Modeling Foreign Bank Performance and Lending Behavior

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This paper examines the profitability and commercial loan growth of foreign banks using a simultaneous-equation framework. Maximizing behavior provides a two-equation system in which bank profitability depends on variables related to expected returns, costs, and risks and in which loan growth is determined by risk and return variables. The model is tested to evaluate the determinants of foreign bank performace and lending behavior in the United States between 1987 and 1991. Overall the results indicate that factors such as capital strength, commercial and industrial loan growth, and assets composition were important in determining foreign banks' return-on-assets in the period under study. The role of capital appears to be particularly important in explaining foreign bank performance. The single significant determinant of loan growth was found to be previous period's loan growth.

I. INTRODUCTION

Since the mid-1980s the globalization of financial services has resulted in foreign banks increasing their market share in nearly all European countries and also in the United States. For example, the European Commission (1997) reports that the number of foreign banks and their assets market share increased in all EU countries, apart from the UK, between 1987 and 1994. In the United States foreign banks share of lending to corporate business has grown by some 15% since 1985 and accounted for 48% of total bank non-farm non-financial corporate loans by the end of 1994.[1] Various reasons have been put forward for the increase in foreign bank lending including the servicing of home-country clients, technical advances in credit scoring and securitization, pricing advantages associated with the offshore booking of loans to firms with domestic operations, and widening differences in regulatory environments that has encouraged foreign banks and other firms to begin moving business to overseas destinations.

The majority of previous studies have aimed to shed light on the determinants and performance of foreign bank activity in the United States. There are two broad strands to this literature. One literature investigates the relative performance of foreign banks compared to domestic banks. The second group of studies examines the determinants and characteristics of foreign bank growth (however measured). This paper aims to bring the two literatures together by establishing a model of the determinants of foreign bank commercial loan growth and profitability. The

[1]See Berger, Kashyap, and Scalise (1995) Table A8 for a detailed breakdown on US bank lending between 1979 and 1994.

Financial Markets, Institutions & Instruments, V. 7, N. 4, November 1998. Published by Blackwell Publishers, 350 Main Street, Malden, MA 02148, USA, and 108 Cowley Road, Oxford, OX4 1JF, UK.

model is then tested to evaluate the determinants of foreign bank performance and loan growth in the United States between 1987 and 1991.

Studies on foreign banks' operations have typically either focused on the determinants of the relative size (or characteristics) of their business or, alternatively, have evaluated their performance relative to domestic banks. Grosse and Goldberg (1991), for example, update and extend earlier research undertaken by Goldberg and Saunders (1981a, 1981b) and Hultman and McGee (1989) and find that foreign direct investment in the United States, foreign trade with the United States, and the size of the baking sector in the foreign country are positively correlated with that country's bank presence in the United States. They also find that the greater the country risk of the source country, the more foreign banking appears to be allocated to the (relatively low-risk) US market, and geographic distance is "somewhat" positively correlated with bank presence.[2] In the only non-US study, Fisher and Molyneux (1996) find that foreign bank presence in the UK is closely related to foreign direct investment and trade flows. Other studies undertaken by McCauley and Seth (1992) and Seth (1993a and 1993b) have examined the growth of foreign bank credit to domestic US corporations. McCauley and Seth (1992) show that in the second-half of the 1980s, US reserve requirements interacted with money market interest rates to give foreign banks an incentive to book loans offshore. Because the rapid growth in this offshore component of foreign loans was in part missed by the US reporting system, foreign penetration of the US market for commercial and industrial loans was more extensive than generally recognized. Seth (1993a, 1993b) examines the contribution of foreign bank entry towards excess capacity and models foreign credit expansion in the US market, respectively. These studies find that foreign banks' strong presence and increased acceptance by US customers probably resulted in significant excess capacity in the market for corporate loans. Demand factors were also seen to be significant but in an unexpected way—in recessionary circumstances foreign banks actually increased their lending to US corporations. Various other studies have focused on the type of loan business that foreign banks undertake. Berger and Udell (1993), for example, have shown that foreign banks are much more likely than domestic banks to buy wholesale loans originated by large banks. Calomiris and Carey (1994) found that the average customer of foreign banks is more highly rated and receives lower loan spreads than the average customer of domestic banks. These studies point to the wholesale nature of foreign bank lending business.[3]

