“Financial stress and commercial bank loan delinquency rate”

AUTHORS	Vichet Sum Jung-Chu Lin

ARTICLE INFO	Vichet Sum and Jung-Chu Lin (2013). Financial stress and commercial bank loan delinquency rate. *Banks and Bank Systems*, *8*(3)
RELEASED ON	Wednesday, 16 October 2013
JOURNAL	"Banks and Bank Systems"
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES **0**

NUMBER OF FIGURES **0**

NUMBER OF TABLES **0**

© The author(s) 2026. This publication is an open access article.

Vichet Sum (USA), Jung-Chu Lin (Taiwan)

Financial stress and commercial bank loan delinquency rate

Abstract

This study is set up to investigate how financial stress dynamically affects commercial bank loan delinquency (CBLD) rate. Using quarterly data from 1994Q1 to 2012Q4, the results show that CBLD rate immediately rises following financial stress shock; however, it significantly drops after 3 quarters following the shock. Financial stress Granger-causes the reaction in CBLD rate; the response feedback from CBLD rate to financial stress is absent. Financial stress forecasts only 0.08% of the CBLD rate at the two-quarter horizon, but it forecasts CBLD rate up to 8.67% at the four-quarter horizon, 10.74% at the six-quarter horizons and 20% at the eight-quarter horizon.

Keywords: loan delinquency, commercial banks, financial stress.
JEL Classification: G20, G21.

Introduction

Based theoretically on the financial amplification model, this paper argues that financial stress is linked to commercial bank loan delinquency rate. In the framework of financial amplification model, Jeanne and Korinek (2010) theoretically describe a mechanism by which declining net worth, tightening borrowing capacity, contracting economic activity and falling prices mutually reinforce one another; this is also known as financial accelerator. The banking sector is important in market economies because this sector is responsible for saving mobilization and credit allocation, payment and fund transfer services. A sound baking sector should offer economic agents favorable opportunities to produce or trade goods or services more cost effectively. When the banking sector is less stressful, consumers should have an easier access to credit and be able to borrow at a lower cost; more credits should be readily available to businesses at a lower rate as well. Wider credit availability and lower cost of finance are desirable situations for economic expansion and growth. Hancock and Wilcox (1998) show that capital declines and loan declines at small banks are linked to the slowdown of real economic activity. However, when the banking sector chokes, access to credit is limited and the cost of capital rises; consequently, consumers and businesses are reluctant to spend and invest (Hakkio & Keeton, 2009). Capital expenditure and investment activities of firms (Gilchrist, Sim & Zakrajzek, 2010; Fernandez-Villaverde et al., 2012) are adversely affected by limited access to credit and rising cost of capital. Ultimately, the economy can slow down and even slip into recession when consumers are reluctant to spend and businesses cease expanding and investing (Bernanke, 1983). Sum (2013a) finds that stock market risk premiums significant drop following financial stress shock. Another study conducted by Sum and Brown (2013) shows that REIT returns negatively respond to financial stress shock.

Other studies have linked loan performance to real economic activity. For instance, Pain (2003) uses panel regression analysis to investigate factors that may help explain loan-loss provisions the major banks in the UK and find that GDP growth, real interest rates and lagged aggregate lending growth are helpful in explaining the spike in loan-loss provisions. Arpa et al. (2001) find that loan provisions increase in periods of real GDP growth declines. Salas and Saurina (2002) study the link between bad loans and the economic cycle in Spain from 1985-1997 and find that during economic booms banks increase their loan portfolio to borrowers of lower credit quality and during recessionary periods banks report increases in bad loans. Moreover, Pesola (2001) shows that a high degree of indebtedness of both corporations and households and coupled with slow GDP growth contribute to banking crisis in Sweden, Norway and Finland. Furthemore, Valckx (2003) reports that a one percentage point decline in the EU GDP growth rate corresponds to 5% to 15% increase in loan provisions. Bikker and Hu (2001) find that the rate of new provisioning is higher when real GDP growth is low. Another study by Bikker & Metzemakers (2002) documents an inverse relationship between loan provision and GDP growth rate. In conclusion, the literature essentially supports the notion that when economic conditions are poor, loan losses and provisions surge, banks' profitability declines and credit supply is limited; all of these actually amplify the effects of the recession.

