NOTES D'ÉTUDES

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ON THE ROLE OF A STOCK MARKET IN THE EUROPEAN BANK LOAN MARKET: A STUDY OF FRANCE, GERMANY, AND THE EURO AREA

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Abstract

What factors cause banks to lend to the private sector in a bank-based financial system like the ones in place in Europe? In this paper we compare a traditional demand oriented model to a non-traditional capital budgeting model of bank lending based on movements in the equity cost of capital for France, Germany, and the Euro area. Using non-nested hypothesis tests and omitted variables tests we find that we can reject the traditional demand oriented model of bank lending and fail to reject the capital budgeting model of bank lending for Monetary Financial Institutions in France and the Euro area. For Germany the evidence is mixed in that both models are rejected for Monetary Financial Institutions, but only the traditional demand oriented model is rejected for the commercial bank sector. Even though Europe may be a bank-based financial system, it appears the stock market plays a key role in the lending decisions of banks.

Key Words: Bank Loans, Stock Market, Non-nested Hypothesis Tests

JEL Classification: E3, E5, G2

Résumé

Quels sont les facteurs qui incitent les banques à accorder des prêts au secteur privé dans un système financier reposant sur les banques comme ceux qui existent en Europe ? Dans cet article, nous comparons l'application à l'activité de prêt bancaire d'un modèle classique axé sur la demande et d'un modèle non classique de budgétisation des charges en capital reposant sur l'évolution du coût des fonds propres pour la France, l'Allemagne et la zone euro. En utilisant des tests d'hypothèses non emboîtées et des tests de variables omises, il apparaît que nous pouvons rejeter le modèle classique axé sur la demande alors que nous ne pouvons pas rejeter le modèle de budgétisation des charges en capital pour les institutions financières monétaires de la France et de la zone euro. En ce qui concerne l'Allemagne, les résultats sont contrastés, les deux modèles étant rejetés pour les institutions financières monétaires, alors que seul le modèle classique axé sur la demande est rejeté pour le secteur des banques commerciales. Bien que le système financier européen repose sur les banques, il apparaît que le marché boursier joue un essentiel dans les décisions de prêt de ces dernières.

Mots clés : Prêts bancaires, marché boursier, tests d'hypothèses non emboîtées.

Codes JEL : E3, E5, G2

I. Introduction

There is a large and growing body of research suggesting that well-developed financial systems make a positive contribution to the long-run growth rate in the real output of a country.[1] The main idea underlying this point of view is that an advanced financial system enables non-financial enterprises access to external financing at the lowest possible cost from ultimate savers by reducing the asymmetric information and moral hazard problems associated with their opaque investments and the profitability of those investments. In this sense advanced financial systems are powerful engines for manufacturing company information and facilitating the savings and investment process.

Banks play a central role in the financial system and the real economy. As the institution whose deposit liabilities are by common agreement an important component of the medium of exchange, they are well-positioned to reduce these information asymmetries and moral hazard problems that naturally arise in a decentralized market economy. One way they can do this is by the simple expedient of peeking at the deposit balances of their loan customers (Norden and Weber, 2007). More generally there is a large amount of research in banking that emphasizes the importance of bank screening and monitoring of small firms where the real investments and investment returns are particularly opaque.[2] Moreover the benefits of bank screening and monitoring go beyond small firms. Large firms having access to external capital markets also benefit from bank screening and monitoring. When a bank grants a new loan or extends an existing loan to a firm, that piece of information sends a strong signal to the capital market that is reflected in the market valuation of the firm's outstanding securities.[3]

One of the first directions this research on "finance matters" took was to categorize developed countries on the basis of whether their financial system was market (typically interpreted as stock market) oriented or bank oriented. Advanced countries were categorized in this way based on such metrics as the magnitude of the security market valuation of their publicly traded firms, and the magnitude of the assets and deposits of their banking sector all relative to such aggregates as population, GDP, and world aggregates such as deposits, banking assets, and security market valuations. On these metrics the U.S. and U.K. were classified as market oriented financial systems and continental Europe and Japan as a bank oriented financial system (see Barth, Nolle, and Rice, 1997). Soon after the question invariably arose as to whether a bank-based financial system was in some sense different (i.e., better or worse) from a market oriented financial system in terms of fostering economic growth. From the perspective of transferring resources from savers to firm investors, the consensus answer seemed to be: No. The only thing that does seem to matter is whether both types of financial orientations were based on the substructure of an efficient and flexible legal and political system that respected property rights and contracts.[4]

But is aggregate size the only useful metric for characterizing a financial system? One of the important social functions of a financial system is to allocate scarce financial resources across time and the different sectors in the economy in a way that matches the production of risk and return by firms (as reflected in the return generating process of their technology) to the taste for risk and return by ultimate savers as reflected in their utility function and expressed in their required yield on financial investments. Optimal capital budgeting rules are designed to achieve

this objective. This would suggest that another useful line of inquiry is whether banks allocate financial resources through their lending operations differently than the securities market guided by optimal capital budgeting rules. The objective of this paper is to pose this question in a precise but narrow way for banks in the Euro area, an area often described as a bank-based financial system. We then offer some empirical evidence on the factors driving bank lending in Continental Europe that will contribute towards a better understanding of the differences and similarities between bank-based and market-based financial systems. However before beginning it is important to note up front that our interest in bank-based versus market-based financial systems centers around the more general question of how the financial side relates to the real side of an economy. In other words, what is the nexus between banks, markets, real investments of households and firms, and general economic activity? For example, do banks amplify or moderate fluctuations in real economic activity? These are topics in aggregate economics. For this reason aggregate time series data will be used in the empirical work reported below.

The natural starting point for discussing issues of finance and investment allocation is to briefly describe the optimal capital budgeting rules that supposedly deliver the socially optimal level of savings and investment in a market economy. According to the theory of capital budgeting, the firm compares the marginal benefits of the future cash flows on new investment projects to the cost of capital appropriate for the projects. This cost of capital is a weighted average of the after tax required yields of those savers holding the various debt securities and the required yield on the equity securities of the firm and depends on such factors as time preference, risk aversion, and the perceived risk of the investment projects. At this point it is not necessary to specify which one of the many asset pricing models described in the literature generates these future random yields. The only assumption necessary at this stage is that these yields respond to changes in risk and risk aversion in the traditional way, namely, the required yields of investors are increasing in risk and risk aversion. The optimal asset adjustments of firms are then carried out to the point where the marginal benefits from the cash flows on new investments just equals the cost of capital or required yields of savers on the new investment project. Other things remaining equal a decline in the required yield of savers for whatever reason (e.g., a fall in risk or risk aversion) will result in an increase in the market valuations of debt and equity securities thereby sending a market signal to the managers of the firm to increase their real capital investments. But what are these assets that firms are supposed to adjust when their cost of capital changes? In the corporate finance literature these assets are typically viewed as tangible assets such as stocks of inventories, plant, and equipment of non-financial enterprises. Consequently in a market-based financial system, changes in the required yield of savers that change the market valuations of debt and equity securities triggers an optimal adjustment in the savings and real investments of a country. In this case the signal from savers is transmitted directly to firms via prices in the stock and bond markets. But what about financial enterprises like Monetary Financial Institutions (MFI's) or banks? Should banks (we often use the terms banks and MFI's interchangeably when it is not confusing) evaluate the cash flows associated with an investment in a loan in the same way a non-financial firm evaluates the cash flows associated with an investment in tangible assets? In this paper we argue that not only should this be true, but there is evidence suggesting that in fact it is true for banks in Europe.

More specifically, we propose to compare at the most basic and fundamental level two specifications for bank investments in private loans in France, Germany, and the entire Euro area

when data availability permits. One specification emphasizes the capital budgeting aspect of bank lending and the role of the market valuations of bank stocks reflecting the equity cost of capital for banks, controlling for other relevant factors. These "other relevant" factors will be captured with the market valuations of stocks in general. This specification takes the view that bank and non-bank share prices incorporate all relevant information needed for the lending decision. Certain rare exogenous events like the reunification of Germany in 1990 and the 2001 attack on the financial district in New York City will be accommodated in the regression analysis with dummy variables. The alternative and more conventional specification looks directly to the market for bank loans, and for institutional reasons peculiar to Europe focuses attention on the demand side of the market. This approach emphasizes the importance of such variables as a measure of aggregate economic activity (like GDP) and the interest rate charged on bank loans. These two specifications do not necessarily have to reflect different views of what determines bank lending. The question for us is whether the stock market with its many eyes can see more clearly the underlying supply and demand factors determining the volume of new loans to the private sector, or, whether these factors can be better observed from the outside indirectly by economists. We compare these two specifications of bank lending using regression analysis and non-nested hypothesis tests. The results of these tests indicate that for the most part the stock market hypothesis provides a better regression specification of bank lending for France and the Euro area than the alternative specification based on indirect measurement of supply and demand factors. For Germany the evidence is somewhat less clear as to which hypothesis provides the better specification for MFI lending to the private sector. However, for the commercial banking sector within the German MFI classification, it appears that the stock market hypothesis provides a better specification of lending than the traditional proxies for the supply and demand factors. These tests are presented in Section II. Section III provides a brief summary of the statistical results and indicates possible directions for future research.

