Ex - Post Risk and the Cyclicality of Banks' Self - Discipline: Evidence from the USA banks

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Abstract

Bank firms try to improve their efficiency by offering credit to large firms which extent trade credit to those firms that are blocked from bank credit or faces high possibilities to not pay back their loans. This self-discipline helps banks to become more prudent when they lend risky firms such as small and medium size firms. So, the aim of this research is to empirically examine if both credit cycle of large lending and business cycle affect the ex-post credit risk (i.e. non-performing loans) in the banking system of USA. A unique data set is created by using the Statistics on Depository Institutions report compiled by the Federal Deposit Insurance Corporation covering the period between 2010Q1-2019Q4. The Credit Crunch of 2007 had its origin in US real estate market, but rapidly it is expanded worldwide because of banking system interconnection across countries. A crucial characteristic of the aforementioned crises was the defaults on subprime mortgages because

of the lax lending practices and because the period covered by the low starter interest rate ended. Therefore, we carry out research on US NPLs considering a very important banking system for the global economy taking into account the pressure on south part pf Eurozone because of the Credit Crunch of 2007 as well as for the robustness of many European banks because of the interconnection of banks across counties. What we found, using the GMM as econometric methodology, is that both current credit cycle of large lending and current business cycle can influence negatively the US NPLs due to the self-discipline role of large lending and the adverse macroeconomic conditions respectively. In addition, we found that the credit cycle of large lending it can be associated positively with US NPLs with one period lag supporting the excess credit influence on NPLs. Moreover, we noticed that the US NPLs have not a symmetric sensitivity between both business cycle and credit cycle of large lending. Finally, the empirical result of our research can help policy makers as well as bankers to their effort to develop a more stable banking system when they design policies to deal effectively with NPLs.

Keywords: Large Lending; Ex-post credit risk; Non -perfoming loans; Bysiness cycle; Credit cycle

JEL classification: C23, C51, G21, G2, E32

1. Introduction

The business of banking relates to the production of information since bankers very frequently face the situation where borrowers have more information about the investment opportunities and activities of their potential borrowers than bankers. This adverse situation for banks can be represented accurately by the case where SMEs apply for loan. In fact, banks are reluctant to finance SMEs because of their financial opacity (Berger & Udell, 1998). On the contrary, banks can reduce the information asymmetries problems that arise during a loan procedure financing large firms considered to be more creditworthy than small and medium sized firms (SMEs) as large firms offer audited financial statements to their creditors. Indeed, banks can use "hard information", which includes quantifiable and available data, to assess credit risk via credit scoring models in standardized loans procedure (Elyasini & Golberg, 2004).

Thus, banks face a higher credit risk, compared to large firms when they lend SMEs (Cassar, 2004) and for this reason banks use the more severe tool that they have to control credit risk rationing the credit of SMEs (Stiglitz, J. E., & Weiss, 1981) and undermining at the same time the positive role of SMEs in investment, innovation, employment and social stability, which are fundamental components of economic growth and social cohesion (Edmiston, 2007; Liang et al, 2017).

According to "bad management hypothesis" efficient banks are more likely to manage appropriately their credit risk keeping their nonperformance loans at low numbers following prudently the principles for managing credit risk (Berger and DeYoung, 1997; Mishkin, 2016). Although, efficient banks are more able to use the principles for managing

credit risk than inefficient banks the whole banking industry can improve its efficiency through large lending (Andriakopoulos and Kounetas, 2023) as large lending can be offered to smaller firms indirectly when large firms extend trade credit to smaller firms alleviating the information asymmetries problems that prevails when banks borrow SMEs.

In fact, economic theory suggests that trade credit is provided mainly by large and old firms that have access to external finance (Berlin, 2003; Petersen & Rahan,1997). So, large lending can be used as trade credit by large firms to finance others having limited access to bank loans because of their small size and opaque nature (Berlin, 2003).

Indeed, trade credit can mitigate the adverse selection problem that exist during a loan procedure revealing the financial situation of a potential borrower as payments beyond the discount period can be thought of by selling firms as a sign of financial distress (Ng et al, 1999). Furthermore, this method of finance can deal with moral hazard problems reducing the incentives of firms for nonpayment or diverting the loan for unprofitable purposes through the ability of selling firms to cut of shipments for nonpayment to inconsistent byers (Burkart &Ellingsen,2004).