Why is it important to examine how financial stress impacts commercial bank loan delinquency rate? Delinquency rate on all loans written by commercial banks has a predictive power in explaining returns on commercial bank sector. Sum (2013b) shows returns on the commercial bank sector significantly drop immediately following the spike in loan delinquency rate. Up to this point, there are not a lot of studies documenting how commercial bank loan delinquency reacts to innovation in financial stress. Consequently, a study to investigate how financial stress dynamically affects commercial bank loan delinquency rate is strongly warranted. A major contribution of this study is to provide empirical evidence of the dynamic relationship between financial stress and commercial bank loan delinquency rate.

© Vichet Sum, Jung-Chu Lin, 2013.

1. Methodology

The current study seeks to investigate how financial stress dynamically affects commercial bank loan delinquency rate. To achieve this objective, a vector autoregressive (VAR) analysis (equation (1)) is used for analyzing the quarterly data from 1994Q1 to 2012Q4 in order to report the orthogonal impulse response functions and variance decomposition of commercial bank loan delinquency rate and financial stress. The Granger causality Wald tests are also performed to report the causality and or feedback response between financial stress and commercial bank loan delinquency rate. Two variables namely financial stress (FS) and commercial loan delinquency rate (DEL) are included in the VAR model.

$$DEL_t = \alpha + \sum_{i=1}^{n} \lambda_i DEL_{t-1} + \sum_{i=1}^{n} \delta_i FS_{t-1} + \varepsilon_t,$$
$$FS_t = \alpha + \sum_{i=1}^{n} \omega_i DEL_{t-i} + \sum_{i=1}^{n} j_i FS_{t-i} + \eta_t. \quad (1)$$

FS is the quarterly financial stress index obtained from the FRED (Federal Reserve Economic Data) database maintained by the research division of the Federal Reserve Bank of St. Louis. *DEL* is the percentage change of delinquency rate on all loans written by all commercial banks in the US; the data are also extracted from the FRED. The optimal lag selection tests indicate 4 lags as the number of optimal lags to be included in the VAR model.

2. Results

Before running the vector autoregressive analysis, the Schwarz's Bayesian information criterion (SBIC), the Akaike's information criterion (AIC) are estimated to determine the optimally appropriate lags to be included in the VAR analysis. The results of the tests suggest four lags to be included in the VAR model.

Descriptive statistics related to *FS* and *DEL* are reported in Table 1 and presented as graphs depicted in Figure 1 and Figure 2 (in Appendix). Results from the vector auto regression (VAR) analysis show that commercial bank loan delinquency (CBLD) rate immediately increases following financial stress shock; however, it significantly drops after 3 quarters following the shock (see Figure 3 in Appendix). As shown in Table 2, financial stress forecasts only 0.08% of the CBLD rate at the two-quarter horizon, but it forecasts CBLD rate up to 8.67% at the four-quarter horizon, 10.74% at the six-quarter horizons and 20% at the eight-quarter horizon. Financial stress Granger-causes the reaction in CBLD rate; the response feedback from CBLD rate to financial stress is absent (see Table 3).

In order to check to see if the stable conditions exist in the VAR estimates as a robustness check, the Eigenvalue stability condition is calculated. As reported in Table 4, all the Eigenvalues lie inside the unit circle verifying that the VAR estimates are stable.

This table reports the various descriptive statistics of the variables included in the VAR model.

Table 1. Descriptive statistics

	DEL	*FS*
Count	76	76
Mean	0.06	0.01
Std	0.27	0.99
Skewness	1.58	2.89
Kurtosis	7.34	14.57
Min	-0.51	-1.22
Max	1.21	5.28

This table reports the variance decomposition results in order to determine the relative importance of financial stress (FS) in forecasting the commercial bank loan delinquency (DEL) rate into the future horizons. The reported values are in decimals.