II. Two Empirical Specifications for Bank Lending in Europe

A. Theoretical Considerations

What determines the volume of bank lending in a bank oriented financial system like Europe? Traditional economic theory teaches that the quantity of bank loans and the price of bank loans are simultaneously determined by the interaction of the factors influencing the supply of loans by banks and the factors influencing the demand for loans by borrowers. Once the supply and demand factors are identified and the equilibrium condition specified, estimation can proceed.[5] However, as noted earlier Europe is usually regarded as a bank-based financial system. One characteristic often associated with bank-based financial systems such as those in Europe and Japan is that there is a close long-term relationship between banks and their loan customers. Through this strong long-term relationship bank loan officers come to know the economic environment and financial requirements of their loan customers, and loan customers in turn come to know the capacity of their banks to supply loan finance. The end result of this long-term banking relationship is that banks typically accommodate the informed loan requests of their customers. For these reasons supply factors such as Basle type risk-based capital requirements, changes in bank risk aversion, changes in credit standards, and changes in monetary policy are often argued to play a relatively smaller role in determining the volume of

new loans in bank-based financial systems than would be the case in market-based financial systems. Among other things this focus on the demand side of the loan market assumes that banks have a cushion of other assets that can always be sold in the market place to accommodate the unexpected loan demand of their customers. The primary determinants of bank lending in bank-based financial systems are the demand factors such as GDP (a proxy for business profitability and household income) and interest rates charged on loans (a proxy for the cost of loan finance). Recent empirical work on demand oriented specifications of bank lending in Europe using VAR and VEC techniques include Calza, Gartner, and Sousa (2003), Eickmeir, Hofmann, and Worms (2006), and Frommel and Schmidt (2006) among others. In these demand oriented studies bank lending is typically described by the following linear specification.

$$\Delta L = b_0 + b_1(GDP) + b_2(R) + e \qquad 1)$$

where

ΔL = The investment in private loans to firms and households by banks.

GDP = Gross domestic product, a proxy for business and household income.

R = Interest rate charged on bank loans, a proxy for the cost of loan finance.

e = Random disturbance term.

The demand interpretation of the traditional view of bank lending in (1) assumes that b_1 is positive while b_2 is negative. However, theory does not exactly pin down the sign of b_1. In this connection Friedman and Kuttner (1993), Bernanke and Gertler (1995), and Calza Manrique, and Sousa (2003) have argued that b_1 could in principle be negative. Their argument is that higher business and household incomes that accompanies higher GDP could be used by financially conservative agents to pay down outstanding debt and increasingly finance acquisitions of tangible assets from internally generated funds. On the other hand when business profits and household incomes reflected in GDP fall, firms and households will borrow more from banks in order to smooth their expenditures on tangible assets. However, in the end these authors favor the traditional demand interpretation for $b_1>0$ and $b_2<0$ on the grounds that it is more consistent with the results actually obtained in most empirical studies of bank lending in Europe.

The second specification of bank lending emphasizes the capital budgeting aspects of bank investments in private loans. According to this view banks adjust their investments in loans in response to changes in the cash flows associated with the loan and their cost of capital. Since the cost of deposit finance is practically zero, we proxy the cost of capital of banks by their equity costs as reflected in their share price in the stock market. This view will be more consistent with a supply interpretation of bank lending in that changes in risk perceptions and risk aversion of bank shareholders could be expected to influence the supply of bank loans to the market. A shock induced increase in risk perceptions and/or risk aversion would cause bank shareholders to increase their required yield on bank shares as they re-price risk, and thereby reduce the market valuation of bank shares. The decline in bank share prices would then be the signal for bank managers to reduce their investments in risky private loans. The converse would

occur for a shock induced reduction in risk perceptions and/or risk aversion. The world-wide financial crisis in 2007 and 2008 associated with losses in the U.S. sub-prime mortgage market would seem to be consistent with this interpretation of bank lending. To allow for demand factors we proxy the expected cash flows on private loans with an index of general share prices that reflects the financial condition of bank loan customers. An increase in general share prices is associated with an increase in wealth of households along with profitable investments of bank loan customers resulting in an increase in the demand for loan finance.[7] A reduction in the index of general share prices would eventually result in a reduction in loan demand by bank loan customers. The linear specification for this stock market oriented view of bank lending is given by:

$$\Delta L = a_0 + a_1(SP,bk) + a_2(SP) + u \qquad 2)$$

where

(SP,bk) = The stock market valuation of bank equity shares.

(SP) = The stock market valuation of shares in general.

U = Random disturbance term.

The prediction from the capital budgeting theory is that a_1 and a_2 are positive.

To sum up we have two non-nested hypotheses on the linear regression specification for bank investments in private loans. They are:

$$\Delta L = a_0 + a_1(SP,bk) + a_2(SP) + u \qquad H1$$

$$\Delta L = b_0 + b_1(GDP) + b_2(R) + e \qquad H2$$

Our objective for the rest of this section is to see which of the two specifications provides the better explanation of the data on MFI (and in addition, commercial banks in the case of Germany) investments in private loans for France, Germany and the Euro area.

Before beginning it is important to note that even though Europe is usually characterized as a bank oriented financial system, there are important differences between the separate countries. For example Barth, Caprio, and Levine (2001) report that bank assets relative to GDP are twice as large in Germany than in France (313 percent versus 147 percent), and Germany has 3.9 banks per 100,000 people whereas France has only .6 banks per 100,000 people. The composition of bank assets and liabilities are also quite different between France and Germany. In this connection Barth, Nolle, and Rice (1997) report that the loan to asset ratio is .656 in Germany whereas it is only .346 in France. Similarly, the deposit to asset ratio is .428 in Germany and only .203 in France. These differences in the composition of MFI balance sheets might imply that bank lending in these two countries is not determined by the same set of explanatory variables. There are also data problems across the three geographical areas. Euro area data before 1999 is mostly reconstructed from the original 11 countries (Greece was included after

2000). The national contributions to Euro area data on GDP, interest rates, nominal loans, and the GDP deflator were aggregated up from the individual countries using the irrevocable fixed exchange rates at the end of 1998. For a description of the aggregation method used see Calza, Manrique, and Sousa (2003). Before 1990 Germany was two different countries. The measures for stock prices, GDP, the producer price index, private loans, and the interest rate were for West Germany before 1990 and for the united Germany after 1990. The Appendix on Data Sources describes the data used in this study in more detail.

B. Bank Lending In France

Table 1 presents the regression results for the two specifications of MFI investments in private loans in France, Δ(L,MFI). This variable is defined to be the change in the real stock of French MFI loans to the private sector. For the H1 specification, MFI investments in real private loans depends on the real market valuations of bank equity shares, (SP,bk), reflecting the cost of capital or required yield of bank shareholders. We also included as additional explanatory variables bank share prices squared, $(SP,bk)^2$, and a general stock price index variable. There are two reasons for including a general stock market variable in the loan investment regression. One reason is institutional. European banks including French banks hold equity shares in their portfolios. Variations in the market valuations of equity shares could have an independent wealth effect on the balance sheets of French MFI's and hence on their willingness (via changes in risk aversion) to supply loan finance to the private sector. A second reason is the one mentioned above reflecting demand factors in the market for loans. Changes in general share prices represents a cost of capital signal for a change in the demand for tangible assets by bank customers. These tangible assets have to be financed, and part of that financing will be provided by banks. The general stock market variable used in Table 1 is the real value of the SBF index of 250 French stocks traded on the Paris Bourse indicated in the regressions as (SP,250). We obtained roughly the same results for the CAC40 stock index. For the demand oriented H2 specification of bank lending the explanatory variables include an economic activity variable (reflecting business revenues and household income) like real GDP, and a real interest rate variable, R, reflecting the cost of loan finance to business. To both specifications we add a dummy variable, (DV2001:3,4), reflecting the attack on the financial district in New York in September 2001.[8] It is expected that the sign of this dummy variable is negative.

