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Is there a financial accelerator in US banking? Evidence from the cyclicality of banks' price–cost margins

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ABSTRACT

We show that price–cost margins for US banks are consistently countercyclical, even after controlling for credit risk, the term structure of interest rates and monetary policy. This evidence supports the existence of a "financial accelerator" in US banking.

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1. Introduction

Bernanke and Gertler (1989) and Bernanke, Gertler and Gilchrist (1996, 1998) (hereafter BGG) first studied the role of an endogenously countercyclical price–cost margin in financial markets (a countercyclical external finance premium) as an amplifier of business fluctuations. After their seminal work, a large body of literature in macroeconomic theory studies this issue. However, empirical research has not devoted much attention to testing a direct implication of this theory, namely, the countercyclicality of margins in credit markets.

In this paper we start filling this gap. We study the cyclical behavior of banks' price–cost margins (calculated as the difference between the interest rate on loans and the marginal cost of funds for banks) in the United States using quarterly data for the period 1984–2005. We equate banks' price–cost margins to the BGG external finance premia on the basis of banks' marginal costs of funds being a good proxy for firms' marginal costs of internal funds.

With this goal, we apply the VAR forecast error-based methodology proposed by den Haan (2000) to measure comovement between variables. We document the countercyclicality of margins, a fact about business cycles that has received no attention before.

Using the methodology in den Haan (2000), as opposed to standard regression analysis, allows us to better control for the cyclical pattern of credit risk, the term structure of interest rates and monetary policy. These could be suggested as the only determinants of the cyclical behavior of margins, and failing to account for them would make the exercise almost trivial. Presenting evidence supporting the financial accelerator requires showing that there is an independent relationship between business cycles and margins, and that the comovement between them is not entirely explained by the cyclical pattern of these variables.[2] Our key finding is that this comovement remains negative and statistically significant even after controlling for these determinants.

2. Data

We use bank-level balance sheet quarterly data for 1984–2005 from the *Call Reports on Condition and Income*. Price–cost margin measures are the asset-weighted averages over all banks.

Two alternative business cycle measures are used in this study: GDP and total loans. Loans reflect better than GDP the behavior of aggregates such as investment, which depend critically on bank financing.

Four alternative definitions are used for margins. Margin 1 is calculated as the ratio of the difference between interest income and

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[2] The countercyclicality is a necessary but not sufficient condition for the existence of the accelerator. It does not guarantee that margins exacerbate the effects of aggregate shocks.

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Table 1
Sample correlations of margins with business cycle measures.

	GDP	Total loans
Margin 1	−0.237	−0.395
	(0.029)	(0.000)
Margin 2	−0.306	−0.657
	(0.004)	(0.000)
Spread BP-FF	−0.322	−0.339
	(0.003)	(0.002)
Spread survey-FF	−0.214	−0.203
	(0.066)	(0.081)

p-values shown in parentheses. Hodrick–Prescott filtered series.

Table 2
Characteristics of the estimated VARs.

Business cycle indicator (in logs)	Margin	No. lags	
		Bivariate	Multivariate
GDP	1	2	2
Loans	1	2	2
GDP	2	2	2
Loans	2	2	2
GDP	Spr BP-FF	2	2
Loans	Spr BP-FF	3	2
GDP	Spr survey-FF	3	2
Loans	Spr survey-FF	2	2

expenses to banks' assets. Margin 2 is calculated as the ratio of the difference between interest income and expenses to loans. The third measure is the spread between the bank prime and the federal funds rate, and the fourth is the spread between the lending rate taken from the Survey of Terms of Business Lending and the federal funds rate. Following Coleman (1995) among others, we use the federal funds rate as a proxy for banks' marginal cost of funds. A data appendix is available upon request.

Table 1 provides a first insight on the cyclicality of margins, showing the sample unconditional correlations between margins and business cycle indicators. These are always negative and significant.

3. Model specification

To measure the comovement between variables at business cycle frequencies we use the methodology proposed by den Haan (2000), based on correlations of VAR forecast errors at various horizons. This approach is better than a standard regression analysis for two reasons. First, even conditional correlations fail to capture important information about the dynamic aspects of the comovement of variables (Rotemberg, 1996; den Haan, 2000). Second, given that the correlation coefficients obtained from a regression analysis are defined only for stationary series, the data must be transformed, which makes the correlations sensitive to the detrending methods used. In the den Haan (2000) method the VAR can contain any combination of stationary processes and processes integrated of arbitrary order. Thus, there is no need for detrending the data.

