Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.8, No.22, 2017

Credit Risk Dynamics in Listed Local Banks in Zimbabwe (2009-2013)

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Abstract
This paper looked at credit risk drivers in local listed banks in Zimbabwe by applying a combination of static and dynamic models using monthly decomposed data. Static models used in this study are Pooled OLS, random effect and fixed effect models whilst difference and system GMM were the only two dynamic models analyzed. Findings reveled that credit risk is largely explained by the macroeconomic environment than the internal environment. This thinking was evidenced by insignificance of microeconomic variables in the all static models as well as significances of one microeconomic variable in both dynamic models. The study rendered capital adequacy ratio as statistically significant microeconomic variable in explaining its linkage with credit risk.
Keywords: Zimbabwe, Local banks, Generalized Method of Moments, Dollarization.

1. Introduction

A highly visible difference in lending cultures between local and foreign bank has been major area of concern in the Zimbabwean banking industry post and prior dollarization. Bank lending activity largely hinges on bank's credit culture and the same culture is what determines the very bank's assets level as well as assets quality. Basically Zimbabwean banking industry constitute of locally owned and foreign-owned banks which, to some noticeable degree, exhibit different lending cultures. Differences in lending culture between local and foreign banks promoted the researcher to look into the sources of credit risk in local banks and align finding to previous studies thereof. Previous studies looked at credit risk determinants in the banking industry as a whole without separating between locally and foreign-owned banks[1].

2. Theories relating to Non-Performing Loans

2.1. Bad Luck hypothesis

This is the notion that external events precipitate increases in non-performing loans in the banking industry. These external events may largely be explained by inevitable adverse shocks in the economy which ultimately breed series of company closures, weakening borrowers' repayment capacity, among others. The underlying concept under this hypothesis is the assumption that banks devote more efforts and expenses in dealing with problem loans which increases their costs and eventually decrease their cost efficiency (Rajha, 2016; Berger and DeYoung, 1997).

2.2. Bad Management hypothesis

The hypothesis that low cost efficiency is a reflection of poor managerial practices by banks and that is assumed to also imply inadequate effort being undertaken when initiating and monitoring loans. Long run effect is deterioration in loan portfolio quality[2].Podpiera et al (2007) put forward that inadequate allocation of resources used to monitor loans is one of the possible signs of poor management. However Katuka et al (2016) contradicted this thinking basing on findings from the study conducted by Nyamutowa & Masumba (2013). According to Katuka et al (2016) , Zimbabwean banks clearly separates all risk factors into different categories hence lowers the chance of under provisioning resources for loan monitoring. Poor loan underwriting and monitoring exemplifies poor management practices and lead to high NPLs. Under this hypothesis low cost efficiency leads to high NPLs. Predictions oppose those of bad luck hypothesis but both hypotheses predict that NPL negatively correlate with cost efficiency[3].

2.3. Skimping Behavior Hypothesis

This is the postulation that amount of resources devoted for loan underwriting and monitoring have impact on both loan quality and cost efficiency (Katuka et al. 2016; Rajha, 2016; Berger and DeYoung, 1997). According to this hypothesis, high cost efficiency in the short-run leads to deterioration in loan quality in the long-run. The skimping behavior hypothesis looks at how weight placed on cost efficiency in the short-run by banks affects loan portfolio quality in the long-run.

[1] See Katuka et al. (2016); Nyamutowa & Masumba (2013); Mukoki & Mapfumo (2015); Manzote et al (2016); Chikoko et al (2012) and Mabvure et al (2012), among others.
[2]Detailed explanation of bad management hypothesis has been put forward by various authors that include Podpiera et al (2007), Mamonov (2013) and Katuka et al (2016).
[3]Berger &DeYoung (1997) provided deep analysis and explanations of the expected relationship between NPLs and cost efficiency.

2.4. Moral Hazard Hypothesis

Banks capitalization level plays a significant role in determining their behavior in response to moral hazard. According to moral hazard hypothesis, low capitalized banks are assumed to increase the riskiness of loan portfolio in response to moral hazard which at the end leads to rise in NPLs in the long-run (Keeton & Morris, 1987; Katuka et al, 2016; Berger & DeYoung, 1997).