To sum up bank lending in France according to H1 depends on two stock market variables, (SP,bk) and (SP,250). According to H2 bank lending depends on (GDP) and (R). The next question is whether these explanatory variables are measured as levels or first differences. A related question is whether these explanatory variables are contemporaneous with Δ(L,MFI) or lagged. If they are lagged, how many quarters are they to be lagged? The following *sample specific* strategy will be used throughout this study to answer these questions of regression specification. Whether an explanatory variable is expressed as a level or a first difference along with the exact lag will be determined by a search for the "best" OLS specification of the two competing hypotheses. The "best" in this sense is in terms of the predicted signs from the two underlying theories and the statistical significance of the estimated coefficients, and the overall explanatory power of each specification as measured by the coefficient of determination. This strategy is implemented in order to give the underlying theory associated with each of the two

specifications the best possible chance to explain bank investments in private loans. For H1 the three stock market variables that yielded the best results were: i) the change in the real market value of bank share prices lagged four quarters, $\Delta(SP,bk)_{t-4}$, ii) the square of contemporaneous bank share prices $(SP,bk)^2$, and iii) the contemporaneous level of the real value of the French SBF index of 250 stocks, $(SP,250)_t$. As mentioned above the dummy variable (DV2001:3,4) is included as an explanatory variable to reflect the unexpected shock to the world financial system of the attack on New York. For the H2 specification we included the contemporaneous change in real GDP, $\Delta(GDP)_t$, and experimented with three measures of real interest rates all lagged four quarters. In H2i the real interest rate is the rate on business loans with an intermediate to long-term (1 to 5 year) maturity, $(R,LT)_{t-4}$, in H2ii the real interest rate was the rate on short-term business loans, $(R,ST)_{t-4}$, and finally in H2iii the real interest rate on marketable French treasury bills, $(R,T\text{-}bill)_{t-4}$. The latter is included to see whether the results are very different between administered rates like the short-term and long-term loan rates, and a market determined rate like the T-bill rate. When both the long-term and short-term interest rate variables were included in the same regression the estimated coefficient on the short rate was always positive (although not statistically significant). For that reason we did not include both interest rates in the same regressions reported in Table 1.

The top part of Table 1 reports the OLS estimates for the coefficients and the associated Newey-West t-scores/P-values along with the adjusted coefficient of determination and the Durbin-Watson statistic for both specifications of bank lending. In the table it can be seen that the estimated coefficients on $\Delta(SP,bk)_{t-4}$, $(SP,bk)_t^2$ and $(SP,250)_t$ are all positive as predicted by theory and all are statistically significant. Moreover, the CUSUM and CUSUM of Squares plots of the recursive residuals (not shown here) lie within the critical 5 percent significance lines indicating that we cannot reject the hypothesis that the estimated coefficients of the explanatory variables are stable over the sample period 1989/2-2006/4. This regression fails to reject the specification in H1. What about the three versions of H2? In Table 1 the estimated coefficients on $\Delta(GDP)_t$ and the three lagged real interest rate variables are respectively positive and negative as predicted by theory. Moreover the negative estimated coefficients on all three lagged interest rate variables are statistically significant. However while the positive estimated coefficient on $\Delta(GDP)_t$ in H2ii (where the cost of borrowing is measured by the short-term business loan rate) is statistically significant at the 5 percent level, the coefficients on $\Delta(GDP)_t$ are only statistically significant at the 8 percent and 10 percent level for the specifications in H2i and H2iii. The CUSUM and CUSUM of Squares plots of the recursive residuals also indicate that we are unable to reject the hypothesis that the estimated coefficients in all three versions of H2 are stable. On the basis of the statistical significance of the estimated coefficients and the adjusted coefficient of determination it would seem that H1 tracks the data on MFI investments in private loans somewhat better than H2.

A second way to compare H1 and H2 is to carry out the J-type of a non-nested hypothesis test developed by Davidson and MacKinnon (1981, 1993). In this test we first run the three regressions in H2 and collect the fitted values of $\Delta L(H2)$. In the second step these fitted values from the three versions of H2 are included as an explanatory variable in the regression H1. If the estimated coefficient on the fitted value $\Delta L(H2)$ is statistically significant, then reject H1. If the estimated coefficient on $\Delta L(H2)$ is not statistically significant, then we cannot reject H1. The procedure is then repeated for the three versions of H2 by running the regression in H1 and

taking the fitted values ΔL(H1) and including them in the second step as an additional explanatory variable in the three regressions for H2. If the estimated coefficient on the fitted value ΔL(H1) is statistically significant, then reject H2; otherwise fail to reject H2. Four outcomes are possible: i) reject H2, fail to reject H1; ii) reject H1, fail to reject H2; iii) reject both H1 and H2; and iv) fail to reject H1 and H2. If both H1 and H2 are rejected as in iii), then neither model is very useful in explaining bank lending. If it is not possible to reject both H1 and H2 as in iv, then the data are not rich enough to discriminate among the two specifications of bank lending. Finally, if one specification wins out over the other as in i) and ii), there always is the possibility that a third specification will overturn the winner.

The results of this J-test for the two specifications of bank lending in France are presented in the bottom half of Table 1. There it can be seen that the estimated coefficients on the fitted values of ΔL(H2) from two of the three H2 demand specifications of bank lending (i.e., H2ii and H2iii) are not significantly different from zero at the 5 percent level. In other words, the two lagged short-term interest rates in conjunction with the contemporaneous change in real GDP have very little effect on bank lending after taking into account the two stock market variables from H1. When the long-term interest rate is included with the change in real GDP as in H2i, then the fitted values from this specification of MFI lending are statistically significant at the 5 percent level but not the 1 percent level. On the other hand, the fitted values from the H1 regression, ΔL(H1), have a large effect on Δ(L,MFI) in all three versions of the H2 regressions in that the estimated coefficient on ΔL(H1) is close to unity and statistically significant at the 1 percent level. Therefore on the basis of these three J-tests and a significance level of 1 percent, the preponderance of the evidence suggests that we can reject the H2 specification of bank lending based on demand considerations, and fail to reject the H1 specification based on stock market valuations and the cost of capital of banks. In other words, our evidence over the sample period 1989/2-2006/4 suggest that the stock market oriented H1 explanation of bank investments in private loans seems to fit the data for France better than the demand oriented H2 explanation.

Still another way to test the difference between H1 and H2 is to carry out an "omitted variables" test. To do this we add the explanatory variables representing the demand for loans—i.e., $\Delta(GDP)_{t,}$ and the three lagged interest rate variables in H2—to the stock market variables in H1 to get an unrestricted regression for the H1 specification. It is then possible to see whether adding these two demand variables from H2 makes a significant contribution to explaining Δ(L,MFI) over and above the stock market explanatory variables from H1. The Null hypothesis is that the additional two demand regressors are not jointly significant and therefore do not belong in the H1 specification. The test for this is an F-statistic and an associated P-value. The results of the three omitted variables test for the H1 specification are as follows: 1) when adding $\Delta(GDP)_t$ and $(R,LT)_{t-4}$ to H1 the F-statistic is 2.16 and the P-value is .12; 2) when adding $\Delta(GDP)_t$ and $(R,ST)_{t-4}$ to H1 the F-statistic is 1.80 and the P-value is .17; and finally 3) when adding $\Delta(GDP)_t$ and $(R,T\text{-bill})_{t-4}$ to H1 the F-statistic is 1.73 and the P-value is .19. For all three specifications of the demand hypothesis in H2 the addition of the GDP variable and the three lagged interest rate variables to the stock market variables in H1 resulted in a failure to reject the Null hypothesis at the 5 percent level of significance. In other words, GDP and lagged interest rate variables are not omitted variables from the H1 stock market specification of MFI lending in France. On the other when the stock market variables $\Delta(SP,bk)_{t-4}$, $(SP,bk)_t^2$, and $(SP,250)_t$ from the H1 specification of MFI lending are added to the three versions of the H2 specification, we

can easily reject the Null that the additional stock market variables are not omitted variables. The F-statistics (and P-values) for H2i, H2ii, and H2iii are respectively 6.38 (.00), 7.68 (.00), and 9.71 (.00). The omitted variable test like the J-test rejects the H2 specification of MFI lending in France but doe not reject the H1 specification.

Before concluding the analysis of the factors determining French MFI's investments in loans to the private sector, it would be useful to consider other possible explanatory variables not particularly related to H1 and H2. In this connection it has sometimes been suggested that bank portfolio adjustments depends on the equity capital position of a bank, particularly since the introduction of the Basle Accord on risk-based capital requirements. The argument is that loans to the private sector are risky, and that a prudently regulated/managed bank should be well capitalized in order to absorb possible losses associated with investments in risky loans. If capital is impaired because of losses on risky loans then banks will substitute safe investments for risky loans where Basle type capital requirements are lower. For a sample of this literature on the relationship of bank lending and capital see Bernanke and Lown (1991), Lang and Nakamura (1995), Berger and Udell (1994), Peek and Rosengren (1995), Shrives and Dahl (1995), Editz, Michael, and Perraudin (1998), Wagster (1999), Borio, Furfine, and Lowe (2001), Estrella (2004), Pennacchi (2005), and Catarineu-Rabell, Jackson, and Tsomocos (2005). To test this proposition we will add an equity capital variable to the H1 and H2 specifications of bank lending. The prediction from this line of reasoning is that the sign of this coefficient should be positive. Our strategy will again be the sample specific one of letting the data define this equity capital variable. The starting point for this strategy is that the estimated coefficient on this equity capital variable must be positive. The best results from this perspective defined the equity capital variable to be the two quarter lagged change in the ratio of equity capital to total assets of French MFI's, or $\Delta(\text{Equity/A})_{t-2}$. The results of including this financing variable in the H1 and H2 specifications for bank lending in France are presented in Table 2. As can be seen from this table the inclusion of $\Delta(\text{Equity/A})_{t-1}$ contributes very little if anything to explaining investments in private loans by French banks. Moreover the estimated coefficients on $\Delta(\text{SP,bk})_{t-4}$, $(\text{SP,bk})^2$, and $(\text{SP250})_t$, $\Delta(\text{GDP})_t$, $(\text{R,LT})_{t-2}$, $(\text{R,ST})_{t-2}$, and $(\text{R,T-bill})_{t-2}$ in Table 1 were virtually unaffected. These results provide little support for the view that French MFI's substitute safe assets for risky loans when their equity capital falls.

