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PANEL EVIDENCE FROM AUSTRIA

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Abstract

This paper is aimed to assess the impact of Basel I on credit growth in Austria for the period from 1996 to 2000 by using a panel-econometric approach. For this purpose, we use a sample consisting of a balanced panel of annual report data from 1996 to 2000 for 750 Austrian universal banks. To disentangle the impacts of the introduction of Basel I from other shocks we control for impacts caused by loan demand shocks by including several variables such as the aggregate output gap and the collateral value of real estate, respectively. The estimates show that minimum capital holding has a negative impact on bank credit creation in Austria. More importantly, the paper provides evidence that the volume of existing bank capital may work as a binding constraint on liquidity and credit creation in Austria. This is a remarkable result against the backdrop of the ongoing overhaul of the Basel Accord.

JEL classification: C23, E51, G21, N20

Keywords: Panel analysis, bank credit, minimum capital requirement, financial market stability

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1. Introduction

Capital requirements take centerstage in modern financial markets regulation and supervision. Bank capital is viewed as the most effective regulatory means to keep banks in solvent and stable conditions by ensuring that banks have enough capital to support their risk bearing. To be more specific, capital requirements are aimed to promote sound and proper banking and to secure a level playing field in the international market place.

In June 1988, the members of the Basel Committee on Banking Supervision reached an agreement to set a common regulatory target for bank capital of internationally operating banks in 12 industrialized countries. This agreement became known as Basel Accord I or Basel I. The capital target as set in Basel I requires that a bank hold capital of at least 8 percent of its risk-weighted assets. In Basel I, credit risks are accounted for by four risk buckets each with a different weight to reflect the degree of credit risk.

Austria joined Basel I in 1993, with the capital requirement of the risk-weighted 8 percent rule to be obligatory for all commercial banks.

Though Basel I has improved soundness and stability in international banking, there is a possible side effect of capital holding by banks, the so-called credit crunch. This notion refers to the fact that bank capital works as a constraint on banks' ability to fund loans. For the USA and Japan, there is empirical evidence that the introduction of risk-based capital requirements has slowed aggregate bank credit growth. In a recent study, Honda (2002) reconfirms this evidence for Japan by making use of panel data of individual banks. In so doing, Honda (2002) shows that Basel I reduced bank credit in Japan independently of loan demand shocks.

This paper is aimed to assess the impact of Basel I on credit growth in Austria for the period from 1996 to 2000 by using a panel-econometric approach similar to the one used in Honda (2002). The work is designed as follows: Section 2 discusses the role of bank capital within the "liquidity creation" view of banking. In Section 3 the panel data models for assessing the impact of bank capital on credit creation by Austrian banks are introduced and the estimates are presented. Bank size receives special attention through estimating respective panel data models for small, medium and large banks. Section 4 concludes.

2. Bank Capital and Credit Creation

Minimum capital requirements form the backbone of contemporary banking regulation. However, holding capital does not come without a cost. First, there is the apprehension that more overall financial stability is traded off for less liquidity (and efficiency) creation by banks subject to minimum capital holding, and, second, it is anything but clear that capital requirements do, under all circumstances, induce the banks to optimize their risk-taking. For example, Blum (1999) explores the intertemporal implications of risk-based capital adequacy requirements in banking and finds theoretical evidence that a bank may value an additional unit of equity tomorrow more

with the bank capital binding than without a minimum capital requirement at all. This particularly holds when raising equity is costly, and when the only way available to increase equity tomorrow is to increase risk today. For a discussion of this point, see Hahn (2001B).

In the following, we rather concentrate on exploring the relation between capital holding and bank credit creation. However, to fully understand the determinants of this relation, one first has to understand the essential functions banks perform. This approach has been chosen by Diamond – Rajan (2000, 2001). Their theory of bank capital rests on the view that the source of illiquidity of assets, be they real or financial, is all the same: human capital too closely tied to the asset providing rent opportunities. As to real assets such as a new investment project, the entrepreneur herself is assumed to be the one and only who gets the best out of the project. Since the entrepreneur can withdraw from the project in the future and thus can demand a rent not to do so, an outside financier cannot fully extract the cash flows generated. This causes illiquidity due to the fact that such a project cannot be financed to the full extent of the cash flows expected.

The same line of reasoning applies as to comprehend why a financial asset such as a loan to a real investment project is illiquid. A lender with the most credible liquidation threat will extort the most in terms of future payments, with any other outside financier who lends against repayment recovering less. A lender's liquidation threat is most credible when the lender knows how best to redeploy the project's assets. The lender can acquire this specific knowledge through building a relationship with the borrowing entrepreneur. This is done best by joining the entrepreneur's project at a very early stage. Of course, relationship-based lending generates a financial asset, that is, a loan, which is as illiquid as the loan financed project itself due to the relationship lender's lack of commitment to recover the full value of the loan without collecting a rent for so doing.