In addition, the positive association of the banks' no performing loans (NPLs) with credit cycle has been noticed by a few scholars underwritten the need for a macro-prudential authority in an economy as banks' balance sheets are correlated via interbank lending with and the ultimate "victims" being the depositors who lose their deposits in case that one bank goes bankrupt deteriorating also the financial situation of the other connected banks. Therefore, governments have a crucial role to improve banks' financial stability while banks can hedge against systemic risk appropriately (Anastasiou, 2017). In other words during expansionary (contractionary) phases of the credit cycle more (less) NPLs are

expected due to increasing (decreasing) loan granting. In addition, recent bank efficiency literature has noticed the beneficial role of large lending on productive performance of banks as both profit and cost efficiency are improved as large lending increases (Andriakopoulos and Kounetas, 2023).

Thus, from the points above of discussions, it warrants to investigate an ambiguous relationship that arises between no performing loans and large lending credit cycle. Indeed, on the one hand there is a positive relationship between credit cycle and NPLs, however from the other hand, no performing loans and large lending cycle may have a negative association since large lending can alleviate the information asymmetries problem that prevail during a loan procedure reducing banks' credit risk, cost inefficiency and therefore, according to bad management hypothesis, no performing loans.

In addition we extent our investigation so as to realize the procyclical nature of banks with the business cycle since economic theory suggests that NPLs are emerges when the downturn phase of the cycle starts and the cycle has reached its peak as this time the creditworthiness of borrowers deteriorates and the profitability of customers worsens. Therefore, losses will occur in the balance sheets of banks (cyclicality).

Clearly, we expect, a negative sign between the business cycle and NPLs since USA banks would have greater (lower) levels of NPLs during worsening (improving) macroeconomic conditions. In other words, during expansionary (contractionary) phases of the business cycle less (more) NPLs are expected due to the improving (worsening) macroeconomic environment.

To evaluate the empirical relationship between the credit cycle of large lending and no performing loans, we employ data on US banks obtained from Statistics on Depository Institutions (SDI) report made by Federal Deposit Insurance Corporation (FDIC). This paper aims to contribute to the bank literature in a few ways. First, this article empirically shows the effect of large lending credit cycle and SME lending credit cycle on NPLs of US banking. To our knowledge this is the first paper that investigates the impact of the large lending credit cycle on NPLs in US banking. Second, this paper focuses on USA banking system which relates to other banking systems and a very a few works have been observed regarding the cycle effect on this issue of today's banking. Third, the relationship between large lending credit cycle and NPLs is still ambiguous and may be different in USA study.

We create the remainder of this paper as follows. Section 2 contains the data of this study. Section 3 presents the methodology while Section 4 reports an analysis of the empirical results. Finally, Section 5 provides a conclusion.

2. Data

The financial and accounting data used in this study were obtained from Statistics on Depository Institutions (SDI) report made by Federal Deposit Insurance Corporation (FDIC)[1]. From the above source we designed a unique database of USA banks identified as large lending lenders. Thus, our sample contains USA banks tracked yearly for the period 2010-2019, creating an unbalanced panel of bank year observations.

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[1] Our data are from the *Statistics on Depository Institutions* (https://www5.fdic.gov/sdi/download), which provides branch-level information.

In the next few lines, we present a brief discussion for both the dependent and independent variables of our equation with the underlying logic for the inclusion of the participated variables.

Variables definition

No performing loans: Inefficient bank is very likely to develop no performing loans, Indeed, "bad management" hypothesis argues that a critical reason for the presence and growth of bad loans is the failure of bank managers to properly control and monitor their operating costs by increasing bad loans. Therefore, low measured bank cost efficiency may lead to an increase in NPLs implying a negative relationship between bank cost efficiency and NPLs.In addition, according to the "bad luck" hypothesis, NPLs may arise due to adverse external events, causing additional costs and administrative costs for banks to deal with NPLs, thus there is a negative correlation between banking cost efficiency and NPLs.In more details, (*NPLs*) defined as the ratio of total assets past due 90 or more days and still accruing interest to the bank's total loans.

Large lending: Banks offer loans to large firms easier than SMEs as the former provide "hard" information that they help bank to assess more accurately the credit risk making therefore large lending a safe bank investment. Moreover, recent literature supports that large lending can be passed indirectly via trade credit to small firms which are blocked from financial markets because of small size and opaque nature, provided that large firms, which have access to bank loans, offer trade credit to small firms. Therefore, we expect a negative relationship between no performing loans and credit cycle of large lending since banks finance indirectly SMEs through trade credit when they grant loans to large firms

improving their screening and monitoring methos and therefore improving cost efficiency and reducing no performing.

