



## Coincident correlations of growth and cash flow in banking

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### ABSTRACT

Prior empirical research indicates that loan growth in the banking industry is positively related to cash flow. I offer an alternative methodology that is better able to capture the effect of cash flow on loan growth while controlling for the potentially coincident effect of loan growth on cash flow. Using a sample of 171,389 observations on banks, 1986–2007, I find that causality runs more consistently from growth to cash flow than from cash flow to growth. This extends prior empirical research by [Houston and James \(1998\)](#) and [Campello \(2002\)](#) on cash flow sensitivities in the banking industry.

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### 1. Introduction

Previous research indicates that cash flow in the banking industry is positively associated with loan growth and that, furthermore, the association is stronger among banks that are unaffiliated with a multi-bank holding company. This is consistent with a hypothesis that bank holding companies operate internal markets to allocate capital among subsidiaries that are cash-flow constrained. Companion studies by [Houston et al. \(1997\)](#) and [Houston and James \(1998\)](#), along with a more recent study by [Campello \(2002\)](#), constitute the core of empirical evidence.

The evidence must be interpreted in the context of industry-wide correlations of loan growth and cash flow that can be observed in data obtained annually, 1986–2007, from the “Call Reports” of condition and income.<sup>1</sup> Although the correlations vary anomalously in sign and level of statistical significance depending on year, definition of cash flow and procedure for deleting outlying observations, they are usually negative.

The apparently paradoxical observation of negative correlations of cash flow and loan growth during part of an era in which previous research found the opposite could be related to endogeneity (see [Gatchev et al., 2010](#)). In competitive markets, banks may achieve growth by lowering interest rates on loans, increasing interest rates on deposits or increasing branches, personnel, advertising or other elements of production capacity. All of these would

tend to reduce cash flow—and at the same time, potentially, that banks may be cash flow constrained.

I address the issue of endogeneity using a model in which loan growth and cash flow are determined simultaneously. Using a sample of 171,389 observations on banks, 1986–2007, I find evidence that loan growth exerts a negative influence on cash flow. I also find that cash flow exerts a positive influence on loan growth under some circumstances. Supplemental analysis on subsamples partitioned by year underscores a causality that runs more consistently from growth to cash flow than from cash flow to growth. This is particularly so after changes to regulatory capital adequacy that were introduced in the early 1990s.

My results are applicable to the analysis of internal capital markets in the banking industry. They also extend research, outside the banking industry, that questions hypothesized relationships between investment and internally generated funds ([Gatchev et al., 2010](#)). This is important because research on investment–cash flow sensitivities constitutes “one of the largest empirical literatures in corporate finance ([Brown and Petersen, 2009](#))”.

The paper is organized as follows. In the next section, I describe my methodology in the context of prior research. My sample is presented in Section 3, with particular attention given to the process for deleting outlying observations. The main results of the tests are in Section 4. Section 5 has ancillary tests of robustness and Section 6 concludes.

### 2. Methodology

Banking in many ways represents a unique laboratory for studying relationships between cash flow and investment. This is

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<sup>1</sup> Call Reports are financial statements filed by banks with the Federal Financial Institutions Examination Council.

due, in part, to the commonly observed organization of individual banks into multi-bank holding companies. Houston et al. (1997) provide empirical evidence that investment activities of individual subsidiaries are subject to an internal market within which scarce capital is allocated. This is consistent with the existence of a “wedge” between the cost of internal and external capital—i.e., only if holding companies had perfect access to external equity capital should they be indifferent between financing loan growth with external or internal funds.

Houston and James (1998) extend Houston et al. (1997) using a similar sample. They compare the external financing constraints faced by affiliated banks (members of multi-bank holding companies) and by banks that are unaffiliated with multi-bank holding companies (either independent banks or banks that are members of one-bank holding companies). Using a sample 17,065 observations on unaffiliated banks and 5934 observations on affiliated banks, 1986–1989, they find that bank lending is highly correlated with cash flow and that this effect is stronger for unaffiliated banks.

Campello (2002) analyzes similar issues using a larger sample of 601,858 quarterly observations on banks, 1981–1997. He finds that the funding of new loans by small banks that are members of multi-bank holding companies is less dependent on cash flow than is the funding of new loans by independent banks. His result is limited, however, to periods of monetary contraction.

Both Campello (2002) and Houston and James (1998) model loan growth as a function of cash flow and other factors. The following equation can be seen as a hybrid of their approaches:

$$\begin{aligned} & (\text{Loans}_t - \text{Loans}_{t-1}) / \text{Loans}_{t-1} \\ &= b_0 + b_1(\text{Cash Flow/Loans})_{t-1} + b_2(\text{Securities/Assets})_{t-1} \\ &+ b_3(\text{Equity/Assets})_{t-1} + b_4 \text{Log}(\text{Assets})_{t-1} \\ &+ b_5(\text{State Loan Growth})_t + b_6(\text{Nonaccruals/Loans})_{t-1} + e_{i,t} \end{aligned} \quad (1)$$

Following Campello (2002), I measure cash flow as net income. Loans are gross (net loans plus allowance for loan losses). The dependent variable represents percentage changes.