As a result, to create liquidity in a context like this the relationship lender has to be financed by demand deposits. Such a relationship lender is usually called a bank. Since deposits are fixed claims with a sequential service constraint (i. e., deposits are a claim with a first-come-first-served right to the bank's cash flows until the bank runs out of money) the bank cannot credibly hold up the depositors by threatening to extort a rent for giving back the full value of the deposits issued. Trying to extort a rent would be answered by the depositors with running on the bank rather than entering into renegotiations. Thus, the collective action problem among depositors is a credible commitment to run on the bank whenever the depositors believe their money claims are in jeopardy. This drives the banker's rent to zero because behaving otherwise would disintermediate her immediately. This is strong enough a threat making the banker pass through all collections directly to depositors (Diamond – Rajan, 2000).

As a result, in the context of certainty the banker provides the social optimum of liquidity for both the depositors and the entrepreneurs when she is all-deposit refinanced.

In a world of uncertainty, however, bank runs can be triggered by reasons other than opportunistic behavior, such as shocks to asset values. In this context issuing softer claims than deposits may help the banker survive times likely to be prone to runs due to increased uncertainty or systemic shock exposure.

A claim which is (much) softer than deposits in terms of renegotiations is capital. Capital issued as equity is a long-term claim with no other right but to liquidate the equity-financed project any time. Since the relationship banker is assumed to recover the most of the loan provided, replacing the banker (that is, liquidating the project) is costly rendering the capital holders' commitment not to renegotiate implausible. Thus, capital holders are not exposed to a collective action problem allowing the banker to capture some rents in the future. This, however, has a downside today in that the banker is not able to raise as much money as she would be able to raise if she were all-deposit-refunded. That is to say, issuing capital instead of deposits in order to increase shock absorption reduces the banker's capability of creating liquidity relative to the case where she issues deposits only. In other words, the flow of credit provided by the banker is curtailed relative to a situation with all-deposit refinancing.

From the viewpoint taken in this paper, the liquidity creation framework as put forward by Diamond – Rajan (2001, 2000) provides a solid rationale for credit supplied cuts due to bank capital holding. The liquidity creation theory makes a strong case in favor of an all-deposit refunded banking system on grounds of its providing liquidity at the social optimum whereas regulations such as minimum capital requirements aimed at making the banks safer incur a cost in terms of lower credit and constraint liquidity creation.

3. The Panel Data Model

In this section we design a model to empirically test the proposition whether there is a negative relation between bank capital holding as required by Basel I and credit creation by banks. For this purpose, we use a sample consisting of a balanced panel of annual report data from 1996 to 2000 for 750 Austrian universal banks (unfortunately, access to quarterly or monthly data was not made possible). That is, for each variable there are 3,750 observations. The bank data used for the estimates have been provided by the Oesterreichische Nationalbank (OeNB). The Data Appendix gives the details on variables and data sources used.

In following Honda (2002), we construct a panel model designed to identify the impact of risk-based bank capital holding according to Basel I on credit creation by trying to disentangle the impacts of the introduction of Basel I from other shocks.

In so doing, we control for impacts caused by loan demand shocks by including several variables. First, the aggregate output gap is used to capture the general business condition or systemic shocks, respectively (Honda, 2002, uses the unemployment rate). Further, a performance index of mutual real estate funds (IATX) is used to capture the impact of collateralization on bank credit creation. Most bank lending in Austria is protected through wholesale collateralization, with real estate as the prime candidate to be chosen as bond (Hahn, 2002). Rising real estate prices indicate that the agency costs of borrowers fall allowing the banks to provide a larger amount of collateralized loan, ceteris paribus. Since the aggregate output gap and the performance index of the mutual real estate funds are exposed to the same macroeconomic shocks these variables enter the equation separately. We use these variables lagged by one period to give credit to the fact that borrowers often need time to adjust to macroeconomic shocks.

By including the total asset of each bank we try to account for the differences in the loan demand structure among the Austrian banks.

In order to control for idiosyncratic shocks of each bank we enclose individual bank dummy variables.

In addition, we use the nominal interest rate for commercial loans as an indicator for capturing shocks to loan pricing.

