are members of the European Union (EU). The time period was limited to what data were available to the author and what would serve as a foundation for future analysis. Obviously, other researchers may be able to use a longer time period. However, present-day banking behavior is too uncertain to fulfill the purpose of this paper. Also, both micro and macroeconomic factors are considered.

The intent of this integrated two-equation examination is to achieve a better understanding of how flows and stocks are related and ultimately affect the capital structure of banks.

The integrated approach used here is in the context of the existing literature. While there exist a large volume of literature on the profit and growth performance of banks over time and across countries, traditionally these functions have been studied separately (see, Goddard et

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al., 2004, for a survey of the two approaches, the persistence-of-profit hypothesis and the law of proportionate effect growth hypothesis). The main contribution of their paper is that they take an integrated (somewhat like a general equilibrium approach but at the micro level) approach to profit and growth, using as their empirical model the vector autoregression (VAR) method of estimation. Their work in terms of methodology is consistent with the integrated approach of the present paper. The difference, of course, is that the present paper integrates profit and risk-avoidance behavior. This literature will be discussed shortly in the econometric section of the paper.

A secondary but related purpose of the paper is to convert the SUR two-equation model into a single reduced-form equation with the capital account, the capital/asset ratio, as the dependent variable. The volatility of this ratio during the time-period studied is then analyzed and serves as a basis to conjecture about present-day bank capital ratio volatility. As indicated later, this variance analysis adds to the relevant literature.

In what follows, I describe a simple theoretical model of profit behavior and risk avoidance related to asset composition behavior in the next section. The following section contains the econometric model, a brief survey of the relevant literature, sample information and the statistical results. The last section contains a summary and conclusions.

2. Theoretical model

It is useful before proceeding with the model to point out that there are usually three categories of credit loss protection recorded by data sources, one is the provision for credit losses that is charged against income (profit) and shows up in the income statement, the other is the reserve for credit losses which is deducted from customer loans (L), and the third one is the provision for credit losses which is listed as a liability in the balance sheet. The last two categories show up in the balance sheet. Data is only available for the second category, L net of the loss charges, for the econometric analysis.

The microeconomic theory of bank behavior is well developed (see, for example, Allen and Rai, 1996; Allen and Santomero, 1997; Freixas and Rochet, 1997; Santomero, 1984). The theory uses accounting items from both the balance sheet and the income statement to establish its empirical relevance. The present paper also uses accounting items from both accounting records for its dependent and predictor variables. For reasons discussed later, the variables are in the form of ratios like cash/assets. For additional information on predictor variables suggested by bank theory, see also, Altman (1968), Barnes (1987), Beaver (1966), Damodaran (1997) Deakin (1972), Johnsen and Melicher (1994), Kallunki et al. (1996), Ohlson (1980), Poston et al. (1994) and Turner (1997).

As is well known among accountants and others, using a simple balance sheet, for example, assets = liabilities + net worth, and for an income statement, revenue − costs = profit, the profit (fully retained for simplicity) is equal to the change in assets which equals the change in net worth, given no other changes. In other words, the difference between assets at t and assets at t + 1 is equal to the change in net worth over the period, which is equal to profit for the period, given no other changes. The rate of change in net worth is equal to the profit rate on net worth. With slightly more detail, the bank's balance sheet can be given by

$$A = L + C + R = DP + PCL + ST + LT + E, \tag{1}$$

where A is total assets, $L = (L^u - RCL)$ is net customer loans (households and businesses) where L^u is unadjusted loans and RCL is the reserve for credit losses, C is cash, R is reserves deposited with the central bank (usually included in the item, C), DP is customer deposits, PCL is the provision for credit loss (set up as a liability), ST is short-term borrowing on the part of the bank, LT is long-term borrowing, E is owner equity to include retained earnings. The L fund is usually the largest component of bank assets and it is usually net of the reserves for credit loss, as indicated earlier. On the average for the sample used here L is about 49% (standard deviation of 20%) of total assets.

The profit function is defined as revenue (from interest on loans and investments and fees) less costs, which for the focus of this paper, the principle cost is the staff and administrative personnel expenses incurred in loan-making. Staff and administrative personnel are also involved in customer deposits generation, but this activity is not explicitly dealt with here. Other costs, such as, interest paid on deposits and bank borrowing, of course, are also present in determining profit and these are theoretically present but are not a part of the empirical analysis as such. The provision for credit losses is also part of costs as indicated earlier, but it has too many missing values and is not used in the econometric analysis. The simplified profit function in general form for loan making is given by

$$\Pi = \Pi[L(C, ADM(C))] = \Pi(C, ADM(C)), \tag{2}$$

where ADM(C) is administrative and staff personnel in money units devoted to the production of customer-loan output given by L and C is cash (including reserves for customer deposits), used to purchase ADM and to add to reserves.

The first-stage profit decision process works this way. Initially, the cash from deposits (and other receivables) is large. Then, it is partially used up when hiring the inputs ADM (other inputs are suppressed for simplification) to produce the loans L. The loans L will also use up cash (the excess reserves with the central bank) in the check-clearing process. So, in the asset section of the balance sheet, C will fall as L increases for a given DP. In other words, in terms of cash flow, C is reduced by L and ADM (ignoring here the effect on C caused by the net revenue earned from the return on the loans, L). If all excess C were used up by these reductions, then ADM and L would be at a maximum, given no other changes. Of course, the bank itself can borrow in the short run to finance the hiring of staff and other personnel and to produce more loans. In any case, the production decision, in effect, involves using cash and staff and administrative personnel to produce customer loans.

For the second stage risk-avoidance decision process, the bank determines its appropriate capital/asset ratio as a risk index. In general, this process involves selecting the optimum composition of assets in terms of cash and customer loans that satisfies the appropriate capital/asset ratio or risk index. Here, macroeconomic factors come into play. The bank's perception of its risk exposure and, therefore, its appropriate capital/asset ratio (within the context of regulatory requirements) will be affected by general macro economic conditions (possibly in its local market but more likely in its national market) (see, for a discussion, Heid, 2005; Lucchetti et al., 2001). The simplified capital/asset ratio equation is given in general by

$$CAPASST = f(micro, micro^*macro), \tag{3}$$

where "micro" represents the micro variables and "micro*macro" signifies a micro–macro interactive variable(s).

In effect, the integrated model can be viewed as showing profit maximization subject to the predetermined optimum capital/asset ratio constraint, resulting in the optimum C^*, L^*, and A^* (among unspecified other variables). Simplifying, $C^* + L^* = A^*$ and the capital/A^* ratio is the desired capital ratio. If actual $L < L^*$, then $A < A^*$ and the actual capital ratio will be larger than the desired ratio. On the other hand, if actual $L > L^*$, then actual $A > A^*$ and the actual capital ratio will be less than the desired ratio.

Thus, banking behavior involves, in effect, a two-stage approach (see, for a classic example of this, Boulding, 1950 and the literature to be discussed below), as indicated at the outset. How well profit