The above studies mainly focus on the determinants and characteristics of increased foreign bank presence in the US. A separate literature examines the relative

[2]Hoshi, Kashyap, and Scharfstein (1993) point to a widening difference between regulation in the US and Japan in the early 1980s as a possible reason why some Japanese banks and firms moved business to the US.

[3]See Budzeska (1991), Damanpour (1991), Gruson (1992), Goldberg (1993), Lee (1993), and Misback (1993) for additional interpretations of foreign bank activity in the US. Also see Houpt (1983, 1988) for a history of foreign bank entry into the US.

performance of foreign banks compared to their domestic US bank counterparts. Goldberg (1981), Hodgkins and Goldberg (1981), and Houpt (1980) studied the performance of US banks acquired by foreign institutions in the 1970s. These studies generally arrive at the same conclusions. Foreign-owned banks were found to direct a smaller percentage of their loans to residential mortgages and consumer loans and were found to be less profitable compared with domestic banks. These differences, however, were found to be a continuation of differences that existed prior to acquisition. No significant new differences emerged after the acquisition. Zimmerman (1989) compared the performance of Japanese-owned banks to domestically owned banks in the state of California and found that the former tended to do relatively more long-distance intermediation and wholesale banking. Japanese banks were also found to have a greater reliance on wholesale money markets as a source of funds and to dedicate a larger percentage of their assets to fund international trade. Seth (1992) examined the relative performance of foreign bank subsidiaries and branches and agencies that were operating in the US between 1980 and 1991. Profitability at both these groups of banks, whether measured by return-on-assets or return-on-equity, was found on average to be a third of that at domestic banks over the period. The underperformance of these banks was "especially evident when their true equity commitment is estimated" (p. 7). Following on from this approach, Leveen and Praveen (1992, 1994) use multivariate methodologies to compare the performance of foreign-owned versus domestic US banks. Both studies find that foreign banks operate with greater risk exposures than their domestically owned counterparts. The latter study also finds that continental European banks and Japanese banks have a greater wholesale orientation than domestic or "British style" banks.[4] Foreign banks are also found to be significantly less profitable than domestic institutions. De Young and Nolle (1996) arrive at a similar conclusion that subsidiaries of foreign banks were less profit efficient than US-owned banks.

In general the literature on foreign bank activity focuses on two main areas, either on the size or growth of business or on bank performance. The following section constructs a model of the determinants of foreign bank performance and commercial credit extension which aims to incorporate these two main approaches.

II. MODEL SPECIFICATION AND DATA

Following an approach similar to Clark (1986), we develop a model in which loan growth and foreign bank performance are simultaneously determined. We assume that managers of foreign banks are risk averse, and they choose the amount of loans so as to maximize expected utility. Their utility in a given period is a concave function of next-period profits. In the case of constant absolute risk aversion, for

[4]Leveen and Praveen (1994) classify the "British" style according to English, Irish, and Canadian banks.

example, we may write the utility function as $U_t = -\exp(-b_t \Pi_{t+1})$, where b_t is a risk-aversion parameter that will vary over time based on bank-specific and country-specific variables.[5]

We can then express the logarithm of expected utility as

$$V_t = E_t(\Pi_{t+1}) - \frac{b_t}{2} Var_t(\Pi_{t+1}) \tag{1}$$

Here $b_t = b(\mathbf{Z_t})$, in which $\mathbf{Z_t}$ is a vector of bank-specific variables and country-specific variables that are related to a bank's risk aversion or willingness to lend.

