Effects of Abnormal Loan Growth on the U.S. Credit Unions Performance

DAHYE HAN, NORTH DAKOTA STATE UNIVERSITY

GREGORY MCKEE, NORTH DAKOTA STATE UNIVERSITY

Motivation of the study

- Concern has increased that banks have experienced abnormally rapid loan growth because of excessively easy credit standards.
- Competition for loan customers has increased, causing banks to reduce interest rates and relax credit standards in order to obtain new business opportunities. (Foos et al, 2010)
- Although many studies point out that the acceleration in loan growth could lead to a surge in loan losses, reduced profits and even bank failures, there is little evidence on the relationship between loan growth and its risk at credit union level.

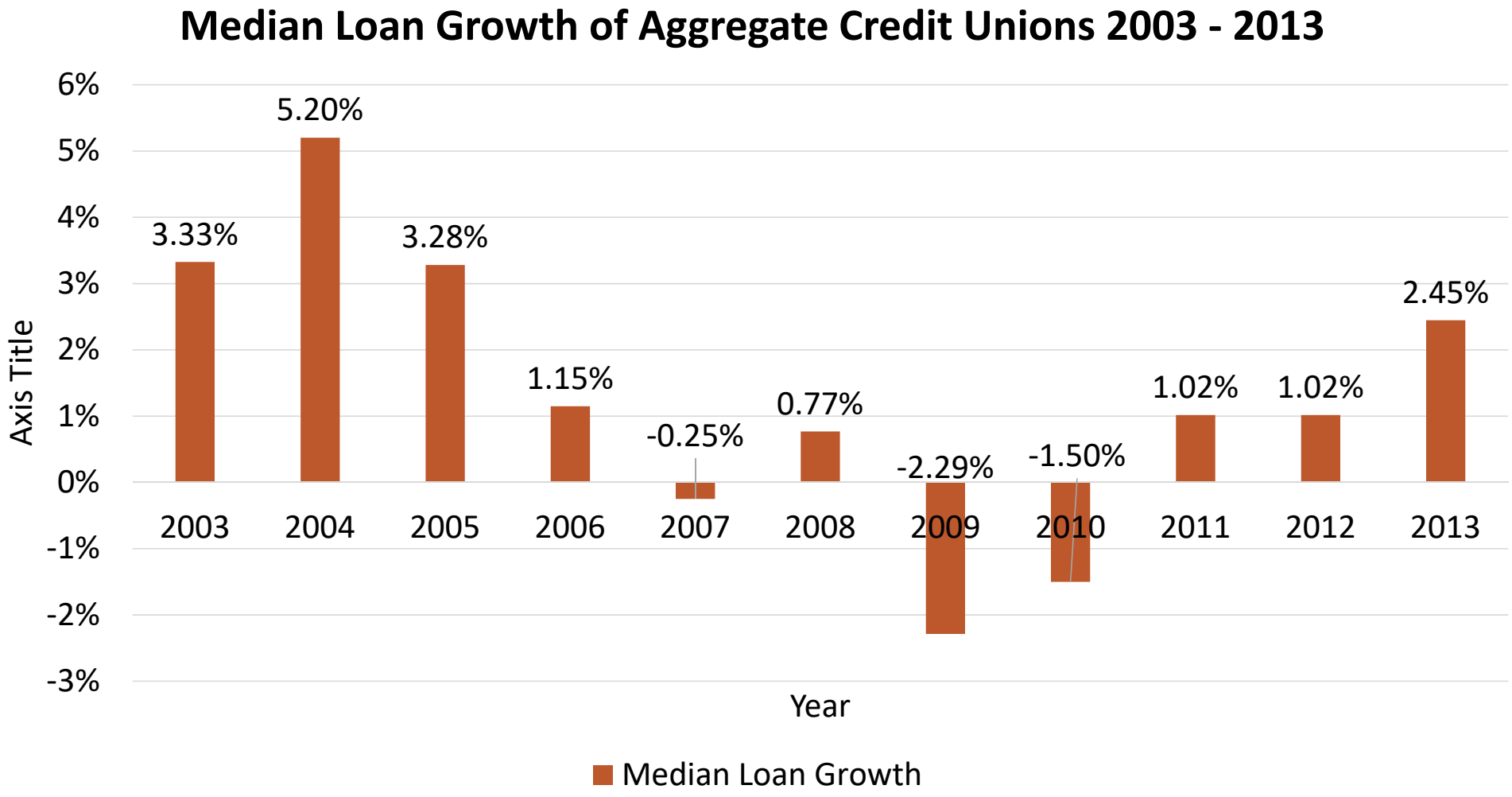
Objectives

What does it mean for credit unions to have greater than median loan growth?

1. The first objective is to analyze the relationship between abnormal loan growth and the riskiness on three aspects of credit unions :
   A. Loan loss
   B. Profitability
   C. Solvency
2. The second objective is to analyze the effects of a degree of market concentrations on three aspects of credit unions: loan loss, profitability, and solvency.