Controlling for theses shocks add up to the following panel model:

$$\frac{\Delta L_{i,t}}{A_{i,t-1}} = \beta_0 + \sum_{j=1}^{749} \mu_j + \beta_1 K_{i,t} + \beta_2 \log A_{i,t-1} + \beta_3 Y_{t-1} + \beta_4 R_t + \varepsilon_{i,t} \qquad (1)$$

$$i = 1, 2, ..., 750; \quad t = 1, 2, ..., 5$$

As suggested by Honda (2002), the left-hand side variable of equation (1) with $\Delta L_{i,t}$ picturing loan creation by bank *i* at time *t* is normalized by the total asset of each bank at the beginning of the period, $A_{i,t-1}$. The μ_j denote the bank-specific effects and $\beta_0, \beta_1, \beta_2, \beta_3, and\ \beta_4$ the coefficients to estimate. Y_{t-1} stands either for the aggregate output gap or for the log of the collateral value of real estate at the beginning of the period, respectively. R_t indicates the nominal interest rate for commercial loans at time *t*. The term $\varepsilon_{i,t}$ is the remainder stochastic disturbance factor.

The variable $K_{i,t}$ represents the actual risk-based bank capital ratios rather than the minimum capital-to-asset ratio as required by Basel I. The actual capital ratio by exceeding the 8-percent minimum rule required by regulation contains the relevant information to capture the impact of bank capital holding on credit creation. Since the actual capital ratios of all banks under study exceed the minimum capital requirement in the years covered actual capital holding is as informative as the gap between regulatory and actual capital. Since the significance of the coefficient β_1 is at the center of this study it is elemental to sort out the relevant measure.

4. Empirical Evidence

The model as given by equation (1) suggests that the fixed effects panel estimator be used as estimation procedure. This is supported by the standard diagnostics. For all models estimated the results highly support the fixed effects model estimates against the plain OLS and the random effects model estimates, respectively.

To be more specific, testing for fixed effects shows that the null $H_0 : \mu_j = 0, \; for \; j = 1,2,....,749$ is rejected at the 1-percent significance level in all models. Further, under the alternative of the fixed effects model the Hausman test statistics are very large altogether suggesting that the null hypothesis of the random effects model be rejected at the 1-percent significance level.

The fixed effects estimates of equation (1) for the 750 Austrian banks are reported in Table 1.

Table 1: Estimates of Credit Creation by the Fixed Effects Models

Left-hand side variables are changes in credit divided by the total value of asset at the beginning of the corresponding period

Explanatory variables	Model with aggregate output gap	Model with collateral value of real estate
Output gap	0.0099**	
	(4.77)	
Real estate value		0.4027**
		(6.15)
Total asset	-0.4808**	-0.5244**
	(-17.35)	*(-17.56)*
Actual capital ratio	-0.0022**	-0.0017**
	(-4.85)	*(-7.70)*
Commercial loan rate	-0.0164**	-0.0136**
	(-7.03)	*(-5.57)*
R^2	0.37	0.37
Adjusted R^2	0.21	0.21
Number of observations	3,750	3,750

** ... denotes significant at the 1-percent level against an one-sided alternative. Numbers in parentheses denote *t-values*.

The estimates corroborate (that is to say, do not reject) the hypothesis that bank capital holding has a negative impact on bank credit creation as suggested by the liquidity creation theory. The coefficient estimate of actual capital holding is highly significant. This result holds in either model reported. The difference of the respective coefficient estimates between the model with the aggregate output gap as the measure of general business condition and the model with the collateral value of real estate is insignificant. The same applies to the remaining coefficient estimates. In both models, all coefficients have the expected sign and are highly significant. Total asset has a negative sign indicating that loan demand reduction is more pronounced for the larger banks. Commercial loan rate has also a negative sign which meets the expectation that loan demand declines with the loan costs rising.

Multiplying the coefficient estimates of actual capital holding by 8, the minimum capital requirement, yields the magnitude of the impact of bank capital regulation on bank credit creation. For the model with aggregate output gap this simple calculation amounts to -0.0022 x 8 = -0.0176, for the model with collateral value –0.0017 x 8 = –0.0136. That is to say, the introduction of Basel I causes a reduction of the ratio of credit creation to the total asset by a margin of approximately 0.015 percent.

In this context, an interesting facet is the consideration that capital sensitivity might change with size. The point is that larger banks which usually deal with a more risky credit structure are more likely to be capital constraint than smaller banks. Though for differences in credit demand structure is controlled for by considering the role of total asset of each bank, we additionally account for bank size directly by re-estimating the model on the basis of panel data sets consisting of banks of approximately the same size. This is achieved by building a balanced panel for small Austrian banks, medium Austrian banks and large Austrian banks, respectively. For the respective definitions we refer to the Data Appendix.