In this paper, we will write next-period profits as $\Pi_{t+1} = r_{t+1} L_t - C_{t+1}$ where r_{t+1} is the return on loans L_t and C_{t+1} is a function representing certain costs and risk adjustments. The return r_{t+1} will be specified to account for costs and risks that are related to the amount of loans, so that C_{t+1} will represent only the component of costs and risks that are independent of loans. Part of the return will be predictable based on current information. Specifically, we have $r_{t+1} = f(\boldsymbol{X}_t) + u_{t+1}$ where $\boldsymbol{X}_t$ represents a vector of variables known in period t that predict return, and u_{t+1} represents the unpredictable component, which has a mean zero and constant variance σ^2. We also write $C_{t+1} = C(\mathbf{W_{t+1}})$, where $\mathbf{W_{t+1}}$ represents a vector of variables related to costs, risks, and demand.

The conditional expectation and conditional variance of profits are then

$$E_t(\Pi_{t+1}) = E_t(r_{t+1}) L_t - E_t(C_{t+1}) \tag{2}$$

$$Var_t(\Pi_t) = \sigma^2 L_t^2 + \sigma_c^2 \tag{3}$$

where the variance of costs σ_c^2 is assumed to be constant.

$$\frac{\partial V_t}{\partial L_t} = f(\mathbf{X_t}) - \mathbf{b}(\mathbf{Z_t})\sigma^2 \mathbf{L_t} = \mathbf{0} \tag{4}$$

Substituting (2) and (3) into (1) and differentiating with respect to L_t gives the first-order condition for profit maximization: Solving (4) for L_t yields the desired level of loans L_t^*. In general, we can then write

$$L_t^* = L^*(\mathbf{Z_t}, \mathbf{X_t}) \tag{5}$$

where desired loans are specified to depend on variables related to risk aversion $\mathbf{Z_t}$ and variables related to expected returns $\boldsymbol{X}_t$. We can further assume actual loans follow desired loans in accordance with a standard partial adjustment mechanism:

$$L_t - L_{t-1} = \lambda(L_t^* - L_{t-1}) \tag{6}$$

where λ is the speed of adjustment parameter.

[5]See Santomero (1984) for a survey of models of banking firms.

At the same time, next-period profits will in general be given by

$$\Pi_{t+1} = \Pi(\mathbf{X_t}, \mathbf{W_{t+1}}) \tag{7}$$

so that profits depend on variables related to expected return X_t and variables related mainly to costs and risks W_{t+1}.

For this paper, we choose variables for $\mathbf{Z_t}$, $\boldsymbol{X_t}$, and $\mathbf{W_{t+1}}$ to derive estimating equations consistent with those estimated in the literature. Starting with a model provides a structural way of interpreting the results. For the risk-aversion variables $\mathbf{Z_t}$, we use two bank-specific measures, the bank's risk-adjusted capital ratio (CAPRTIO) and the bank's proportion of past-due loans (BADPROP) and other measures that aim to account for the risks associated with loan growth in the US compared with home-country expansion. We use the risk-adjusted capital ratio to account for risk aversion because higher capitalized banks are viewed as safer and have less incentive to take on excessive risks to bolster returns than do their lower capitalized counterparts. While it can be argued that the capital ratio is a poor proxy for risk aversion, we include this variable in line with previous studies (for example, see Molyneux and Thornton, 1992). A similar criticism can be made about using past-due loans as a risk-aversion variable in that this is merely an ex-post measure of risk and does not accurately indicate banks' risk aversion. We assume that poor credit quality in previous periods reflects a bank's willingness to take on risk and therefore serves as a reasonable proxy indicating the potential for excessive risk-taking in the future. Other measures that account for the risks associated with loan growth in the US compared with home-country expansion include the stock market capitalization of the bank's home country (MARKCAP),the price-to-earnings ratio of the stock market in the home country of the foreign bank (PERATIO), the foreign direct investment flows to the United States from the bank's home country (FDIFLOW), the log change in the home country's GDP (FORGDP), the exchange rate between the home country and the US dollar (EXCHANGE), and cross-border flows from home-country banks to US nonbanks (BISFLOW). For the return variables $\boldsymbol{X_t}$, we use CAPRTIO, the log change in US real GDP (USGDP), the US prime rate minus the home-country lending rate (DIFFINT), and a measure of profitability (ROA or ROE). Note that CAPRTIO is both a risk-aversion variable and a return variable. For the cost, risk, and demand variables $\mathbf{W_{t+1}}$, we use the bank's interest cost ratio (INTCOST), the bank's non-interest cost ratio (NONINTCOST), the bank's loan-to-asset ratio (LARATIO), and the log change in the bank's commercial and industrial loans (CIGROW). The loan-to-assets ratio is the measure of balance sheet risk and the change in loan growth is a measure reflecting realized demand.