In summary, an analysis of aggregate MFI investments in private loans over the period 1989/2-2006/4 indicates that the stock market view in H1 reflecting both the required yield of bank shareholders and the wealth effect of equity ownership captures the lending decisions of French banks better than the demand factors of GDP and interest rates in H2 used by many economists. In part C we will see whether this conclusion holds for German MFI's.

C. Bank Lending In Germany

The German economy is the largest in the Euro area. Germany is also the country most closely associated with a bank oriented financial system in the sense that banks are closely linked to non-financial enterprises. These links historically arose through their direct ownership of equity shares in non-financial companies and their indirect control over the voting rights of shares placed with them through trusteeships. This ownership and control of equity shares give

German banks a dominant position in that part of the supervisory boards elected by shareholders. As such banks in Germany have considerable influence over the management of non-financial enterprises in terms of their operating decisions and financing decisions. For these institutional reasons it would seem a priori that German banks should be more predisposed to accommodate their business loan customers, and hence the demand oriented theory of bank lending in H2 should fit the data on loans to the private sector better than the supply oriented theory in H1 based on the stock market.

The first comparison between H1 and H2 will cover the long time period 1974/1 to 2006/4. The best OLS specification for H1 (in the sense described above for France) is one where MFI investments in private loans, Δ(L,MFI), depends on the change in the real market value of bank share prices lagged two quarters, $\Delta(SP,bk)_{t-2}$ and the contemporaneous change in the real value of the CDAX index of general stock prices, $\Delta(SP,CDAX)_t$. The CDAX index of general share prices, like the (SP,250) in France, is included as an additional regressor because of the relatively large amount of equity shares owned by German banks. Changes in the market valuation of the CDAX share index can therefore be expected to have an important wealth affect on the balance sheets of German MFI's as well as possibly reflecting changes in the demand for consumption, investment, and financing of bank customers. According to the theory underlying the specification in H1, the estimated coefficients on both Δ(SP,bk) and (SP,CDAX) are expected to be positive. We also include in all specifications the dummy variable DV90 reflecting the reunification of East and West Germany in 1990. The coefficient on this dummy variable is expected to be positive. Curiously the attack on New York City in 2001 did not have an important affect on MFI lending in Germany as it did for France above and the Euro area below. Consequently no dummy variable for 2001 was included in the regression specifications of H1 and H2. For the traditional demand oriented theory of bank lending, H2, the "best" explanatory variables are the contemporaneous change in the percentage growth rate of real GDP, $\Delta(GDP\text{-}GR)_t$, and secondly the change in the average real interest rate on all debt securities issued by German residents lagged three periods, $\Delta(R, Ave)_{t-3}$. The dummy variable DV90 is also included in the H2 specification.

The first set of statistical results for the long sample period 1974/1 to 2006/4 is presented in Table 3. The first thing to note is that for both specifications there was a severe problem of first-order serial correlation in the residuals. The existence of serial correlation will not affect the estimated coefficients, but it will impart an upward bias to the estimated t-scores overstating the statistical significance of the estimated coefficients. To overcome this problem of serial correlation we implemented a Cochrane-Orcutt procedure that transforms the data in H1 and H2 with an AR(1) process. This AR(1) process is included in both H1 and H2 regressions. The cost of correcting the serial correlation problem with the Cochrane-Orcutt procedure is that we will not be able to use the CUSUM and CUSUM of Squares diagnostic to test for the intertemporal stability of the estimated coefficients or carry out an omitted variables test on the two specifications of MFI lending. In any event for the variables of interest in the H1 specification of MFI lending it can be seen that the estimated coefficients on $\Delta(SP,bk)_{t-2}$ and $\Delta(SP,CDAX)_t$ are both positive, and the Newey-West calculated t-statistics indicate that both estimated coefficients are statistically significant. These results are consistent with the stock market oriented theory of MFI lending. We had more difficulty verifying the H2 specification. The estimated coefficient on $\Delta(GDP\text{-}GR)_t$ while positive (as predicted by the demand oriented

theory) is only significant at the 13 percent level. The estimated coefficient on the interest rate variable, $\Delta(R,Ave)_{t-3,}$ is negative and statistically significant. This result is consistent with the demand oriented theory of bank lending. At this point the best OLS evidence for H2 seems less strong than the evidence for H1 in terms of the statistical significance of the estimated coefficients of the explanatory variables and the coefficient of determination. To analyze this further we carry out a non-nested hypothesis test between the two specifications in the bottom half of Table 3. Inserting the regression computed values of H2, $\Delta(L,H2)$, as an additional explanatory variable in H1 leads to a rejection of H1. Similarly inserting the regression computed values of H1, $\Delta(L,H1)$, as an additional explanatory variable in H2, leads to a rejection of H2. Neither specification does a particularly good job explaining German MFI investments in loans to the private sector.[9]

So far the dependent variable in the lending regressions has been the quarter to quarter change in the real stock of private sector loans outstanding for monetary financial institutions, $\Delta(L,MFI)$. Germany also has balance sheet data for the commercial bank component of MFI's. The commercial bank sector is the largest component of the MFI's in Germany. In Table 4 we test the two specifications of bank lending on the commercial bank sector over the period 1973/4 to 2006/4. Our strategy in picking the exact specifications for H1 and H2 is again to let the data determine the choice. For H1 the choice of explanatory variables yielding the best result was exactly the same as before; namely, $\Delta(SP,bk)_{t-2}$ and $\Delta(SP,CDAX)_{t}$. For H2 the best results were obtained using $(GDP\text{-}GR)_{t-2}$ and $\Delta(R,Ave)_{t-3}$. Both specifications include DV90. In the top half of Table 4 the regression results for the two specifications are presented. The first thing to note is that the Durbin-Watson statistic for both regressions indicates an absence of serial correlation in the residuals and consequently no Cochrane-Orcutt transformation is applied to the data. For the H1 specification it can be seen in the table that the estimated coefficients on both stock market variables are positive and statistically significant. This result is consistent with the stock market cost of capital view of bank lending. For H2 the estimated coefficients on $(GDP\text{-}GR)_{t-2)}$ and $\Delta(R,Ave)_{t-3}$ are respectively positive and negative which is also consistent with the demand theory underlying H2. In this specification the estimated coefficient on $(GDP\text{-}GR)_{t-2}$ is only statistically significant at the 13 percent level but the estimated coefficient on $\Delta(R,Ave)_{t-3}$ is significant at the one percent level. In addition the adjusted coefficient of determination while low for both specifications is 45 percent larger in H1 than H2. Finally, it is also the case that the CUSUM and CUSUM of Squares tests (not shown here) for both H1 and H2 indicates that the cumulative sum of the recursive residuals are within the 5 percent critical boundaries (although the residuals for H2 creep along the lower boundary) indicating that the estimated parameters are stable over the sample period. The evidence so far indicates that H1 is a somewhat better specification of bank lending in Germany than H2. To analyze this further we carry out a non-nested hypothesis test. The results of the non-nested hypothesis tests for these two specifications of bank lending are presented in the bottom half of the table. As can be seen from the table, H1 is not rejected when $\Delta(L,H2)$ is included as an additional regressor in the H1 regression. In other words, $\Delta(L,H2)$ is not a statistically significant regressor when included in the H1 regression. On the other hand, H2 is rejected when $\Delta(L,H1)$ is included as an additional explanatory variable in the H2 regression. On this criterion the H1 specification is superior to the H2 specification of bank lending. However as in all statistical tests there is always the possibility that some H3 specification will supplant H1.

To test our results further we carry out an omitted variable test on our H1 specification. In this connection we add the explanatory variables $(GDP\text{-}GR)_{t-2}$ and $\Delta(R,Ave)_{t-3}$ to the H1 specification to get an unrestricted regression for the H1 specification. The output of this test is an F-statistic and an associated P-value testing whether the estimated coefficients on these two additional regressors from H2 are jointly zero. When adding $(GDP\text{-}GR)_{t-2}$ and $\Delta(R,Ave)_{t-3}$ to the regression in H1 we obtain an F-statistic of 1.35 and P-value of .26. We therefore reject (at the 5 percent level) the hypothesis that these measures of output/income and interest rates are omitted variables from the H1 specification. On the other hand when $\Delta(SP,bk)_{t-2}$ and $\Delta(SP,CDAX)$ are included in the H2 specification the F-statistic is 10.06 and the P-value is .00 indicating that these two stock market variables are omitted variables from the H2 specification. These results are also consistent with the hypothesis that commercial bank investments in private loans are relatively better described by H1 compared to H2.