The VAR we estimate is:

$$X_t = \alpha + \mu_1 t + \mu_2 t^2 + \sum_{l=1}^{L} \beta_l X_{t-l} + \sum_{i=1}^{2} \delta_i R_{it} + \sum_{i=1}^{3} \theta_i Q_{it} + \epsilon_t \quad (1)$$

where t denotes time, L is the total number of lags included in the equations, and X_t is a vector of variables which includes the margin measure and the business cycle indicator.

The R matrix includes dummy variables to control for two important regulatory changes that took place in the United States banking sector during the period covered by this study. First, in 1994 the Riegle–Neal Interstate Banking Act allowed national banks to operate branches across states after June 1, 1997. Second, the Gramm–Leach–Bliley Act enacted in November of 1999 increased the number of activities allowed for banks. The Q matrix includes quarterly dummy variables to control for seasonality in the bank data.

By estimating this VAR, we compute the K-period ahead forecast of the variables ($E_t X_{t+K}$). We then obtain the K-period ahead forecast errors ($X^{ue}_{t+K,t}$) as $X^{ue}_{t+K,t} \equiv X_{t+K,t} - E_t X_{t+K}$ and their variance–covariance matrix as a function of the coefficients β and $Var(\epsilon)$. Using this variance–covariance matrix, we can compute the correlation coefficient between the K-period ahead forecast errors of the two random variables in X (i.e. a measure of margins and a business cycle indicator). We denote it by $COR(K)$.

Last, we construct bootstrapped confidence bands for $COR(K)$ based on 2500 replications of the system.[3]

3.1. Multivariate specification

The cyclicality of credit risk, the term structure of interest rates and monetary policy could be suggested as the only determinants of the cyclicality of margins. Therefore, in a second step we want to assess whether we have uncovered a truly independent relationship between business cycles and margins. To do so we include the following two additional endogenous variables in the X matrix.

3.1.1. Credit risk

The net charge-off rate (defined as loan charge-offs net of loan recoveries as a percentage of total loans) is used as a measure of aggregate risk. If a higher credit risk and hence higher margins are associated with recessions, the countercyclicality of risk is an important candidate to explain that of margins.

3.1.2. The term structure of interest rates and monetary policy

The cyclicality of margins could also be explained by maturity mismatches in banks' balance sheets. If bank assets are of longer maturity than their liabilities, and with recessions typically driving short-term rates down by more than long-term rates, banks' expenses might fall by more than their income. Then, ex-post margins (calculated using the difference between interest income and expenses) might increase in recessions.

Therefore, in the multivariate VAR the matrix X includes the slope of the yield curve (the spread between the ten-year and the one-year rate).

This slope is affected by monetary policy (see Bernanke and Blinder, 1992), so that including it allows us to control for the effects of monetary policy on margins.

Table 2 summarizes the characteristics of the estimated VARs.

4. Results

Figs. 1 and 2 plot $COR(K)$ for various K forecast horizons and the 10% and 5% confidence bands.

First, we estimate a bivariate VAR where X_t includes only a measure of margins and a business cycle indicator. The countercyclicality of price–cost margins is documented here with negative and significant correlation coefficients for most K and for all the specifications (see Fig. 1).

Second, we estimate a multivariate VAR. Results indicate that margins and economic activity are negatively and significantly correlated even after controlling for the cyclicality of credit risk, the term structure of interest rates and monetary policy (see Fig. 2). Our results are robust to using alternative measures of risk and the term

[3] Our codes for the construction of confidence bands in bivariate and multivariate VARs are available upon request.