The loan growth variable (CIGROW) is also the dependent variable for our loan equation and the measure of profitability (ROA or ROE) is also the dependent variable for our profits equation, which takes account of the interdependence between profits and loans. Profits and loan growth will be negatively related if rapid growth leads to an increase in funding costs thus depressing overall returns. Alternatively, if foreign banks are experiencing strong growth for their services

loan growth may result in increased profitability. Note that the system is identified because some variables in the loan equation are not in the profits equation (i.e., those in $\mathbf{Z_t}$ except for CAPRTIO, which is also in $\mathbf{X_t}$), and some variables are in the profits equation but not in the loan equation (i.e., those in $\mathbf{W_{t+1}}$).

Estimating the above equations leads to a procedure similar to Clark's (1986) in which bank profitability is estimated using a model which allows for simultaneity between foreign banks' profitability and growth in their commercial and industrial loan business. We use a two-stage least squares procedure to estimate a linearized version of the above model. Hence,

$$\begin{aligned} CIGROW_{ij} \quad = \quad & a_o + b_1\, ROA_{ij}(ROE)_{ij} + a_2\, OLDCIGROW_{ij} \\ & + a_3\, BADPROP_{ij} + a_4\, MARKCAP^j + a_5\, PERATIO^j \\ & + a_6\, FDIFLOW^j + a_7\, FORGDP^j + a_8\, EXCHANGE^j \\ & + a_9\, BISFLOW^j + a_{10}\, USGDP_j + a_{11}\, DIFFINT^j \\ & + a_{12}\, CAPRTIO_{ij} + e_1 \end{aligned} \tag{8}$$

Equation (8) is of a similar composition to the models outlined in Grosse and Goldberg (1991) and Hultman and McGee (1989). The equation for desired loan growth falls out from banks' profit maximization. Coupled with a partial adjustment model, we get a reduced form for loan growth that is a function of variables that influence a bank's risk aversion (bank specific and country related) and expected return.

The role played by credit quality is captured in the bank-specific variable, BADROP. Poor asset quality has largely resulted from a combination of bank exposure to real estate loans and rapidly declining real estate values. In our model we use the percentage of loans not accruing or past due ninety days or more, BADPROP, to proxy for the extent of bad loans in each bank's portfolio. We expect a negative sign for the coefficient of BADPROP because the more numerous the bad loans, the poorer the asset quality and the slower we expect loans to grow. The bank-specific variable, OLDCIGROW, the past period's growth in commercial and industrial loans by the foreign bank captures a possible adjustment factor (L_{t-1}) that may result from either demand and supply-side shocks. Finally, as in previous studies, the risk-adjusted capital-to-assets ratio, CAPRATIO, was included. This variable has usually been interpreted as a bank-specific risk variable, the higher the capital ratio the more risk averse the bank and hence lower loan growth. However, high capital ratios may also reflect buoyant demand conditions, bolster profits, and feed through into higher capital ratios. We, therefore, treat the sign of the CAPRATIO variable as indeterminant prior to estimation.

Country-specific effects that influence banks' risk aversion include MARKCAP, PERATIO, FDIFLOW, FORGDP, EXCHANGE, and BISFLOW.