The results obtained by directly controlling for bank size are displayed in Table 2.

Table 2: Fixed Effects Model Estimates of Credit Creation by Small, Medium and Large Banks

Left-hand side variables are changes in credit divided by the total value of asset at the beginning of the corresponding period

Explanatory variables	Model with aggregate output gap for			Model with collateral value of real estate for		
	small banks	medium banks	large banks	small banks	medium banks	large banks
Output gap	-0.0010	0.0175**	0.0238**			
	(-0.42)	*(5.04)*	*(2.68)*			
Real estate value				-0.0613	0.5883**	1.0092**
				(-0.81)	*(6.12)*	*(4.20)*
Total asset	-0.3042**	-0.5483**	-0.6571**	-0.2909**	-0.6110**	-0.7713**
	(-7.48)	*(-12.52)*	*(-7.54)*	*(-6.56)*	*(-12.95)*	*(-8.36)*
Actual capital ratio	-0.0023**	-0.0029**	-0.0079*	-0.0024**	-0.0026**	-0.0084*
	(-5.40)	*(-2.26)*	*(-2.31)*	*(-5.22)*	*(-2.01)*	*(-2.49)*
Commercial loan rate	-0.0142**	-0.0178**	-0.0227*	-0.0153**	-0.0109**	-0.0083
	(-5.45)	*(-4.39)*	*(-2.19)*	*(-5.07)*	*(-2.46)*	*(-0.75)*
R^2	0.37	0.39	0.31	0.37	0.39	0.33
Adjusted R^2	0.22	0.23	0.13	0.22	0.24	0.16
Number of observations	1,945	1,525	280	1,945	1,525	280

** ... denotes significant at the 1-percent level against an one-sided alternative, * ... denotes significant at the 5-percent level against an one-sided alternative. Numbers in parentheses denote *t-values*.

The results show that the negative impact of capital holding on credit creation is indeed significantly bigger by larger banks than by the smaller ones. The respective magnitude is more than three times as big by large banks with a coefficient estimates of approximately –0.0080 as by small and medium banks with coefficients of around –0.0025. Further the estimates suggest that the general business condition as measured by the aggregate output gap or the collateral value of real estate hardly have a significant influence on credit creation by small banks. This result squares well with the fact that small banks' borrower clientele mainly consists of private households and small businesses whose borrowing behavior is rather steady.

5. Concluding Remarks

This paper shows that bank capital holding has a negative impact on bank credit creation in Austria. According to the fixed effects model estimates the impacts of Basel I are in between 0.018 percent and 0.067 percent with the small and medium banks closer to the lower bound and the larger banks closer to the upper end. More importantly, the paper provides evidence that the volume of existing bank capital may work as a binding constraint on liquidity and credit creation in Austria. This is a remarkable result against the backdrop of the ongoing overhaul of the Basel Accord. While sharpening the risk awareness of the banking industry the newly proposed capital requirement framework by the Basel Committee on Banking Supervision, in short Basel II, is designed to set the regulatory capital-to-asset ratio based on the perceived risk of individual banks' portfolios. In so doing, Basel II tends to put the measurement of the banks' actual risk exposure on a firmer conceptual footing by providing a more accurate gauge of risk aimed at narrowing the gap between regulatory and economic capital holding.

The New Basel Accord proposed has many upsides but also a few downsides, with a liquidity and credit shortage due to a bank capital crunch as one of the more dangerous negative side effects well within the range of likelihood. Thus, the lesson should be learnt soon that minimum capital holding intended to bolster the financial system can indeed make it less stable.

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Data Appendix: Variables and Sources

Variable	Definition	Original source
Credit creation (mio. EUR)	Changes in credits to non-banks	OeNB, Annual Reports Statistics of Austrian Banks
Output gap (percent)		OECD Economic Outlook
Real estate value (index)	Austrian Real Estate Securities Index	Vienna Stock Exchange
Total asset (log)		OeNB, Annual Reports Statistics of Austrian Banks
Actual capital ratio (percent)	Equity Ratio Pursuant to §23 Austrian Banking Act 1993	OeNB, Annual Reports Statistics of Austrian Banks
Commercial loan rate (percent)		OeNB
Small banks	Banks within the interval ranging from the minimum to the median of total asset of the entire sample	
Medium banks	Banks within the interval ranging from the median to the mean plus 1 standard deviation of total asset of the entire sample	
Large banks	Banks within the interval ranging from the mean plus 1 standard deviation to the maximum of total asset of the entire sample	

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