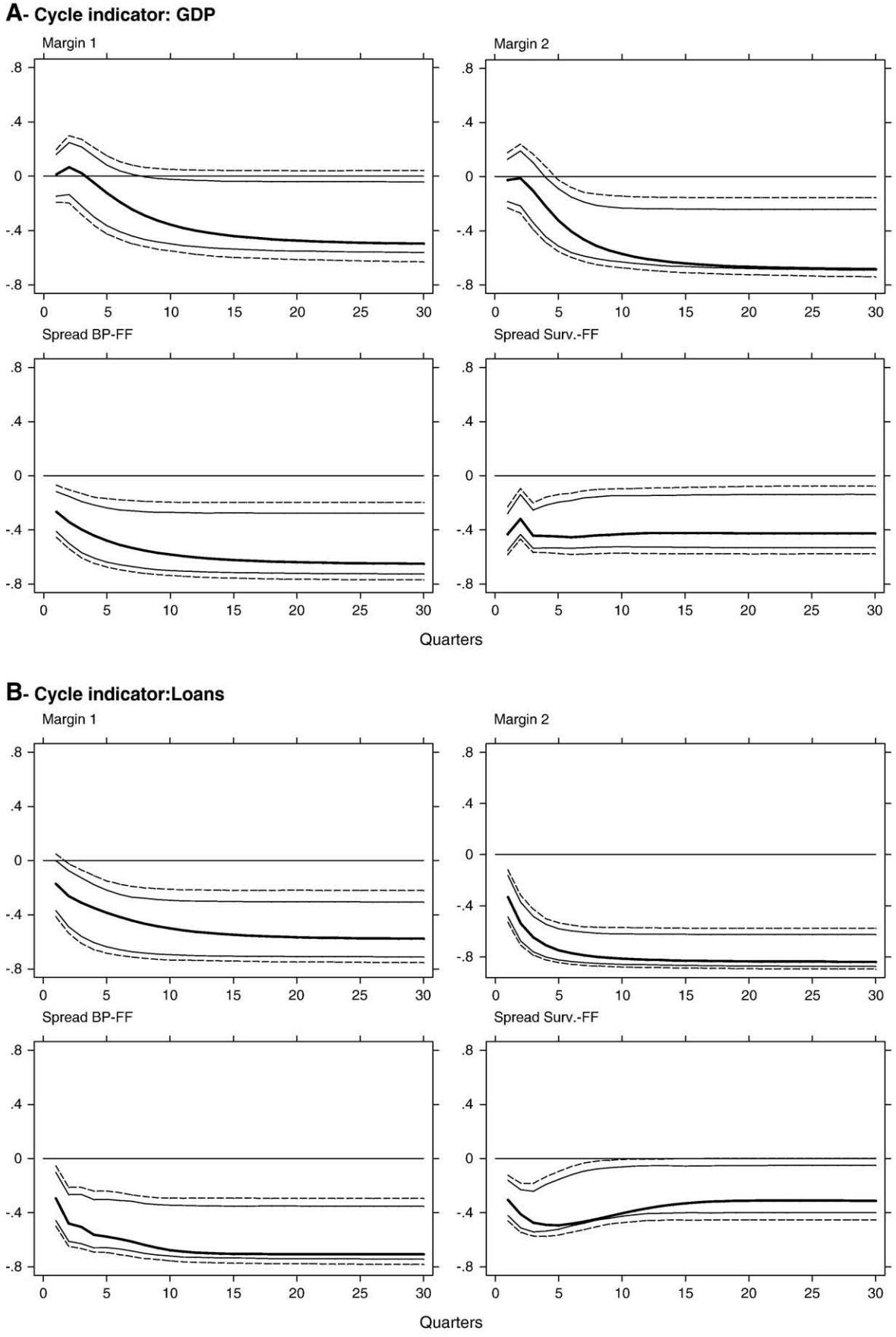

Fig. 1. Bivariate VARs: Correlations of Forecast Errors. The x-axis measures the forecast horizon in quarters. Estimated correlation coefficients (thick lines). 5%, 95% (thin lines), 10% and 90% (dash lines) bootstrapped confidence bands using a one-sided test.