Wealth effects may affect foreign bank activity. For home-country investors, more wealth should create greater demand for all instruments, assuming the investor's portfolio is appropriately diversified, and should lead to greater direct foreign investment, including investment in foreign banking. It has been pointed

out that "greater fund availability" by foreign banks could account for their growing presence.[6] It is possible that wealth effects underline this argument. These wealth effects would suggest a positive coefficient on market capitalization or MARKCAP. It has also been argued that the willingness of foreign investors to accept lower returns than do US investors has probably been the most important determinant of foreign bank growth in the United States.[7] To examine the effect of differences in cost of equity on the growth of foreign banks, we include the price-earnings ratio of the stock market, PERATIO, in the home country of the foreign bank. The lower the price-earnings ratio, the higher the cost of equity, and the greater we can expect the foreign bank expansion to be. Thus, we expect the sign on this coefficient to be negative.

The literature on foreign bank activity in the US has frequently tied the growth of foreign banks to the servicing of home-country clients.[8] This servicing of home clientele would suggest a positive sign on the coefficient of foreign direct investment capital flows, FDIFLOW, to the United States from the home of the foreign bank. The bank's risk aversion as affected by home-country growth and exchange rate is captured in FORGDP and EXCHANGE.

Finally, foreign banks lend to US corporations both by booking loans onshore and offshore. In examining the factors determining growth in loans booked by foreign banks onshore, we would have to control for the loans they booked offshore. The two types of loans could conceivably be substitutes or complements. If the loans are substitutes, foreign banks would book fewer onshore loans if their offshore book was increasing rapidly. This situation would arise if, say, it was more cost effective to borrow abroad and lend offshore. If the loans are complements, these banks would be increasing their onshore book at the same time that their offshore book was increasing. Since bank-specific data are not available for offshore loans, we include in our model all bank flows to nonbanks in the United States from the home country of the bank in question-BISFLOW.

The profit equation (9) follows from equation (7) and is similar to those presented by Bourke (1989) and Molyneux and Thornton (1992). This equation is driven mainly by variables related to expected returns and costs. Expected returns relate to growth in real GDP in the US, USGDP, capital strength of the foreign bank, CAPRATIO, and the differences in lending rates between the home country of the foreign bank and the United States, DIFFINT. As Berger (1995) has shown, however, interpreting the capital-profits relationship is problematic given the endogenous nature of capital. For example, foreign banks facing strong demand will earn higher profits, retain some of these profits, and thereby increase capital.

[6] Zimmerman (1989).

[7] See McCauley and Seth (1992) and Zimmer and McCauley (1991).

[8] At least as early as 1979, a study by the General Accounting Office suggested that among the reasons for the influx of foreign banks into the United States was the "following by foreign banks of foreign business to the United States." See Comptroller General of the United States, General Accounting Office (1979). Also see Ball and Tschoegl (1982).

Alternatively, a positive capital-profits relationship may also be explained by the fact that capital strength reflects lower funding costs and/or banks being able to lend to better quality borrowers. Similarly, an inverse relationship between capital and profits may reflect poor demand conditions or, alternatively, lower capitalized banks may take on more undiversifiable risks that require higher returns in the form of increased profitability. The GDP growth variable is included because changes in market demand are expected to affect foreign bank profitability. Differences in lending rates between the home country and the US, adjusted for expected movements in the exchange rate, are also likely to affect foreign bank profitability, so we include the DIFFINT variable, which is the difference between the US prime rate and the base rate of the country from which the foreign banks originate:

$$\begin{aligned} ROA_{ij}(ROE_{ij}) \quad = \quad & b_o + b_1\, CIGROW_{ij} + b_2\, USGDP_j \\ & + b_3\, DIFFINT^j + b_4\, LARATIO_{IJ} + b_5\, INTCOST_{ij} \\ & + b_6\, CAPRTIO_{ij} + b_7\, NONINTCOST_{ij} \\ & + Q_n\, DUM + e_2 \end{aligned} \tag{9}$$

The profits equation also includes two firm-specific variables to account for cost differences between banks, INTCOST and NONINTCOST, representing interest and noninterest costs and a loans-to-assets ratio, LARATIO, is included as a risk variable. As loans are generally regarded as more risky than other forms of bank assets, the higher the ratio of loans to assets the greater the expected profits should be.