Finally, we add to both the H1 and H2 specifications of financial intermediary lending an equity leverage variable to see whether financing considerations enter the portfolio decisions of MFI's and commercial banks in Germany. As was the case for France the best measure of this equity leverage variable (in terms of the predicted sign of the coefficient and its statistical significance) in Germany turned out to be $\Delta(Equity/A)_{t-1}$. The results are presented in Table 5. The top part of the table displays the results for MFI's. As can be seen the estimated coefficient on $\Delta(Equity/A)_{t-1}$ for the H1 and H2 specifications of MFI lending is positive. In the case of H1 the estimated coefficient on $\Delta(Equity/A)_{t-1}$ is not significantly different from zero at the 5 percent level of significance although it is at the 7 percent level. For H2 the positive coefficient on $\Delta(Equity/A)_{t-1}$ is significantly different from zero at the 5 percent level. In the bottom part of Table 5 we present the results for commercial banks. There it can be seen that the positive estimated coefficient on $\Delta(Equity/A)_{t-1}$ for both the H1 and H2 specification is statistically different from zero. The equity leverage ratio does seem to be a significant explanatory variable in regressions explaining MFI and commercial bank investments in private loans in Germany.[10] This is not the result we obtained for France. One reason for this difference might be that French MFI's have both a smaller proportion of their assets invested in risky loans (42.6 percent versus 61.6 percent) and a thicker equity cushion (8.9 percent of total assets versus 3.9 percent) than German MFI's over their respective sample periods. From this perspective German MFI's seem to be carrying more portfolio risk and financial risk than French MFI's thus necessitating German financial institutions to more closely link their investments in risky private loans to their equity leverage ratio.

The results of our comparison between the demand oriented H2 specification of bank lending and the stock market H1 specification of bank lending in Germany are somewhat mixed. For the broader set of monetary financial institutions neither specification worked very well. Part of the problem might be related to the serial correlation in the residuals of both regressions. This problem might also be related to the splicing of the pre-unification data on loans with the post-unification loan data. We did however achieve some success for the commercial bank sector, the largest sector within the monetary financial institutions. There we were able to reject the H2 demand oriented specification of bank lending and unable to reject the H1 stock market cost of capital specification of bank lending. Whether the positive estimated coefficient on the lagged valuations of bank stock is reflecting supply factors, or, demand and supply factors in the bank loan market remains an open question. On the other hand, it would seem that the positive

estimated coefficient on the valuations of shares in general (i.e., the CDAX index) held by banks in their portfolios would reflect a wealth induced risk aversion affect that works primarily through the supply side of the market. Even though customer relationships are very important in a bank-based financial system like that in place in Germany, it would appear that stock market valuations play an important role in determining the portfolio decisions of commercial banks.

D. The Euro Area

Up to this point we have looked at two large individual countries in the Euro area. Now we will look at the entire Euro area defined as the original 11 countries. Unfortunately the lack of long time series data is particularly severe for the Euro area. Moreover some of the data used in the tests below are not official data generated by the European Central Bank (ECB), but instead by ECB economists working on problems and issues in the EU. The end result is that fewer empirical tests will be performed for the Euro area than for France and Germany above. In particular there is no published data on the total assets and equity capital of Euro area banks. For that reason we cannot test whether capital requirements are an effective determinant of bank lending.

In comparing the two specifications of bank lending for the Euro area the same strategy will be employed that was used for France and Germany. The first step is to find the best OLS regression specification (in terms of the variables, levels versus first differences, and the exact lag) for the two non-nested hypotheses H1 and H2. The criterion again is to only consider specifications where the estimated coefficients on the explanatory variables have the signs predicted from the two underlying theories. From this set of specifications we took the ones to represent H1 and H2 that had the highest explanatory power in terms of the coefficient of determination. In the second step we perform a J-test on H1 and H2 to see whether it is possible to reject one of the two specifications. For H1 the bank stock market variable that met this criterion was the level of real bank share prices lagged one quarter, or $(SP,bk)_{t-1}$. The general stock market variable was measured by the change in the real MSCI EU stock price index lagged one quarter, $\Delta(SP,MSCI)_{t-1}$. The prediction from the underlying theory is that the estimated coefficients for both stock market variables will be positive. For the demand oriented H2 hypothesis the best result was obtained for the specification where bank lending depended on the change in GDP lagged two quarters, $\Delta(GDP)_{t-2}$, and the level of real interest rates on the composite lending rate of banks in the original 11 Euro countries lagged one quarter, $(R,Loan)_{t-1}$. The prediction from the demand oriented theory is that the estimated coefficient on the GDP variable will be positive and the estimated coefficient on the interest rate variable will be negative. Along side these explanatory variables for both specifications we also included a dummy variable for the first quarter of 1990 to reflect the historic reunification of East and West Germany, and the third and fourth quarters of 2001 to reflect the attack on the twin towers of the World Trade center in New York City. The expectation is that the estimated coefficient will be positive on DV90 and negative on DV2001/3,4.

The OLS results for both H1 and H2 are presented in the top half of Table 6. There it can be seen that the regression results provide support for both specifications of bank lending. For H1 the estimated coefficient on lagged real bank share prices, $(SP,bk)_{t-1,}$ is positive and statistically

significant. Similarly, the estimated coefficient on $\Delta(SP,MSCI)_{t-1}$ is also positive and statistically significant. These results are consistent with the theory underlying H1. The Durbin-Watson statistic indicates an absence of first-order serial correlation in the residuals and the CUSUM and CUSUM of Squares tests indicates that we cannot reject the hypothesis that the estimated coefficients in H1 are stable over the sample period 1987/1 to 2006/2. The same is more or less true for H2. The estimated coefficient on $\Delta(GDP)_{t-1}$ is positive while the estimated coefficient on $(R,Loan)_{t-1}$ is negative. Both estimates are statistically significant and both are consistent with the demand oriented theory underlying H2. Moreover as was the case with H1 the Durbin-Watson statistic indicates an absence of first-order serial correlation among the residuals, and the CUSUM and CUSUM of Squares plots of the recursive residuals all (with the exception of the year 2005 for the CUSUM of Squares plot) lie within the 5 percent upper and lower boundaries indicating that the estimated coefficients are approximately stable over the sample period. The only difference is that the adjusted coefficient of determination is almost 40 percent higher for H1 than H2.

The bottom half of Table 6 presents the results of the J-test version of the non-nested hypothesis test. There it can be seen that the estimated coefficient on the fitted values from the regression for H2, $\Delta(L,H2)$, when included as an explanatory variable in the regression for H1 are not significantly different from zero. In other words, the fitted variable $\Delta(L,H2)$ has no affect on $\Delta(L,MFI)$ after taking into account the stock market variables $(SP,bk)_{t-1}$ and $\Delta(SP,MSCI)_{t-1}$. We therefore cannot reject H1. Next this procedure is reversed by including in regression H2 the computed values of $\Delta(L,H1)$. The estimated coefficient on $\Delta(L,H1)$ in regression H2 is close to unity and statistically significant. What this says is that adding $\Delta(L,H1)$ in the regression H2 essentially accounts for all the explained variation in $\Delta(L,MFI)$. We therefore reject the specification for bank lending in H2. Of course it is necessary to again point out that the specification for some third hypothesis might beat the specification in H1.

The final specification test for comparing H1 to H2 for the Euro area is to carry out an omitted variables test. To do this we add $\Delta(GDP)_{t-2}$ and $(R,Loan)_{t-1}$ to the regression specification in H1. The F-statistic generated by this test is 1.04 with a P-value of .36. We therefore reject (at the 5 percent level) the hypothesis that these two demand variables are omitted variables from the specification given in H1. On the other hand adding $(SP,bk)_{t-1}$ and $\Delta(SP,MSCI)_{t-1}$ to the specification given in H2 yields an F-statistic of 10.83 and a P-value of .00 indicating that these two stock market variables are omitted variables from the H2 specification of bank lending. These results for the omitted variables test reinforce the results obtained in the J-tests. Our empirical work suggests that for the entire Euro area the stock market does a better job tracking MFI investments in private loans over the 1988:3 to 2006:2 time period than the more traditional demand factors.