So, large lending is calculated from the difference between commercial and industrial loans minus commercial and industrial lending to small business divided by loans and lease financing receivables of the institution, including unearned income[2].

Cycle: Following the bad luck hypothesis, increases of nonperforming loans that have been occurred because of external events decreases cost efficiency as banks are forced to waste sources and efforts to handle additional expenses associated with problem loans. Therefore, we expect a negative relationship between no performing loans and business cycle since according to bad lack hypothesis during downturns period is very likely to happen adverse events that can increase the problem loans.

There is a body of literature that suggests ways of separating the short-term trend of the economy from the long-term trend of the economy. We use the Christiano Fitzgerald filter (CF filter, hereafter), originally proposed by Christiano and Fitzgerald (2003). However, in this study I used the Christiano Fitzgerald filter (CF filter, hereafter), originally proposed by Christiano and Fitzgerald (2003) since, compared to the other famous method proposed by the Hodrick-Prescott filter (HP filter, in following) the CF filter works with an assumption about the range while the HP requires a specific assumption about the time range of a variable's cycle. Furthermore, the CF filter asymptotically converges to the ideal filter, which theoretically considers an infinite number of observations in a row.

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[2] Trade credit suppliers predominately operate in upstream goods industries, such as the wholesale trade, manufacturing and construction industries (Fitzpatrick and Lien, 2013)

In more detail, the business cycle (*CYCLE hereafter*) and the credit cycle of large lending (*CCLL hereafter*) are produced with the methodology of Drehmann et.al. (2012). In particular, we take real GDP and the ratio of large business lending to total credit respectively, and through the CF filter derive the short-term trend of the economy and the long-term trend of the economy, decomposing each business cycle trend. These cyclical components represent the business cycle and credit cycle of corporate lending respectively. We are interested in real values of gross domestic product, not changes due to inflation, so we used real GDP (GDP - Gross Domestic Product) instead of nominal GDP.

In addition, we study the impact of the short-term economic trend on NPLs. According to the work of Drehmann et.al. (2012), it is assumed that there are two frequency levels where a cycle can be detected, the short-term and the medium-term. The short-term trend of the business cycle is believed to cover frequencies between 1 and 8 years (4 and 32 quarters in our data). The medium term can last anywhere between 8 and 30 years or between 32 and 160 quarters respectively. Due to the relatively short time period coverage in our paper, I only consider how the short-term trend of the business cycle affects the aforementioned critical variables. Table 1 contains the time sample average of dependent variable as well as independent variables covering the time interval of our study

*****Insert Table 1 here*****

3. Methodology

The empirical relationship between large lending credit cycle and no performing loans is assessed by using GMM estimators. Following the "bad management" hypothesis, we notice that large lending credit cycle may influence NPLs negatively provided that large

lending increases bank efficiency via the reduction of information asymmetries problem that exists between lenders and borrowers and therefore bankers are more able to monitor and screen loans reducing both credit risk and non performing loans.

Thus, we investigate the effect of credit cycle of large lending on NPLs with cycle movements. There is a strand of literature that it uses GMM methodology so as to explore the relationship between credit cycle and NPLs (Anastasiou, 2017). In a similar vein, in order to investigate the relationship between large lending credit cycle and NPLs, we follow their approach expressing the formation of large lending of credit cycle and NPLs as below:

$$NPLs_{it} = a_1 NPLs_{it-1} + a_2 CCLL_{it} + a_3 CYCLE_{it} + a_4 CCLL_{it-1} + a_5 CYCLE_{it-1}$$
$$+ \; \varepsilon_{i,t}$$

Where i, t, $NPLs_{it}, CCLL_{it},$ and $CYCLE_{it}$ denote bank, time (quarter), nonperforming loans, credit cycle of large lending and business cycle respectively. In more details, the dependent variable of our model is the non performing loans as a percentage to total loans, as explanatory variables we employed the cyclical (or short-run) component from the decomposition of the real GDP, namely the business cycle (CYCLE hereafter) and the cyclical component from the decomposition of the large lending credit to industrial and commercial loans to gross loans, that is the credit cycle of large lending (CCLL hereafter)

In order to estimate the dynamic model, I employed the difference Generalized Method of Moments, firstly proposed by Arellano and Bond (1991). As instruments I used

the first lagged variables for both the dependent variable and the explanatory variables.