2.5. Pro-cyclical Credit Policy and Cognitive dissonance hypothesis

Athanasoglou (2011) defined pro-cyclicality in lending as tendency of banks to lax their lending standards during booms and stiffening during downturns[1]. Cognitive dissonance hypothesis that states that cognitive dissonance stems from the rejection of currently available information by banks to justify past choices (Athanasoglou, 2011).

3. Empirical Literature

A number of studies have been conducted to explain determinants of non-performing loans in different countries. Quantum of studies looked at macro and micro determinants in aggregate whilst some studies analyzed these two sources in isolation. Different sets of studies incorporated array of variables which were both common and unique to other studies.

The most commonly used models were static models as applied by various authors such as Zibri and Boujelbene (2011) and Poudel (2013). With reference to Zimbabwe Mukoki and Mapfumo (2015) applied autoregressive distributed lag (ARDL) Bond Test. A study by Manzote et al (2016) used a static model. Chikoko et al (2012) employed survey research design while Mabvure et al (2012) applied case study approach. Some researchers such as Katuka et al (2016), Beck, Jakubik and Piloiu (2013) and Klein (2013) employed a combination of both static and dynamic models.

Array of models were employed to identify macroeconomic determinants of credit risk [2].Another set of studies identified both micro and macroeconomic determinants of credit risk[3]. In the same line of research, Ganic (2014) looked into bank-specific variables only whilst Garr (2013) incorporated macroeconomic, bank-specific and industry specific variables. The commonly discussed macroeconomic variables are, *inter alia*, GDP growth rate, inflation growth rate, exchange rate fluctuations, political dummy variables, unemployment, interest rates, and credit growth and broad money supply. Hypothesized relationship between changes in real GDP and NPLs is that improvement in real GDP growth rate raises incomes for borrowers as well as their capacity to services the debt leading to reduced credit risk (Gosh and Das, 2007; Castor, 2012; Zibri and Boujelbene, 2011). Garr (2013) on the other hand found direct relationship between GDP growth rate and credit risk. GDP growth rate was statistically insignificant in some studies[4].

Zibri and Boujelbene (2011), Waemustafa and Sukri (2015) found that inflation negatively correlate with credit risk variable. According to Waemustafa and Sukri (2015), conventional banks are negatively affected by inflation but Islamic banks do not. Negative influence of inflation on conventional banks' credit risk communicates that high inflations make debt servicing easier than low inflation because the real value of outstanding loans deteriorates under high inflationary condition. Gezu (2014) found that inflation was statistically insignificant in determining credit risk exposure for banks. According to Diaconasu, Popescu and Socolius (2014) there direct relationship between unemployment rate and credit risk.

Microeconomic variables include loan growth, size, loans to deposits ratio, capital adequacy ratio, and branch network. Djiogap and Ngomsi (2012) found positive relationship between capital adequacy and NPLs whilst Makri et al (2014), Shingjerji (2013), Hyun and Zhang (2013) found a negative relationship. Mukoki et al (2015) identified that liquidity; return on equity (ROE), efficiency and interest rate spread were main determinants of NPLs in Zimbabwe. Chikoko et al (2012) on the other hand found that NPLs were mainly emanating from poor corporate governance, weak internal systems, lack of client knowledge, high lending rates and over reliance on balance sheet strength.

Another variable of interest is loan to deposit ratio. Swamy (2012) and Boru (2014) found negative association between loan to deposit ratio and NPLs. However the variable was statistically insignificant according to Poudel (2013) and Ganic (2014).

There are also mixed findings on the effect of lending rates on NPLs. Zibri et al (2011) and Saba et al (2012) found negative association whilst Ranja and Chandra (2003) and Farhan et al (2012) found a positive linkage. Vigiazas and Nikolaidou (2011) revealed that there is negative relationship between loan growth rate and NPLs. Das and Ghosh (2007) indicated that branch network is an insignificant determinant of NPLs.

[1] Detailed explanation was put forward by Belaid (2014), Katuka et al. (2015)
[2] Refer to Diaconasu, Popescu and Socolius, 2014, Gitonga, 2014; Castro, 2013, Bucur and Drogomirescu, 2014.
[3] Refer to Messai and Jouini, 2013, Gosh and Das, 2007, RBZ, 2015.
[4] Refer to Waemustafa and Sukri, 2015; Poudel, 2013; Bucur and Dragomirescu, 2014.