III. Summary and Conclusion

In this study we compare two hypotheses on the determinants of bank investments in private loans in France, Germany, and the combined Euro area. Economic theory asserts that the factors underlying the supply of and demand for bank loans determine both the quantity and price of bank loans. This traditional view of the bank loan market has been modified by a

number of researchers to accommodate certain institutional features of the European financial system. These institutional features center on the close relationship between banks and their customers that are developed over long periods of time. As a result of these close long-term relationships European banks go to great lengths to accommodate their borrowing customers. For this reason supply considerations are usually set aside when analyzing the European bank loan market and attention is focused on the factors determining the demand for loans by borrowers. Typically this involves finding proxies for firm and household income (reflecting the ability to pay interest and repay the loan at maturity) along with the cost of bank borrowing. The H2 specification of bank lending proxies these variables with GDP and various measures of the interest rates. Previous empirical studies and the ones carried out here were for the most part unable to reject the H2 specification of bank lending in France, Germany, and the Euro area when that was the only hypothesis on the table. This paper proposed an alternative hypothesis of bank lending and then proceeded to compare it with the more traditional H2 hypothesis. The view taken here was that bank investments in private loans, like investments in any capital asset undertaken by firms in general, have to meet a cost of capital hurdle. That cost of capital hurdle in this paper was proxied by the market valuation of bank equity shares. Moreover banks in Europe hold equity securities in their portfolios. For that reason we also included as an explanatory variable the market valuation of equity securities in general since changes in the market valuations of these securities can have a wealth affect on the willingness of European banks to supply loan finance to the market. An alternative interpretation for the inclusion of an index of general stock prices is that changes in general stock valuations affect the demand for assets by both households (as owners of equity shares) and firms (as issuers of equity shares), and ultimately the financing of those assets. Part of this financial requirement will be supplied by banks. This stock market/capital budgeting hypothesis was labeled H1. These two hypotheses were then compared using non-nested hypothesis techniques. For the most part the results indicated that we were able to reject the more traditional demand oriented bank lending hypothesis in H2, but unable to reject the stock market/capital budgeting view of bank lending in H1. Omitted variables tests reinforced this conclusion. GDP and interest rates on loans were found not to be omitted variables in the H1 specification of bank lending, but share valuations were found to be omitted variables in the H2 specification. Of course this is not to say that there is not some potential third hypothesis H3 of bank investments in private loans that could beat H1. Whether that potential H3 would be devoid of some role for the equity markets is problematic. One potential H3 examined in this paper was to add an equity leverage variable, Δ(Equity/A), to both the H1 and H2 specifications. The reason for adding an equity leverage variable is that these ratios are now part of the regulatory background within which banks operate. The results of this experiment were interesting. For France the addition of this explanatory variable in the OLS specifications of H1 and H2 had no material effect on bank investments in private loans. For Germany the case was quite different in that the addition of this equity leverage variable had a material effect on bank lending. Bank lending in Table 5 was shown to be positively related to $\Delta(\text{Equity/A})_{t-1,}$ and that positive relationship was statistically significant. One possible reason for the difference between France and Germany is that French banks were observed to have a more conservative portfolio (eg., a smaller proportion of their assets invested in risky loans) and were more heavily capitalized with equity finance than their German counterparts. For France the regulatory equity leverage constraint is far from binding. On the other hand German banks in the aggregate seemingly pursue riskier portfolio strategies

and financial strategies and are therefore closer to the point where the regulatory constraint on capital is binding.

Before concluding it might be useful to ask whether there are any possible implications the model in H1 might have for the conduct of monetary policy in moderating fluctuations in real economic activity. According to this model banks adjust their investments in loans to the private sector in response to changes in equity share valuations as their investors reassess and re-price risk following an external shock in the environment. First comes the external shock, next the stock market response to the shock, and then the lagged investment response of nonfinancial firms and banks to changes in equity market valuations. Bank lending decisions change the budget constraints of the private sector and therefore the demand for real output. If fluctuations in bank lending amplify fluctuations in the demand for real output, then perhaps the Central Bank might want to consider ways of stabilizing bank share prices. One possibility here would be for the Central Bank to carry out open market transactions in a well diversified portfolio of a non-managed mutual fund containing bank shares.[11] The idea would be to change the level of share prices but leave the structure of relative bank share prices unchanged. Of course government purchases of equity shares are not without precedent. The governments of Hong Kong, South Korea, and Kuwait are recent examples of cases where governments purchased equities to prop up a sagging stock market. Other possibilities would include cyclically varying margin requirements on stock purchases for all investors; raising margins when stock prices are high and lowering them when prices are low. While it is premature to recommend these kinds of policy changes on the basis of the results obtained in this paper, it is not premature to call for future research in this important area.

In closing there has been much research indicating that there are important differences between the financial systems in Europe and the U.S., and the way corporate investments are financed in those countries. The former is classified by this research as a bank-based financial system and the latter a stock market oriented financial system. Aggregates of bank deposits, bank assets, and stock market valuations all relative to GDP and world aggregates of these variables lend support to the view that Europe is different than the U.S. In stock market oriented financial systems capital budgeting theories tell us that real corporate investment should respond to changes in the stock market valuations of real corporate earnings. The job of the public corporation is to generate a rate of return on their assets that is at least equal to the required rate of return of their investors. It should be no different for banks. In financial systems where bank loans provide a relatively large share of the financing of real corporate investment, the question arises as to how banks should make their lending decisions. It would seem that if capital budgeting rules can evaluate the cash flows associated with tangible assets, they could in principle be used to evaluate the cash flows associated with bank loans. Under these conditions bank lending should then respond to changes in the market valuations of bank stock. Our research indicates that the banks in Europe are in fact guided by the stock market when it comes to determining their investments in private loans. In this sense it might be said that Europe is also a stock market oriented financial system.

END NOTES

1. The theoretical literature on the link between finance and growth goes back at least to Schumpater (1934). Modern empirical work on the link begins with King and Levine (1993). Since then the production of papers in this area has itself become a growth industry. A mid-1990's review of this large literature can be found in Levine (1997) and a more recent update in Levine (2005). On the other hand there is a minority view that questions the direction of causation (eg., Robinson, 1952; and Manning, 2003). There also is the view that the finance/growth link is becoming weaker over time for developed countries like the U.S. For evidence on this see Acemoglu, Johnson, and Robinson (2001), Rioja and Valev (2004), and Rousseau and Wachtel (2006).

2. A small sample of this research would include Berger and Udell (1993, 1995, and 1996), Nakamura !993, Peterson and Rajan (1994), and the review by Berger and Humphrey (1998).

3. Early empirical research on the stock market value of a bank relationship includes James (1987), Slovin, Sushka, and Hudson (1988), James and Wier (1990), Slovin and Young (1990), and Hirshey, Slovin, and Zaima (1990). For more recent research see Ongena, Roscovan, and Werker (2007).

4. This line of research was initiated by LaPorta, Lopez-de-Silanes, Shleifer, and Vishny (1998, 1999, and 2000). Other contributions in this area include Levine (2002) and Chakraborty and Ray (2006) among others.

5. For an early attempt of estimation in this direction see Krainer (1969).

6. In Krainer (2003, pp.293-294) (2008) a model is developed where stockholders make the asset or portfolio adjustments for U.S. banks and depositors/regulators make the financing decisions. In that model bank share prices determine the mix between bank loans and securities held in bank portfolios.

7. Although as mentioned above a change in general share prices could also have a balance sheet/wealth affect on bank lending since European banks hold equities in their portfolios. In the U.S. banks are not allowed to hold equities in their portfolios. In a study of the determinants of bank portfolio adjustments (between loans and securities) Krainer (2008) found that including an index of nonfinancial common stock prices as an independent variable in a regression explaining bank investments in private loans while in most cases was positively related to bank lending, the estimated coefficient was never statistically significant. This would suggest that bank lending was not much affected by the demand factor measured by changes in nonfinancial firms share prices.

8. Curiously the reunification of Germany had no material effect on French MFI lending to the private sector. For that reason no dummy variable was included in the regressions for that year.

9. An alternative strategy to implementing a Cochrane-Orcutt procedure to address the serial correlation problem is to instead include a lagged value of the dependent variable as a regressor in the Table 3 regressions for H1 and H2. The interpretation of the coefficient on this regressor would be a measure of the speed of adjustment in MFI loans. The J-test results for this specification turned out to be the same as those reported in Table 3; namely, we rejected both H1 and H2.

10. We also carried out a non-nested hypothesis test for both the change in MFI loans and the commercial bank sector loans using the two specifications in Table 5. The results were the same as those presented in Tables 3 and 4. For MFI's the t-statistics/P-values on the estimated coefficients for Δ(L,H2) is 6.15/.00, and for Δ(L,H1) they are 9.39/.00. We therefore reject both the H1 and H2 specifications for MFI lending which was the same result we obtained in Table 3. For the commercial banking sector the t-statistics/P-values on the estimated coefficients for Δ(L,H2) is 1.24/.22 while for Δ(L,H1) it is 4.47/.00. As in Table 4 we therefore fail to reject the H1 specification of bank lending, but reject the H2 specification for the commercial banking sector.

11. For a discussion of the pros and cons of including equities in open market operations of the Central Bank see Krainer (2003, pp.285-288). Tobin and Brainard (1977) and Fischer and Merton (1984) have also advocated for open market operations in equities.

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APPENDIX ON DATA SOURCES

FRANCE

MFI= Monetary financial institutions excluding the Banque de France and mutual funds. MFI's include resident credit institutions and other resident credit institutions that issue deposits and/or close substitutes, and grant credit and/or make investments in securities.

(L,MFI)= The stock of MFI loans outstanding to other euro area residents. This variable is deflated by the French consumer price index. Source: Banque de France. Pre-1999 data converted into euros at the fixed irrevocable exchange rate between French francs and euros.

(Equity)= The total stock of equity capital and reserves of French MFI's. Source: Banque de France. Pre-1999 data converted at the fixed irrevocable exchange rate between French francs and euros.

A= The stock of total assets of MFI's in France. Source: Banque de France. Pre-1999 data converted at the fixed irrevocable exchange rate between French francs and euros.

(SP,bk)= Quarterly index of French bank share prices deflated by the consumer price index in France. Source: Datastream, Code: SBFNNKZ.