Table 2. Variance decomposition of *DEL* and *FS*

Horizon (in quarters)	*DEL*	*S.E.*	*FS*	*S.E.*
2	0.991	0.016	0.009	0.016
4	0.913	0.059	0.087	0.059
6	0.892	0.046	0.108	0.046
8	0.800	0.088	0.200	0.088

Notes: Order of *VAR*, *DEL*, *FS*.

This table reports the *p*-values of the Granger causality Wald tests in order to find out if financial stress (*FS*) Granger-causes the commercial bank loan delinquency (*DEL*) rate.

Table 3. Granger causality Wald tests

Regressors	Dependent variables	
	DEL	*FS*
FS	0.000	-
DEL	-	0.249

Notes: The *p*-values for *F*-statistics for joint tests on lags are reported here.

Table 4. Eigenvalue stability condition

Eigenvalue			Modulus
0.8745363	+	0.1025126i	0.880524
Eigenvalue			Modulus
0.8745363	-	0.1025126i	0.880524
0.0083185	+	0.7571925i	0.757238
0.0083185	-	0.7571925i	0.757238
-0.7107577			0.710758
0.4002335	+	0.5046179i	0.644070
0.4002335	-	0.5046179i	.64407
-0.3082761	+	0.1025126i	.308276

Notes: All the Eigenvalues lie inside the unit circle; the *VAR* satisfies stability condition.

Conclusions

This paper argues that there is a dynamic linkage between financial stress and commercial bank loan delinquency rate; this argument is based on the financial amplification model which suggests that declining net worth, tightening borrowing capacity, contracting economic activity and falling prices mutually reinforce one another. This study seeks to investigate how financial stress dynamically affects commercial bank loan delinquency (CBLD) rate. The results show that CBLD rate immediately rises following financial stress shock; however, it significantly drops after 3 quarters following the shock. Financial stress Granger-causes the reaction in CBLD rate; the response feedback from CBLD rate to financial stress is absent. Financial stress forecasts only 0.08% of the CBLD rate at the two-quarter horizon, but it forecasts CBLD rate up to 8.67% at the four-quarter horizon, 10.74% at the six-quarter horizons and 20% at the eight-quarter horizon.

References

1. Arpa, M. Giulini, I. Ittner, A. & Pauer, F. (2001). The influence of macroeconomic developments on Austrian banks: implications for banking supervision, *BIS Papers*, 1, pp. 91-116.
2. Bernanke, B. (1983). Irreversibility, uncertainty and cyclical investment, *Quarterly Journal of Economics*, 98, pp. 85-106.
3. Bikker, J.A. & Hu, H. (2001). Cyclical patterns in profits, provisioning and lending of banks and procyclicality of the new Basel capital requirements, DNB Staff Report, No. 86, DeNederlandsche Bank.
4. Bikker, J.A. & Metzemakers, P.A.J. (2002). Bank provisioning behavior and procyclicality, DNB Staff Report, No. 50, De Nederlandsche Bank.
5. Fernandez-Villaverde, J., Guerron-Quintana, P. Kuester, K. & Rubio-Ramirez, J. (2012). Fiscal volatility shocks and economic activity, University of Pennsylvania mimeo.
6. Gilchrist, S., Jae W. Sim, S.J. & Zakrajsek, E. (2010). Uncertainty, financial friction and investment dynamics, Working paper, Boston University and Federal Research Board.
7. Hakkio, C.S. & Keeton, W.R. (2009). Financial stress: What is it, how can it be measured, and why does it matter? *Economic Review*, pp. 5-50.
8. Hancock, D. & Wilcox, J.A. (1998). The "credit crunch" and the availability of credit to small business, *Journal of Banking & Finance*, 22 (6), pp. 983-1014.
9. Jeanne, O. & Korinek, A. (2010). Excessive volatility in capital flows: A Pigouvian taxation approach, *American Economic Review*, 100 (2), pp. 403-07.
10. Pain, D. (2003). The provisioning experience of the major UK banks: A small panel investigation, Bank of England Working Paper, 177, London.
11. Salas, V. & Saurina, J. (2002). Credit risk in two institutional regimes: Spanish commercial and savings banks, *Journal of Financial Services Research*, 22 (3), pp. 203-224.
12. Sum, V. & Brown, K. (2013). Dynamic effects of financial stress on the US real estate market performance, Working Paper, available at: SSRN 2196251.
13. Sum, V. (2013a). Impulse response functions and causality test of financial stress and stockmarket risk premiums, *International Journal of Financial Research*, 4 (1), pp. 1-4.
14. Sum, V. (2013b). Commercial bank performance and loan delinquency, Working Paper, available at SSRN 2286040.
15. Valckx, N. (2003). What determines loan-loss provisioning in the EU? Mimeo, ECB.