These instruments are in line with the results of the Difference in Hansen test.

After the estimation of the empirical model, we examined whether the following

hypotheses hold:

$$\text{Hypothesis 1: } H_0: a_2 = a_3 = 0$$

So, US NPLs will be sensitive neither to business cycle nor to credit cycle of large

lending in case that we do not reject the null hypothesis

$$\text{Hypothesis 2: } H_0: a_2 = a_3$$

The above hypothesis suggests that US NPLs have a symmetric sensitivity between

both business cycle and credit cycle of large lending when we accept the aforementioned

null hypothesis.

4. Results

The estimated coefficients and their corresponding robust standard errors for our

dynamic model are contained in table 2,

*****Insert table 2 here*****

It is worth saying that based on the sings of the majority of the estimated

coefficients the aforementioned empirical analysis not only confirms the economic theory

but also enrich the relevant literature. Also, according to the first testable hypothesis,

rejected at 0.05 level, both CCLL and CYCLE are important and significant factors that

they can affect USA NPLs as meaning that USA NPLs are sensitive both to CCLL and CYCLE.

A new finding for the literature of NPLs is that our empirical analysis offers us some positive evidence that NPLs and CCLL are related negatively implying that large lending can reduce NPLs through the improvement of bank cost efficiency as the estimated coefficient of current CCLL enters significantly in our empirical model.

In more details the current values of NPLs seems to not be influenced significantly by the one lagged period NPL although the relevant estimated coefficient appears the appropriate positive sign. Turning to CYCLE variable, our empirical analysis offers us some evidence that NPLs and CYCLE are related negatively as the estimated coefficient of CYCLE variable enters significantly but only in current terms. In absolute terms, the CCLL appears to have a greater impact on the evolution of the NPLs than the CYCLE as the coefficient of CCLL found to be superior than the corresponding coefficient of CYCLE. Moreover, this finding is in line by the results of the second hypothesis that we tested, since we observed that the null hypothesis of the second testable hypothesis is rejected and thus, we can infer that US NPLs have not a symmetric sensitivity between the influences of both CCLL and CYCLE.

In general terms the variables CYCLE and CCLL found to appear the proper sign. In more details, the coefficient of CCLL and the coefficient of one period lag CCLL, they both found to be statistically significant at 0.05 level, but with different impact on the US NPLs.The coefficient of the current CCLL seems to confirm the idea that large lending influences negatively no performing loans through the improvement of cost efficiency

while the coefficient of one period lag of CCLL is in line with economic theory that supports that credit cycle affects positively the no performing loans due to credit expansion.

As far as the impact of CYCLE on NPLs we noticed that the coefficient of the current period CYCLE enters significantly at 0.05 level with the appropriate negative sign in our dynamic model. On the contrary, the one period lagged CYCLE is insignificant at 0.10 level even if it appears a positive sign which it does not confirms the economic theory.

Therefore, our empirical results contribute to literature review of no performing loans focusing on the credit cycle of large lending. What we find is that the impact of the credit cycle of large lending on NPLs can be realized in two directions confirming our main motivation to investigate this ambitious issue. In other words, during expansionary (contractionary) phases of the credit cycle of large lending more (less) NPLs are expected due to increasing (decreasing) loan granting as well as it is possible that during expansionary (contractionary) phases of the credit cycle of large lending less (more) NPLs are expected because of increasing (decreasing) banks' cost efficiency. In addition, our findings confirm our initial expectation that less (more) NPLs are expected during expansionary (contractionary) phases of the business cycle due to the improving (worsening) macroeconomic conditions.

5. Conclusion

This study tries to shed light on an ambiguous issue that arises in the banking industry due to double usage of large lending from banks. Indeed, we expand the literature of banking examining an unexplored cycle which may influence no performing loans through two different directions. It is well known that credit cycle influence positively no performing

loans due to loan expanding however the credit cycle of large lending can also affect no performing loans negatively as large lending can reduce cost inefficiency improving therefore banks' monitoring which it could finally reduce no performing loans. As far as our knowledge, this is the first empirical study which attempts to examine an unexplored credit cycle that may influence USA no performing through two different directions.

The empirical results of our research were produced by a dynamic model, using differenced GMM as estimation methods. The important finding of our research is that it offers some evidence that credit cycle of large lending affects USA NPLs negatively enriching the relevant literature which supports that credit cycle influence positively NPLs due to loan credit expanding.