4. Data and Methodology

Several microeconomic and macroeconomic variables were incorporated in this study in order to gain full knowledge on sources of credit risk in local listed banks.

Variable	Proxy	Definition	Expected Sign
NPL	Non-performing loans	Nonperforming loans/ Gross loans	
RGDP	Real GDP growth rate	[(Current year real GDP/Previous year real GDP)-1]	-
INFR	Annual inflation rate	Annual inflation rates as given in worldbank database	+
CAR	Capital Adequacy Ratio	[(Tier 1 capital + Tier 2 capital)/ Risk weighted Assets]	?
UR	Unemployment Rate	Unemployment rate as given in worldbank database.	+
IR	Interest rates	Average lending rates	+
LTD	Loan-to-deposit Ratio	Total loans/ Total deposits	+

4.1. Econometric Models

The study employed a combination of static and dynamic models. Monthly data was used in the analysis using STATA 13.0. This paper adopted static models used by Poudel (2013) and Katuka et al. (2016). Static models that were incorporated in this study include pooled OLS, fixed effect and GLS random effect models. The model general form is as follows:

$$NPL_{it} = \phi_i + \beta_1 RGDP_{it} + \beta_2 INFR_{it} + \beta_3 CAR_{it} + \beta_4 UR_{it} + \beta_5 IR_{it} + \beta_6 LTD_{it} + \beta_8 t + \varepsilon_{it} \quad \text{...(1)}$$

The study also employed dynamic model employed by Katuka et al. (2016) and eliminated political dummy variable from the regression equation. Two forms of dynamic models that were incorporated in this study are system GMM and difference GMM estimators. The model was employed to detect whether NPLs ratio evolved over time and revised model is as follows:

$$NPL_{it} = \phi_i + \beta_0 NPL_{i,t-1} + \beta_1 RGDP_{it} + \beta_2 INFR_{it} + \beta_3 CAR_{it} + \beta_4 UR_{it} + \beta_5 IR_{it} + \beta_6 LTD_{it} + \beta_8 t + \varepsilon_{it} \quad \text{...(2)}$$

4.2. Diagnostic Test

Series of tests were performed before running the final model. The study performed panel unit root tests and multicollinearity tests.

	npgl	Unr	Rgdpgr	ltd	Ir	Infr	Car
npgl	1						
unr	-0.5517	1					
rgdpgr	-0.3318	-0.1345	1				
ltd	0.2771	-0.6841	0.0888	1			
Ir	-0.0169	-0.0617	0.3409	0.2186	1		
infr	0.3448	-0.9327	0.4337	0.6803	0.237	1	
car	-0.299	0.7323	-0.1407	-0.7106	-0.1288	-0.7156	1

Table above shows that most variables have coefficients that lie between -0.8 and 0.8, therefore only UNR variable which had higher coefficient of -0.9327 was dropped from the analysis.

Levin-Lin-Chu unit-root test was performed to determine whether panel data was stationary under the following hypothesis:

H_0: Panels contain unit roots
H_a: Panels are stationary

Results indicated that only INFR variable was stationary at level and remaining variables were stationary at order of integration one.

Levin-Lin-Chu unit-root test			
Variable	Adjusted t*	p-value	Order of Intergration
Npgl	-8.3753	0.0000	I(1)
Rgdpgr	-7.8146	0.0000	I(1)
Ltd	-7.9275	0.0000	I(1)
Ir	-7.7247	0.0000	I(1)
Infr	-1.994	0.0231	I(0)
Car	-8.0019	0.0000	I(1)

4.3. Model Specification Tests

Hausman test was performed to select between random effect and fixed effect models and the test supported the use of random effect over fixed effect model since the probability value was 0.9985. Breusch and Pagan LM test was further performed to help in choosing between pooled OLS and random effect model and test results favored the use of random effect model over pooled OLS model.