As the model indicates, we include the change in commercial and industrial loans (CIGROW) made by foreign banks to reflect firm-specific realized demand that would be expected to be related to foreign bank performance as measured by ROA or ROE. It is uncertain, however, as to whether one would expect a positive or negative sign on this coefficient. If, for example, foreign banks were rapidly increasing their loan books, they may have a higher cost for their funding requirements and this could have a negative impact on profitability. On the other hand, foreign banks may be faced with strong demand for their services and this would tend to increase their lending and may have a positive impact on profitability.

Finally, binary variables, Q_n DUM, distinguishing between four different size categories of foreign banks, are included in the profits function to identify the equation. These divide the sample of foreign banks into quartile size groupings according to the assets of all US subsidiaries of foreign banks.

The sample was partially dictated by data availability. Subsidiaries of foreign banks file both balance sheet and income statement reports, while the branches and agencies of foreign banks file only balance sheet information. The information contained in reported capital ratios is unclear for the latter group as this group is not separately capitalized from its foreign parent. As a consequence our sample consists of data on US subsidiaries of foreign banks obtained from the Federal Financial Institutions Examinations Council, Reports of Condition. Subsidiaries were defined as US incorporated entities with more than 10% foreign ownership.

The model was estimated quarterly over the period Q1 1990 to Q3 1992. The sample was constructed on the basis of banks that were in existence over the whole period.[9] We thus avoided the problem of de novos and M&A activity during the period under consideration, both of which could have significant short-run effects on profitability and loan growth, independent of the explanatory variables. Moreover, since subsidiaries are incorporated in the United States, they face the same legal and regulatory requirements as US owned banks. Because various variables used in the model were only available for certain countries the estimation only included foreign bank subsidiaries from Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom.

III. RESULTS

Table 2 contains the estimated parameters and t-statistics obtained from the application of the two-stage least-squares (2SLS) approach to the model outlined in the previous section.[10] Equations (1) and (2) report the models that use ROA as the profits measure and (3) and (4) in which we use ROE. The ROA equations appear to perform better than the latter in terms of explanatory power although only 14% of the variance is explained.[11] Equation (1) shows that foreign bank profitability in the United States was significantly and positively related to the growth in individual bank's commercial and industrial loan books, capital levels, and the growth in US GDP.[12] The finding that profitability is positively related to growth in USGDP suggests that demand factors are important in influencing foreign bank performance. It is also likely that similar forces explain the positive correlation between loan growth and profits. While we have noted the problems associated with interpreting the relationship between capital strength and profitability, our results do suggest that demand factors are likely to be just as important as supply-side arguments (relating to lower funding costs and/or higher quality borrowers) in explaining the positive capital-profits relationship. Profitability also appears to be inversely related to banks loans-to-assets ratios which implies that foreign banks which dedicate a larger proportion of their business to securities have relatively higher returns. This characteristic is not unusual in periods when the yield curve

[9]For asset size, quartiles were measured as of the third quarter of 1992.

[10]We prefer to use the 2SLS approach on the grounds that the 3SLS method would only provide greater efficiency if none of the equations were misspecified. 3SLS will result in inconsistent estimates of all model parameters if any of the equations are misspecified while 2SLS will result in consistent estimates of all parameters except those appearing in the misspecified equations.

[11]As they in fact do in the single-equation profits equations estimated by Molyneux and Thornton (1992) and Bourke (1989).

[12]The finding of a positive relationship between capital levels and bank profitability is in accordance with the Berger (1995) results on the determinants of US bank profitability although we do not test for the direction of causality.

is steep. Investors that played off the yield curve, borrowing short and investing long in securities, at this time showed healthy profits.