(SP,250)= Quarterly index of general share prices of 250 stocks traded on the Paris bourse. This stock series was deflated by the consumer price index in France. Source: Datastream, Code: FSBF250.

(GDP)= Real gross domestic product in France. Nominal GDP was deflated by the consumer price index for France. Source: Banque de France.

(R,LT)= Real interest rate on medium to long-term loans to business. The nominal interest rate was deflated by the percentage rate of change in the French consumer price index. Monthly rates were averaged to obtain quarterly rates. Source: Banque de France, Business Conditions Division.

(R,ST)= Real interest rate on overdraft facilities. The nominal rate was deflated by the percentage rate of change in the French consumer price index. Monthly rates were averaged to obtain quarterly rates. Source: Banque de France, Business Conditions Division.

(R,T-Bill)= Real interest rate on French T-bills. The Nominal rate was deflated by the percentage rate of change in the French consumer price index. Monthly rates were averaged to obtain quarterly rates. Source: Banque de France, Business Conditions Division.

GERMANY

MFI= Monetary financial institutions excluding the Deutsche Bundesbank and mutual funds. These are financial institutions that issue deposits or close substitutes for deposits, and grant credit and/or make investments in securities.

(L,MFI)= The stock of MFI loans outstanding to non-MFI borrowers. This variable is deflated by the German producer price index (2000=100) seasonally adjusted. Source: Deutsche Bundesbank, Time series key OU0083. Pre-1999 data converted at the fixed irrevocable exchange rate between DM's and euros.

(L,Banks)= The stock of commercial bank loans outstanding to non-MFI borrowers. This variable is deflated by the German producer price index.seasonally adjusted. Commercial banks comprise the sub-group of big banks, regional banks, other commercial banks, and branches of foreign banks. Source: Deutsche Bundesbank, Time series key OU0783. Pre-1999 data converted at the fixed irrevocable exchange rate between DM's and euros.

(A,MFI)= The stock of total assets of MFI's. Source: Deutsche Bundesbank, Time series key: OU0308. Pre-1999 data converted at the fixed irrevocable exchange rate between DM's and euros.

(A,Banks)= The stock of total assets of commercial banks. Source: Deutsche Bundesbank, Time series key: OU0749. Pre-1999 data converted at the fixed irrevocable exchange rate between DM's and euros.

(Equity)= Total equity capital. For MFI's this variable was obtained from the Deutsche Bundesbank, time series key OU0322. For commercial banks this variable was obtained from the Deutsche Bundesbank, time series key OU1543. Pre-1999 data converted at the fixed irrevocable exchange rates between DM's and euros.

(SP,bk)= Quarterly index of large German bank share prices deflated by the German producer price index. Source: Datastream, DS banks, Code BANKSBD (PI).

(SP,CDAX)= The CDAX stock price index of all ordinary and preference shares officially listed on the Frankfurt stock exchange of companies domiciled in Germany. The series is deflated by the German producer price index. Source: Deutsche Bundesbank S 300, Time series key WU 001a.

(GDP-GR)= The percentage quarter to quarter change in the chain linked index of real GDP in Germany. For 1974-1990 the data was for West Germany. For 1991-2006 the data was for the unified Germany. Source: Deutsche Bundesbank, Time series key jbb000.

(R,Ave)= The average yield on German debt securities of all maturities. Monthly data were averaged to obtain quarterly data. The average yields were deflated by the percentage change in the German producer price index. Source: Deutsche Bundesbank, Time series key WU0017.

EURO AREA

MFI= Monetary institutions excluding central banks and mutual funds in the Euro area. MFI's include resident credit institutions and other financial institutions who issue deposits and/or close substitutes, and grant credit and/or make investments in securities.

(L,MFI)= The stock of MFI loans outstanding to other Euro area residents deflated by the GDP deflator. Source: ECB *Monetary Statistics*, October 2006, pp. 1C*-6C*.

(SP,bk)= The quarterly stock price index of Euro area banks deflated by the Euro area GDP deflator. Source: Datastream, EU-DS Banks; Code, BANKSEU.

(SP,MSCI)= The quarterly MSCI European Union general stock price index deflated by the Euro area GDP deflator. Source: Datastream.

(R,loan)= The composite lending rate of banks in the original 11 Euro countries. This lending rate was deflated by the GDP deflator for the Euro area. Source: Unofficial data provided to the author by the European Central Bank.

(GDP)= Real gross domestic product for the Euro area. Source: Unofficial data provided to the author by the European Central Bank.

Table 1
FRANCE
Quarterly: 1989:2 to 2007:1

$$\Delta(L,MFI)_t = -1087.368 + 86.534\Delta(SP,bk)_{t-4} + 0.312(SP,bk)^2_t + 236.254(SP,250)_t - 1379.583(DV,2001{:}3,4) \quad \textbf{H1}$$
(-3.16/.00) (3.28/.00) (3.22/.00) (3.91/.00) (-3.37/.00)

$\bar{R}^2 = 0.50$ DW = 1.77

$$\Delta(L,MFI)_t = 2164.139 + 199.482\Delta(GDP)_t - 266.147(R,LT)_{t-4} - 593.234(DV,2001{:}3,4) \quad \textbf{H2i}$$
(3.34/.00) (1.78/.08) (-3.76/.00) (-1.17/.25)

$\bar{R}^2 = 0.33$ DW = 1.62

$$\Delta(L,MFI)_t = 2033.997 + 222.876\Delta(GDP)_t - 233.403(R,ST)_{t-4} - 460.237(DV,2001{:}3,4) \quad \textbf{H2ii}$$
(2.99/.00) (2.02/.05) (-3.40/.00) (-0.90/.37)

$\bar{R}^2 = 0.31$ DW = 1.58

$$\Delta(L,MFI)_t = 1455.949 + 199.128\Delta(GDP)_t - 205.824(R,T\text{-}bill)_{t-4} - 414.840(DV,2001{:}3,4) \quad \textbf{H2iii}$$
(2.58/.01) (1.69/.10) (-3.15/.00) (.81/.42)

$\bar{R}^2 = 0.28$ DW = 1.51

J-Test Results

$$\Delta(L,MFI)_t = -659.795 + 90.464\Delta(SP,bk)_{t-4} + 0.221(SP,bk)^2_t - 106.066(SP,250) - 697.281(DV,2001{:}3,4) + 0.524\Delta(L,H2i)$$
(-1.60/.11) (3.45/.00) (1.70/.09) (1.00/.32) (-0.92/.36) (2.01/.05)

$$\Delta(L,MFI)_t = 332.232 + 118.913\Delta(GDP)_{t-4} - 61.584(R,LT)_{t-4} + 59.694(DV,2001{:}3,4) + 0.817\Delta(L,H1)$$
(0.52/.60) (1.41/.16) (-0.82/.42) (0.08/.93) (4.27/.00)

Table 1 (Continued)

$$\Delta(L,MFI)_t = -759.759 + 91.116\Delta(SP,bk)_{t-4} + 0.239(SP,bk)^2_t + 130.883(SP,250)_t - 815.110(DV,2001{:}3,4) + 0.446\Delta(L,H2ii)$$
(-1.89/.06) (3.45/.00) (1.86/.07) (1.26/.21) (-1.08/.28) (1.76/.08)

$$\Delta(L,MFI)_t = 155.637 + 125.103\Delta(GDP)_t - 37.603(R,ST)_{t-4} + 134.689(DV,2001{:}3,4) + 0.862\Delta(L,H1)$$
(0.26/.80) (1.49/.14) (-.57/.57) (.19/.85) (-4.57/.00)

$$\Delta(L,MFI)_t = -845.105 + 89.388\Delta(SP,bk)_t + 0.272(SP,bk)^2 + 147.654(SP,250)_t - 917.771(DV,2001;3,4) + 0.384\Delta(L,H2iii)$$
(-2.20/.03) (3.38/.00) (2.18/.03) (1.48/.15) (-1.25/.22) (1.66/.10)

$$\Delta(L,MFI)_t = 50.207 + 119.911 - 32.022(R,T\text{-}bill)_{t-4} + 147.939(DV,2001{:}3,4) + 0.877\Delta(L,H1)$$
(.12/.91) (1.40/.17) (-.57/.57) (.21/.83) (5.39/.00)

$R,^{-2}$ = Adjusted coefficient of determination.
DW= Durbin-Watson statistic.
Newey-West computed t-scores and p-values are given in the parentheses beneath the estimated coefficients.