	Coefficients			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	Fixed Effect	Random Effect	Difference	S.E.
rgdpgr	-.9162316	-.918869	.0026374	.0139817
ltd	-.012921	-.0143855	.0014645	.0041998
ir	-.1622053	-.1611059	-.0010995	.007903
infr	.4997767	.4997083	.0000684	.0030347
car	.1882848	.182072	.0062127	.0125164
	Hausman Specification Test chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 0.25 Prob>chi2 = 0.9985			**Breusch and Pagan LM test** chibar2(01) = 539.15 Prob > chibar2 = 0.0000

4.4. Results: Static and Dynamic Models

Variable	Pooled OLS	Fixed Effect	Random effect	SYSTGMM	DIFFGMM
rgdpgr	-1.0106445*	-.91623162**	-.91886904**	-.32678993***	-.37694317***
ltd	-.06529986	-.01292104	-.01438553	-.07929957	-.08961303
ir	-.12287417	-.16220534	-.16110586	.01558731	.0103059
infr	.49732857***	.49732857***	.49977666***	03748907*	.00986193
car	-.03404557	.18828475	.18207202	-.3916135**	-.46384449**
npgl L1				.98334547***	.91879167***
cons	.07475914***	.07495944***	.07495385***	.00248452*	
Prob>F	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
N	236	236	236	236	232
r2	.14044338	.18921361			
r2_a	.12175736	.16063964			

legend: * p<.05; ** p<.01; *** p<.001

In this study there are three static models and two dynamic models that were employed in order to fully understand NPL drivers under both sets of models. Study findings showed that non-performing loans decreases with rise in real growth rates. The variable is significant in all static as well as both dynamic models. Real GDP growth rate is statistically significant at 0.1% level in both system and difference GMM models, 1% in random and fixed effect models and 5% in pooled OLS model. Negative association infers that rise in GDP growth rates positively affect borrowers' income which improved debt servicing and hence reduction in credit risk. Similar relationship was found in studies conducted by (Gosh and Das, 2007; Castor, 2012; Zibri and Boujelbene, 2011). However results contradicted findings made by Katuka et al (2015), which suggest positive association between changes in real GD growth rate and NPLs. This deviation tells us that listed local banks are differently affected by changes in real GDP growth rate which is unlikely when we a panel of all (*local and foreign*) banks in the model.

Inflation was found to have positive effect on credit risk in all static models and SYSTGMM model. The variable is statistically significant at 0.1% in all static models and significant at 5% in SYSTGMM model. The found relationship suggests that credit risk increases with rise in inflation. Findings conformed to those made by Mileris,(2012), Kochetkov,(2012), Renou,(2011), Derbali, (2011). Clearly study findings conformed to what banks experienced during periods of rising inflation around 2003-2008 in Zimbabwe. Positive nexus between rate of inflation and credit risk explains how real currency value is eroded and the ultimate effect to banks taking into account the notion that loans constitute greatest proportion of bank assets in most developing nations.

Research results showed that capital adequacy ratio was only significant in the dynamic models and that the ratio negatively influence NPLs of local banks in Zimbabwe. The variable is statistically significant at 0.1% in both DIFFGMM and SYSTGMM model and findings conformed to Hyung and Zhang (2013) and Shingjerji (2013). The study suggest that increase in bank capital adequacy reduces NPLs. Bank capital adequacy ratio measures risk taking behavior of any banking institution and according to results banks with low capital adequacy ratio increase NPLs through moral hazard (risky loans).

Loan-to-deposit ratio variables were statistically insignificant in all models. Findings conformed tothose concluded by Poudel (2013) and Ganic (2014). The study rendered interest rates as insignificant drivers on credit risk in all models. Although some variables were insignificant in both static and dynamic models, the study proved how dynamic models overpower static model as there were more significant variables in dynamic models than in static models.

5. Conclusions

This paper looked at credit risk driver in local listed banks in Zimbabwe by applying a combination of static and dynamic models using monthly decomposed data. Findings reveled that credit risk is largely explained by the macroeconomic environment than the internal environment. This thinking was evidenced by insignificance of microeconomic variables in the static models as well as significances of one microeconomic variable in dynamic models. The study rendered capital adequacy ratio as significant microeconomic variable in explaining bank risk taking behavior and therefore suggest banks to heighten their capital adequacy ratios.

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