Median Loan Growth

- The median is the middle score for a set of data that has been arranged in order of magnitude.
- The median is less affected by outliers and skewed data.
- The mean value of our data might not be the best way to accurately reflect the typical loan growth of a credit union.


Median Loan Growth of Aggregate Credit Unions 2003 - 2013
6%
5%
4%
3%
2%
1%
0%
-1%
-2%
-3%
Axis Title
3.33%
5.20%
3.28%
1.15%
-0.25%
0.77%
-2.29%
-1.50%
1.02%
1.02%
2.45%
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year
Median Loan Growth

Loan portfolio of credit unions consists of 8 loan categories

- **During the period of 2002 – 2013, across all size of credit unions, on average,**

1. **Total 1st Mortgage Real Estate Loans/Lines of Credit (33%)**
2. **Used Vehicle Loans (19%)**
3. Total Other Real Estate Loans/Lines of Credit (15%)
4. New Vehicle Loans (14%)
5. Total All Other Loans/Lines of (6%)
6. All Other Unsecured Loans/Lines of (5%)
7. Credit Unsecured Credit Card Loans Credit (4%)
8. Leases Receivable (0.19%)

Loan portfolio comparison – on average

Description	Abnormal	Difference	Normal
Total 1st Mortgage Real Estate Loans/Lines of Credit	32.238%	0.114%	32.353%
Used Vehicle Loans	23.159%	1.939%	21.220%
Total Other Real Estate Loans/Lines of Credit	14.752%	1.296%	16.048%
New Vehicle Loans	11.974%	0.165%	12.139%
Total All Other Loans/Lines of Credit	5.998%	0.514%	5.484%
All Other Unsecured Loans/Lines of Credit	5.895%	0.426%	6.320%
Unsecured Credit Card Loans	5.703%	0.475%	6.178%
Leases Receivable	0.094%	0.053%	0.147%
Total (%)	100%		100%

*Abnormal = Credit unions having abnormal loan growth **Normal = Credit unions having normal loan growth

- Abnormal credit unions tend to have more used vehicle loans and less real estate loans/ lines of credit.
- Abnormal credit unions provided more loans over the period of 2002- 2013.

Data

1. **Yearly Call reports from National Credit Unions Association (NCUA) from 2002-2013 comprising 98,086 annual observations from 9,805 credit unions.**
2. 7,517 observations from 2,228 credit unions were dropped because
    1. They did not survive for 7 consecutive years (in part due to mergers, acquisitions, and bankruptcy); or
    2. At least one of our key variables (total loans, loan loss provisions, interest income, or equity-to-total asset ratio) is missing.
3. Credit unions having extreme values are excluded at 3% and 97% quantile.

Variables

1. ALG(abnormal loan growth)= $LG_{i,t} - Aggregate\ LG_{c,t}$
2. If loan growth is greater than the median, it is defined as abnormal.
3. Total loans represents a comprehensive lending of credit unions and it is used to control a credit union's size.
4. Equity-to-total asset ratio represents a level of capitalization.
5. Herfindahl-Hirschman Index (HHI) is measured by the ratio of each credit union's total outstanding loans to the total credit of the county provided by commercial banks and credit unions.
   - The HHI can range from close to zero to 10,000. A monopolized market would have nearly 10,000 HHI.

Methodology – loan loss

- Loan Loss=$\frac{Loan\ Loss\ Provision_{i,t}}{Total\ Loans_{\ i,\ t-1}}$
- We regressed the loan loss on the following equation:

$$\text{Log(Loan Loss, t)} = \alpha + \beta_1 \text{Log(Loan Loss}_{i,t-1}) + \sum_{K=1}^{3} \beta_{K+1} ALG_{i,t-k}$$

$$+\beta_5 \text{Log(equity to total asset ratio)} + \beta_6 \text{Log(Total Loan)} + \beta_7 \text{Log(HHI)}$$

$$+ \beta_8 \text{Abnormal} + \sum_{K=1}^{3} \beta_{K+8} (abnormal * ALG_{i,t-k})$$

$$+ \beta_{12}\ \text{(abnormal} * \text{Log(Total Loan))} + \beta_{13}\ \text{(abnormal} * \text{Log(HHI))}$$

Methodology – profitability

- As a proxy of profitability, the relative interest income is used :

$$\text{Relative Interest Income} = \frac{Total\ Interest\ Income_{i,t}}{Total\ Loans_{i,t}}$$

- We regressed the profitability on the following equation:

$$\text{Log(relative Interest Income)} = \alpha + \beta_1 \text{Log(ALG)} + + \beta_2 \text{Log(Total Loan)} + \beta_3 \text{Log(HHI)} + \beta_4 \text{Abnormal} + \beta_5 \text{ (abnormal} * \text{Log(Total Loan))} + \beta_6 \text{ (abnormal} * \text{Log(ALG))} + \beta_7 \text{ (abnormal} * \text{Log(HHI))}$$