Independent variables control for factors affecting growth. The lagged ratio of securities to assets (total securities plus Federal funds sold) controls for constraints on growth that may be associated with liquidity. The lagged ratio of equity (common) to assets controls for capitalization.<sup>2</sup> Note that since the direct effect of lagged income on subsequent loan growth is impounded in lagged capitalization—income, net of dividends, increases capital—previous research using lagged cash flow incorporates only indirect effects, which reflect, presumably, positive correlations with income during the following year in which loan growth is measured.

The lagged log of assets controls for size. State loan growth, which is measured as the median loan growth rate for all banks in the state in which a given bank is located, is intended to capture growth opportunities.<sup>3,4</sup> The lagged ratio of loans in non-accrual status to loans should be negatively related to loan growth if past losses affect a bank's willingness to extend loans.

I adjust Eq. (1) by exchanging concurrent cash flow,  $(\text{Cash Flow/Loans})_t$ , for lagged cash flow,  $(\text{Cash Flow/Loans})_{t-1}$ . I then add a

<sup>2</sup> Houston and James (1998) include cash, marketable securities and Fed funds sold as securities. Campello (2002) eliminates cash and adds trading assets.

<sup>3</sup> Average state loan growth is used by Houston and James (1998), while Campello (2002) uses dummy variables for each state.

<sup>4</sup> To mitigate problems with foreign loans, I adjust statewide loan growth for banks which report foreign loans by multiplying the annual growth rates in total international loans (reported by the Bank for International Settlements) by the percentage of a bank's total loans that are foreign. This is added to the product of statewide loan growth and the percentage of a bank's loans that are domestic.

separate equation for cash flow to create the following two-equation system:

$$\begin{aligned} & (\text{Loans}_t - \text{Loans}_{t-1}) / \text{Loans}_{t-1} \\ &= b_0 + b_1(\text{Cash Flow/Loans})_t + b_2(\text{Securities/Assets})_{t-1} \\ &+ b_3(\text{Equity/Assets})_{t-1} + b_4 \text{Log}(\text{Assets})_{t-1} \\ &+ b_5(\text{State Loan Growth})_t + b_6(\text{Nonaccruals/Loans})_{t-1} + e_{i,t} \end{aligned} \quad (2)$$

$$\begin{aligned} & (\text{Cash Flow/Loans})_t \\ &= b_0 + b_1(\text{Loans}_t - \text{Loans}_{t-1}) / \text{Loans}_{t-1} + b_2(\text{Loans/Assets})_{t-1} \\ &+ b_3 \text{Log}(\text{Assets})_{t-1} + b_4(\text{State Income/Loans})_t \\ &+ b_5(\text{Nonaccruals/Loans})_{t-1} \\ &+ b_6(\text{Provisions for Loan Losses/Loans})_{t-1} + e_{i,t} \end{aligned} \quad (3)$$

In Eq. (3), the lagged ratio of loans to assets controls for portfolio choice and the lagged ratio of nonaccruals to loans controls for loan quality. The lagged ratio of provisions to loans accounts for discretionary accounting practices (Campello, 2002) or other factors. State income, a control for profit potential, is the median ratio of statewide bank income to loans. The log of assets controls for possible size effects.

My hypotheses are:

H1: The coefficient on  $(\text{Cash Flow/Loans})_t$  in Eq. (2) is positive.

H2: The coefficient on  $(\text{Loans}_t - \text{Loans}_{t-1}) / \text{Loans}_{t-1}$  in Eq. (3) is negative.

The former would be consistent with the existence of frictions that create a wedge between a bank's cost of internal and external funds. The latter would be consistent with the existence of an impact of growth on cash flow that results from lower interest rates on loans, higher interest rates on deposits or higher non-interest expenses.

### 3. The sample

I collect data from Call Reports on banks located in the 50 states or the District of Columbia, 1986–2007. Because my methodology requires that the same bank be in existence across consecutive years over which loan growth is measured, I delete non-matching observations. I also eliminate observations on banks which acquired other banks (acquisitions are listed by the National Information Center of the Board of Governors of the Federal Reserve). This seems reasonable insofar as loan growth achieved through

**Table 1**  
Descriptive statistics.

	Standard			
	Mean	Deviation	Minimum	Maximum
$(\text{Loans}_t - \text{Loans}_{t-1}) / \text{Loans}_{t-1}$	0.091	0.140	-0.259	1.019
Cash Flow/Loans <sub>t</sub>	0.018	0.013	-0.059	0.084
Securities/Assets <sub>t-1</sub>	0.321	0.144	0.015	0.739
Equity/Assets <sub>t-1</sub>	0.095	0.028	0.040	0.229
Log(Assets) <sub>t-1</sub>	11.59	1.208	7.305	20.90
State Loan Growth <sub>t</sub>	0.072	0.042	-0.336	0.425
Nonaccrual Loans/Loans <sub>t-1</sub>	0.008	0.012	0.000	0.083
Loans/Asset <sub>t-1</sub>	0.576	0.144	0.160	0.889
State Income <sub>t</sub>	0.017	0.042	-0.039	0.033
Provisions/Loans <sub>t-1</sub>	0.005	0.007	-0.004	0.084

Information is provided for 171,389 observations on banks, 1986–2007. State loan growth is the median rate of loan growth for banks in a state. State income is the median ratio of net income to loans for banks in a state.

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