The only other variable which is statistically significant is the Q_2DUM variable indicating that the second smallest quartile of foreign banks appear to be significantly more profitable than other size categories. In fact, market share, as indicated by Q_3DUM and Q_4DUM, is positively but insignificantly related to bank profitability. There does not appear to be any a priori reason why the second largest group should have the largest profits. Foreign banks tend to be large banks, and the range in size is not nearly as large as in the case of domestic banks. It could be argued that it may be more appropriate to have one and not four size variables. When we introduced a single C&I loan market share variable we found a positive but insignificant relationship with ROA and ROE. For most of the analysis, however, we retained the grouping of foreign banks into the four-size categories.

For equation (2), parameter signs are generally in accordance with expectations although they are all statistically insignificant apart from the lagged commercial and industrial loans (OLDCIGROW) variable. Serially correlated demand shocks perhaps explain the positive correlation between loan growth and its lagged value.

It is also interesting to note that the capital-to-assets ratio is significantly related to profits but not to commercial and industrial loan growth. This is an interesting finding in light of the credit crunch literature that finds that capital strength had an impact on domestic banks' capacity to make loans.[13] While our weak results may be due to the low statistical power of our tests given our sample size, the credit crunch literature does not control for joint determination of profitability and lending behavior. During the period under consideration, moreover, foreign banks buoyed US loan growth irrespective of their precise capital strength, probably because their capital problems were not as obvious as those of domestic banks.

Equations (3) and (4) show the 2SLS estimates using ROE as the profits measure. Parameter signs are similar to equations (1) and (2) but the explanatory power of these are much lower with less than 2% of variance being explained in either model. Equation (3) gives the profits equation and indicates that only foreign banks' capital levels are positively and significantly related to ROE. The smallest foreign banks (Q_1DUM) appear to have significantly lower ROEs than their larger counterparts. Equation (4) again confirms the importance of last-quarter loan growth to current period commercial and industrial loan growth. Two previous studies (Chang, Hasan, and Hunter, 1993; and Nolle, 1994) have shown that foreign-owned subsidiaries were less cost efficient than a cohort group of US banks. Our results suggests that within the group of foreign-owned subsidiaries, the interest cost and non-interest cost ratios at least, cannot explain profit rates.

[13]See, for example, Peek and Rosengren (1992), Hancock and Wilcox (1992), and Bernanke and Lown (1991). One qualification is that explicit regulatory enforcement action was found to be more important than voluntary response by bank management to low capital-to-asset ratios in explaining the credit shrinkage.

Table 1: Variable Definitions

Endogenous Variables	
ROA_{ij}	Bank i's profit measured as return-on-assets (net income/total assets).
ROE_{ij}	Bank i's profit measured as return-on-equity (net income/total equity).
$CIGROW_{ij}$	Log change in commercial and industrial loan growth or bank i's.
Exogenous Variables	
$CAPRATIO_{ij}$	Risk-adjusted capital ratio for bank i's.
$USGDP_j$	Log change in real US GDP.
$DIFFINT^j$	US prime minus foreign (country of origin of bank) lending rate.
$LARATIO_{ij}$	Loans to assets ratio for bank i's.
$INTCOST_{ij}$	Interest cost ratio for bank i's.
$NONINTCOST_{ij}$	Non-interest cost ratio for bank i's.
$BADPROP_{ij}$	Percent of total loans 90 days past due and not accruing for bank i's.
$MARKCAP^i$	Total stock market capitalization of home country of bank i.
P/E $RATIO^j$	Price-to-earnings ratio of the home country of bank i's stock market.
$FDIFLOW^j$	Foreign direct investment capital flows to the United States from the home country of bank i's.
$FORGDP^j$	Log change in real GDP in the home country of bank i's.
$EXCHANGE^j$	Exchange rate (foreign currency per US dollar).
$BISFLOW^j$	Cross-border bank flows to nonbanks in the United States from the home country of bank i's.
$OLDCIGROW_{ij}$	One-quarter lagged log change in commercial and industrial loans.
Q_nDUM_{ij}	Binary variables accounting for market share of assets. Q_1DUM is a dummy for banks that lie in the smallest quartile; Q_2DUM second quartile; Q_3DUM third quartile; Q_4DUM highest quartile.