Appendix

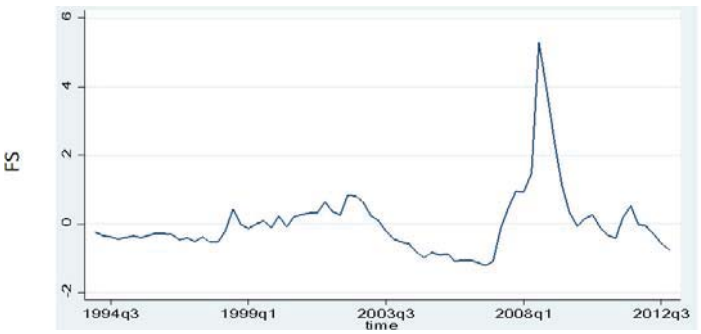

Fig. 1. Financial stress index (FS)

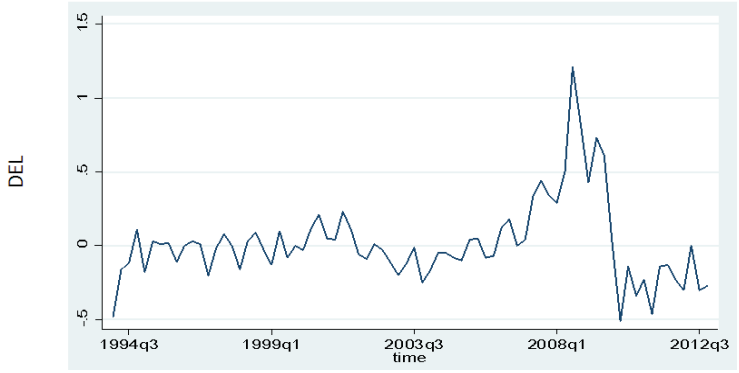

Fig. 2. The percentage change of delinquency rate on all loans written by all commercial banks in the US (DEL)

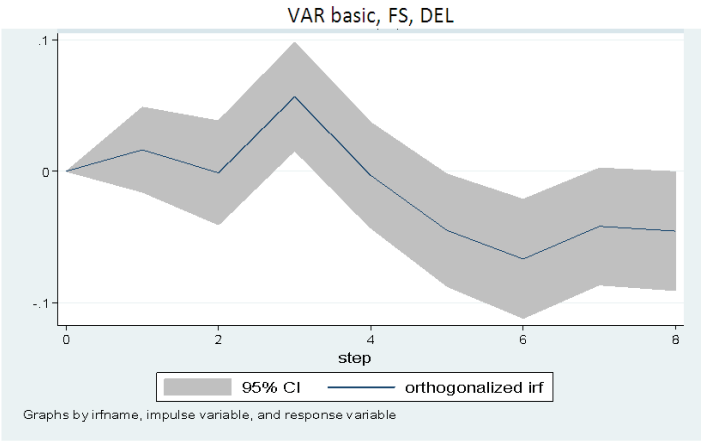

Fig. 3. The orthogonal impulse response function of DEL to FS