Methodology – solvency

- The equity-to-total assets ratio shows a credit union's ability to deal with unexpected losses.
- We regressed solvency on the following equation:

$$\text{Log(Equity-to-total asset ratio)} = \alpha + \beta_1 \text{Log(ALG)} + + \beta_2 \text{Log(Total Loan)} + \beta_3 \text{Log(HHI)} + \beta_4 \text{Abnormal} + \beta_5 (\text{abnormal} * \text{Log(Total Loan)}) + \beta_6 (\text{abnormal} * \text{Log(ALG)}) + \beta_7 (\text{abnormal} * \text{Log(HHI)})$$

Methodology – fixed effects model

- Each credit unions has had different experiences about loan growth.
- We used a panel data consisting of a number of credit unions and their yearly financial statements.
- When it comes to panel data, some variables can vary depending on time series and/or cross sectional terms. If there is an unchanged variable, fixed effects model controls the effects of unobserved effects.
- Hausman test result shows that there are group effects or time effects or both and Ordinary Least Squares (OLS) would not give reasonable result.

Empirical Analysis - Loan loss

	Normal	Abnormal
Loan Loss average	-6.6478***	-6.9053***
logLL1	0.2016***	0.1864***
lnNetLn	0.3852***	0.3671***
lneqv	-1.4515***	-1.2957***
ALG1	-0.0018	-0.0009
ALG2	0.0022*	0.0020*
ALG3	0.00205	-0.00117
lnHHI	-0.0383***	-0.0311***

N=9625, R^2= 0.5484, F-test <0.0001
* p < 0.10, ** p < 0.05, *** p < 0.01

Holding others fixed,

1) Average loan loss in abnormal credit unions is larger than that of normal credit unions.
2) Past abnormal loan growth with a time lag 2 is significantly and positively related to contemporaneous loan loss. 1% (1 unit) increase in past loan loss would increase this year's loan loss by 0.2%
3) As market concentration increase, loan loss would decrease. So 1% increase in HHI tends to decrease loan loss by 0.031%.

Empirical Analysis - Profitability

	Normal	Abnormal
Profitability average	9.2499***	9.1902***
ALG	-0.0025***	-0.0029***
lnNetLn	-0.3596***	-0.3569***
lnHHI	-0.0650***	-0.0637***

N=9625, R^2= 0.8660, F-test <0.0001
* p < 0.10, ** p < 0.05, *** p < 0.01

Holding others fixed,

1) Average profitability in abnormal credit unions is smaller than that of normal credit unions.
2) Abnormal loan growth leads to a reduction in the interest income. 1 unit (1%) increase in abnormal loan growth decrease profitability by -0.29%.
3) A degree of market concentration is significantly and negatively related to profitability. 1% increase in HHI tends to decrease profitability by 0.063%.

Empirical Analysis - Solvency

	Normal	Abnormal
Equity-to-total asset ratio average	5.1901***	5.0411***
ALG	0.0019***	-0.0014***
lnNetLn	-0.1153***	-0.1072***
lnHHI	-0.0521***	-0.0506***

N=9625, R^2= 0.9008, F-test <0.0001
* p < 0.10, ** p < 0.05, *** p < 0.01

Holding other effects fixed,

1) Average equity-to-total asset ratio in abnormal credit union is smaller than that of normal credit unions.
2) 1 unit increase in abnormal loan growth would decrease equity-to-total asset ratio by 0.0014%.
3) A degree of market concentration is significantly and negatively related to profitability. 1% increase in a degree of market concentration would decrease equity-to-total asset ratio by 0.05%

Conclusion

1. With respect to first objective, we find that
   A. Past abnormal loan growth has a positive and significant impacts on subsequent loan losses with a time lag 2.
   B. Abnormal loan growth leads to a decline in the relative interest incomes of credit unions.
   C. Abnormal loan growth is negatively related to solvency,
2. With respect to second objective, a degree of market concentration negatively affects to loan loss, profitability, and solvency.

Implications

- **"The ability of loan officers to recognize potential loan problems fades out over time, lowering the credit standards and increasing lending volume."** (Berger and Udell, 2004)
- If loan growth increases because credit unions become more willing to lend, credit standards should fall and loan losses should eventually rise and profitability and solvency should decrease.
- However, if loan growth can increase by maintaining strong credit standards, faster loan growth might not lead to higher loan losses and it would not make credit unions fragile.

Implications(Cont.)

- Supervisors and board of directors of credit unions should consider loan growth as an early warning sign of the risk.
- Credit unions should carefully check whether the additional income generated by an increase in lending represents an adequate compensation for the additional risk taking.