Note: - Subscript i's represents foreign banks subsidiaries operating in the US market, denoted by subscript j. - Superscript j represent the home country market of the foreign bank i's.

IV. CONCLUSION

This paper develops a theoretical framework based on Clark (1986) to accommodate two empirical issues in the literature. The previous literature focused

Table 2: Two-stage least-square estimation of foreign bank profitability and commercial and industrial credit extension

Explanatory Variables	ROA (1)	CIGROW (2)	ROE (3)	CIGROW (4)
CONSTANT	—	−0.0078 (−0.237)	—	−0.0046 (−0.141)
ROA	—	0.0011 (0.010)	—	—
ROE	—	—	—	0.0009 (0.294)
CIGROW	1.7781** (1.793)	—	41.8107 (1.436)	—
CAPRATIO	0.0111* (3.584)	0.0009 (0.482)	0.3110* (2.260)	0.0006 (0.390)
USGDP	3.1853* (2.512)	0.4332 (0.557)	44.1694 (0.786)	0.4060 (0.548)
DIFFINT	−0.0074 (−1.331)	0.0029 (0.607)	−0.2819 (−1.147)	0.0035 (0.679)
LARATIO	−0.4149* (−2.923)	—	−10.3593 (−1.646)	—
INTCOST	0.0007 (1.060)	—	0.0143 (0.467)	—
NONINTCOST	−0.0005 (−0.906)	—	−0.004 (−0.146)	—
BADPROP	—	0.0001 (0.021)	—	0.0005 (0.153)

separately on foreign bank profitability and commercial loan growth. This paper adds to the established literature by developing a simple theoretical model that specifies both foreign bank performance and lending behavior. A two-equation sytem is derived in which bank profitability depends on variables related to expected returns, costs and risks and where loan growth is determined by variables related to risk aversion and expected returns. From the model we derive equations consistent with those estimated in the literature.

The model is tested to evaluate the determinants of foreign bank profitability and commercial loan growth in the United States between 1987 and 1991. Overall the role of capital appears particularly important in determining foreign bank

Table 2: Continued

Explanatory Variables	ROA (1)	CIGROW (2)	ROE (3)	CIGROW (4)
MARKCAP	—	0.00002 (0.18)	—	−0.00002 (−0.017)
P/E RATIO	—	−0.0003 (−0.427)	—	−0.0003 (−0.344)
FDIFLOW	—	0.00001 (0.823)	—	0.00001 (0.738)
FORGDP	—	−0.4384 (−0.820)	—	−0.4499 (−0.893)
EXCHANGE	—	0.1065 (0.563)	—	0.0986 (0.546)
BISFLOW	—	−0.0000004 (−1.012)	—	−0.000004 (−1.051)
OLDCIGROW	—	0.1287* (2.950)	—	0.1240* (2.805)
Q_1DUM	−0.0307 (0.456)	—	−6.1477* (−2.057)	—
Q_2DUM	0.1412* (2.279)	—	0.3440 (0.125)	—
Q_3DUM	0.0719 (1.018)	—	−0.7452 (−0.238)	—
Q_4DUM	0.0385 (0.613)	—	−0.2962 (−0.106)	—
R^2	0.1475	0.006	0.020	0.006
F Value	11.037*	0.1986	2.084*	1.329

Note: Values appearing in parentheses are the relavant t-statistics.

*Coefficient significant at the 5% level

**Coefficient significant at the 10% level

performance, but (unlike the US credit crunch literature that focused on domestic banks) capital does not appear to be relevant in explaining commercial loan growth. This difference along with the insignificance of asset quality parameters is probably accounted for by the fact that we control for the joint determination of profitability and lending behavior in our model. Finally, we suggest that a fruitful area for future

research would be to evaluate whether the same type of relationships explain the growth of foreign banking presence across European banking markets.

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The views expressed are those of the authors and do not necessarily reflect those of the Federal Reserve Bank of New York or the Federal Reserve System.