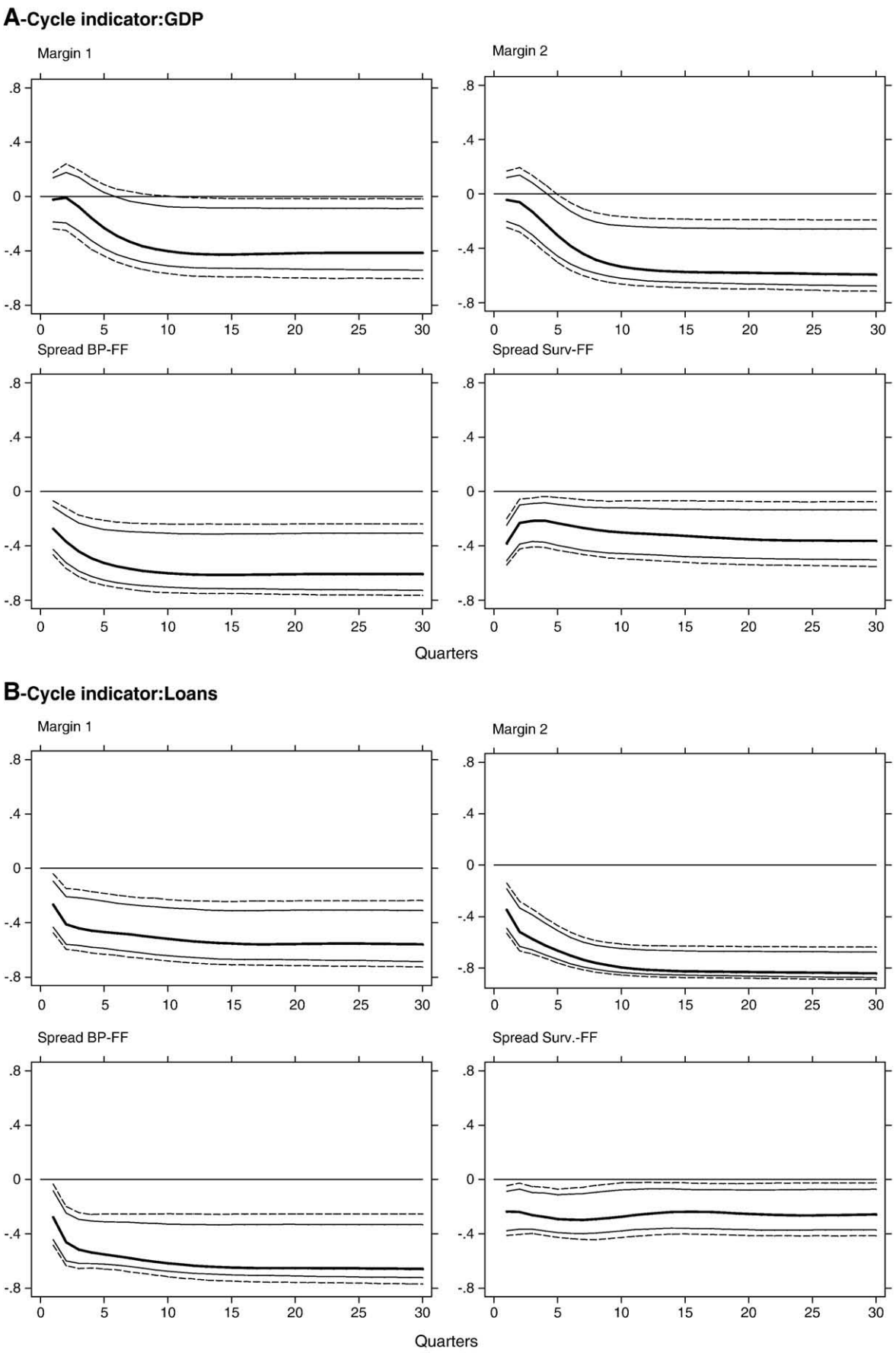

Fig. 2. Multivariate VARs: Correlations of Forecast Errors.

structure. Showing how the countercyclicality "survives" to the inclusion of these controls is a key contribution of this paper.

5. Conclusions

We provide evidence for a financial accelerator à la BGG working in the United States. In bad times credit becomes more expensive than in an economy with constant margins, and firms may delay investment and production. This makes recessions worse.

Our study complements the extensive literature in macroeconomic theory that uses countercyclical margins and the accelerator as a mechanism for the propagation of aggregate shocks. From a policy perspective, the documented countercyclicality may provide additional grounds for stabilization.

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