As far as the impact of business cycle on USA NPLs we notice a negatively association between no performing loans and business cycle due to improving macroeconomic conditions. Moreover, we notice an asymmetric sensitivity between the USA NPLs both CYCLE and CCLL. This article can contribute in existed literature offering another aspect of the impact of credit cycle on NPLs helping bank experts to exert a more prudential monetary policy improving financial stability. Future research is needed to realize determinants of the volume of large lending provided that banks although they have the option to offer or not offer large lending it is also crucial for them the volume of large lending.

TABLES

Table 1: **Time Sample Averages**

	NPLs[a]	*CCLL*	*CYCLE*
2010	0.002	0.043	-0.082
2011	0.002	-0.053	1.529
2012	0.002	-0.130	-2.027
2013	0.001	-0.159	-2.129
2014	0.001	-0.119	1.230
2015	0.001	-0.021	1.145
2016	0.001	0.100	-0.671
2017	0.001	0.197	0.977
2018	0.001	0.229	0.910
2019	0.001	0.182	-0.882

Notes: (a) NPLs stands for no performing loans as the ratio of total assets past due 90 or more days and still accruing interest to the bank's total loans.

Table 2: Estimation results, USA, 2010Q1-2019Q4

	Dynamic GMM
NPL_{t-1}	0.051

	(0. 035)
$CCLL_{it}$	-0. 022**
	(0. 010)
$CYCLE_{it}$	-0.001**
	(0.0005)
$CCLL_{it-1}$	0.018**
	(0.008)
$CYCLE_{it-1}$	0.00008
	(0.00005)
Diagnostics	
Observations	49096
Number of panel id	1292
Testing Hypotheses(probability values)	
$H_0: a_2 = a_3 = 0$	0.038**
$H_0: a_2 = a_3$	0.036**
Notes: (a) The number of stars (*) denote significance level:*** p-value<0.01, ** p-value<0.05 and * p-value<0.1. (b) Robust standard errors adjusted for clustering on banks are in parentheses. (c) Variables NPLs, LLCC, CYCLE stand for non-performing loans, credit cycle and business cycle respectively. Source: Call Reports of FDIC, Own estimations	

References

Anastasiou, D. (2017). Is ex-post credit risk affected by the cycles? The case of Italian banks. Research in International Business and Finance, 42, 242-248.

Andriakopoulos, K., & Kounetas, K. (2023). Large lending and banks performance. Is there any relationship? Empirical evidence from US banks. Bulletin of Economic Research, 75(3), 688-716.

Arellano, M., Bond, S., (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations, Review of Economic Studies, 582: 277-297.

Berlin,M.(2003).Trade credit: Why do production firms act as financial intermediaries. Business Review, Q3, 21–28.

Berger, A. N., & DeYoung, R. (1997). Problem loans and cost efficiency in commercial banks. Journal of Banking & Finance, 21(6), 849-870.

Burkart, M., & Ellingsen, T. (2004). In-kind finance: A theory of trade credit. American Economic Review, 94(3), 569–590

Cassar, G. (2004). The financing of business start-ups. Journal of Business Venturing, 19(2), 261–283.

Christiano L. J. and Fitzgerald, T. J., (2003). The Band Pass Filter, International Economic Review, 44(2): 435–465.

Drehmann, M., Borio, C., and Tsatsaronis, K., (2012). Characterising the financial cycle: don't lose sight of the medium term, BIS Working Paper, No 380, Monetary and Economic Department.

Elyasiani, E., & Goldberg, L. G. (2004). Relationship lending: A survey of the literature. Journal of Economics and Business, 56(4), 315–330.

Petersen, M. A., & Rajan, R. G. (1997). Trade credit: Theories and evidence. The Review of Financial Studies, 10(3), 661–691.

Liang, L. W., Huang, B. Y., Liao, C. F., & Gao, Y. T. (2017). The impact of SMEs' lending and credit guarantee on bank efficiency in South Korea. *Review of development finance*, *7*(2), 134-141.

Mishkin F.S.(2016) Economics of Money, Banking and Financial Markets, The, 11th Edition.

Ng, C. K, Smith, J. K., & Smith, R. L. (1999). Evidence on the determinants of credit terms used in interfirm trade. Journal of Finance, 54, 1109–1129.

Stiglitz, J. E., & Weiss, A. (1981). Credit rationing in markets with imperfect information. The American economic review, 71(3), 393-410.