Table 2
FRANCE
Quarterly: 1989:2 to 2007:1

$$\Delta(L,MFI)_t = -1084.521 + 85.401\Delta(SP,bk)_{t-4} + 0.315(SP,bk)^2_t + 233.780(SP,250)_t - 1351.301(DV,2001{:}3,4) + 16386.77\Delta\left(\frac{Equity}{A}\right)_{t-2}$$

(-3.16/.00) (3.13/.00) (3.28/.00) (3.91/.00) (-3.21/.00) (.31/.76)

$\bar{R}^2 = 0.50$ DW = 1.78

$$\Delta(L,MFI)_t = 2166.149 + 197.271\Delta(GDP)_t - 269.182(R,LT)_{t-4} - 511.972(DV,2001{:}3,4) + 57848.66\Delta\left(\frac{Equity}{A}\right)_{t-2}$$

(3.31/.00) (1.77/.08) (-3.75/.00) (-0.99/.32) (1.35/.18)

$\bar{R}^2 = 0.34$ DW = 1.64

$$\Delta(L,MFI)_t = 2038.554 + 220.668\Delta(GDP)_t - 236.607(R,LT)_{t-4} - 377.279(DV,2001{:}3,4) + 58710.00\Delta\left(\frac{Equity}{A}\right)_{t-2}$$

(2.96/.00) (2.01/.05) (-3.40/.00) (-0.73/.47) (1.35/.18)

$\bar{R}^2 = 0.31$ DW = 1.60

$$\Delta(L,MFI)_t = 1463.470 + 195.232\Delta(GDP)_t - 210.665(R,T\text{-}bill)_{t-4} - 328.196(DV,2001{:}3,4) + 63563.74\Delta\left(\frac{Equity}{A}\right)_{t-2}$$

(2.58/.01) (1.67/.10) (-3.17/.00) (-0.63/.53) (1.44/.15)

$\bar{R}^2 = 0.28$ DW = 1.53

$\bar{R}^2$ = Adjusted coefficient of determination.
DW= Durbin-Watson statistic.
Newey-West computed t-scores and p-values are given in the parentheses beneath the estimated coefficients.

Table 3
GERMANY
Quarterly: 1974:1 to 2006:4

$$\Delta(L,MFI)_t = 17.318 + 0.253\Delta(SP,bk)_{t-2} + 0.379\Delta(SP,CDAX)_t + 106.047(DV,90) \quad \textbf{H1}$$
(3.85/.00) (3.56/.00) (2.46/.02) (38.43/.00)

$R,^{-2} = 0.36$ DW = 2.20 AR(1) = 0.47

$$\Delta(L,MFI)_t = 17.468 + 1.385\Delta(GDP - GR)_t - 16.530\Delta(R,Ave)_{t-3} + 95.423(DV,90) \quad \textbf{H2}$$
(3.71/.00) (1.53/.13) (-2.75/.01) (18.26/.00)

$R,^{-2} = 0.32$ DW = 2.20 AR(1) = 0.48

J – Test Results

$$\Delta(L,MFI)_t = -4.768 + 0.175\Delta(SP,bk)_{t-2} + 0.135\Delta(SP,CDAX)_t - 14.976(DV,90) + 1.229\Delta(L,H2)$$
(-1.51/.13) (2.46/.02) (1.27/.21) (-.54/.59) (8.43/.00)

$$\Delta(L,MFI)_t = -2.386 + 1.325\Delta(GDP - GR)_t - 9.850\Delta(R,Ave)_{t-3} - 3.823(DV,90) + 1.094\Delta(L,H1)$$
(-.73/.47) (.72/.47) (-2.16/.03) (-.13/.90) (7.37/.00)

$R,^{-2}$ = Adjusted coefficient of determination.
DW= Durbin-Watson statistic.
Newey-West computed t-scores and p-values are given in the parentheses beneath the estimated coefficients.

Table 4
GERMANY
Quarterly: 1973:4 to 2006:4

$$\Delta(L,Banks)_t = 4.180 + 0.132\Delta(SP,bk)_{t-2} + 0.180\Delta(SP,CDAX)_t + 83.077(DV,90) \quad \textbf{H1}$$
(3.60/.00) (2.91/.00) (2.04/.04) (70.42/.00)

$R,^{-2} = 0.29$ DW = 2.21

$$\Delta(L,Banks)_t = 3.553 + 2.119(GDP - GR)_t - 2.665\Delta(R,Ave)_{t-3} + 81.087(DV,90) \quad \textbf{H2}$$
(2.66/.01) (2.13/.04) (-1.63/.11) (52.23/.00)

$R,^{-2} = 0.20$ DW = 2.10

J – Test Results

$$\Delta(L,Banks)_t = -0.056 + 0.126\Delta(SP,bk)_{t-2} + 0.184\Delta(SP,CDAX)_t + 8.402(DV,90) + 0.902\Delta(L,H2)$$
(-0.02/.99) (2.93/.00) (2.97/.00) (0.166/.87) (1.52/.13)

$$\Delta(L,Banks)_t = -1.161 + 2.242(GDP - GR)_t - 1.089\Delta(R,Ave)_{t-3} - 2.015(DV,90) + 1.004\Delta(L,H1)$$
(-0.67/.50) (1.63/.10) (-0.41/.68) (-0.09/.93) (4.50/.00)

$R,^{-2}$ = Adjusted coefficient of determination.
DW= Durbin-Watson statistic.
Newey-West computed t-scores and p-values are given in the parentheses beneath the estimated coefficients.

Table 5
GERMANY
Quarterly: 1974:3 to 2006:4

$$\Delta(L,MFI)_t = 17.521 + 0.234\Delta(SP,bk)_{t-2} + 0.388\Delta(SP,CDAX)_t + 4188.863\Delta\left(\frac{Equity}{A}\right)_{t-1} + 102.328(DV,90)$$

(3.74/.00) (3.12/.00) (2.42/.02) (1.85/.07) (39.12/.00)

$\bar{R}^2 = 0.36$ DW = 2.13 AR(1) = 0.50

$$\Delta(L,MFI)_t = 17.488 + 1.183\Delta(GDP - GR)_{t-2} - 17.127\Delta(R,Ave)_{t-3} + 4726.387\Delta\left(\frac{Equity}{A}\right)_{t-1} + 90.397(DV,90)$$

(3.46/.00) (1.44/.15) (-2.71/.01) (2.14/.03) (18.82/.00)

$\bar{R}^2 = 0.33$ DW = 2.09 AR(1) = 0.53

$$\Delta(L,Banks)_t = 4.328 + 0.116\ \Delta(SP,bk)_{t-2} + 0.191\Delta(SP,CDAX)_t + 2051.596\Delta\left(\frac{Equity}{A}\right)_{t-1} + 74.954(DV,90)$$

(3.65/.00) (2.66/.01) (2.26/.03) (2.70/.01) (22.71/.00)

$\bar{R}^2 = 0.34$ DW = 1.99

$$\Delta(L,Banks)_t = 3.983 + 1.629(GDP - GR)_{t-2} - 2.308\Delta(R,Ave)_{t-3} + 2039.889\Delta\left(\frac{Equity}{A}\right)_{t-1} + 73.342(DV,90)$$

(2.91/.00) (1.68/.10) (-1.41/.16) (2.64/.01) (22.71/.00)

$\bar{R}^2 = 0.25$ DW = 1.88

$\bar{R}^2$ = Adjusted coefficient of determination.
DW= Durbin-Watson statistic.
Newey-West computed t-scores and p-values are given in the parentheses beneath the estimated coefficients.

Table 6
EURO AREA
Quarterly: 1988:3 to 2006:2

$$\Delta(L,MFI)_t = \underset{(-2.55/.01)}{-32.109} + \underset{(6.43/.00)}{0.136(SP,bk)_{t-1}} + \underset{(2.52/.01)}{0.445\Delta(SP,MSCI)_{t-1}} + \underset{(23.11/.00)}{113.801(DV,90)} - \underset{(-2.22/.03)}{47.671(DV,2001)} \quad \textbf{H1}$$

$$R,^{-2} = 0.50 \qquad DW = 2.16$$

$$\Delta(L,MFI)_t = \underset{(6.09/.00)}{135.808} + \underset{(2.22/.03)}{0.002\Delta(GDP)_{t-2}} - \underset{(-4.99/.00)}{12.690(R,Loan)_{t-1}} + \underset{(14.30/.00)}{114.567(DV,90)} - \underset{(-2.12/.04)}{51.429(DV,2001)} \quad \textbf{H2}$$

$$R,^{-2} = 0.36 \qquad DW = 1.87$$

J – Test Results

$$\Delta(L,MFI)_t = \underset{(-1.74/.08)}{-22.264} + \underset{(3.08/.00)}{0.107(SP,bk)_{t-1}} + \underset{(1.99/.05)}{.418\Delta(SP,MSCI)_{t-1}} + \underset{(2.25/.03)}{104.418(DV,90)} - \underset{(-0.90/.37)}{25.418(DV,2001)} + \underset{(0.23/.82)}{0.065\Delta(L,H2)}$$

$$\Delta(L,MFI)_t = \underset{(-0.52/.60)}{-18.756} + \underset{(1.30/.20)}{0.001\Delta(GDP)_{t-2}} + \underset{(0.39/.70)}{1.344(R,Loan)_{t-1}} - \underset{(-0.27/.79)}{12.009(DV,90)} + \underset{(0.12/.90)}{3.472(DV,2001)} + \underset{(4.67/.00)}{1.037\Delta(L,H1)}$$

$R,^{-2}$ = Adjusted coefficient of determination.
DW= Durbin-Watson statistic.
Newey-West computed t-scores and p-values are given in the parentheses beneath the estimated coefficients.

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