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Bank risks, capital and loan supply: evidence from Sierra Leone

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Abstract

Purpose – The study aims to investigate the factors that influence banks' loan supply in Sierra Leone. More specifically, it seeks to look into the effects of risk premium, leverage ratio and credit risk on banks' loan supply in Sierra Leone.

Design/methodology/approach – Using annual bank level data on an unbalanced panel of 13 commercial banks data observed over a period of ten years (2002 to 2011), the study employs time and bank-specific fixed effects model for estimation.

Findings – The findings indicate that risk premium, the share of non-performing loans in the banks' loan portfolio, tier 1 capital ratio (leverage ratio) and local currency deposit levels positively and significantly affect the share of loan supply to the private sector in banks' earning assets. On the other hand, advances to local currency deposit ratio and bank size have significant negative effects on the share of loans in banks assets. The study also finds bank type and the growth rate of real GDP (a proxy for economic activity) to be important determinants of the share of loans in banks' earning assets.

Practical implications – The study recommends that the monetary authorities, banking practitioners and the government should pay keen attention to the key risk factors such as non-performing loans and risk premium in the operation of the banking sector to boost commercial banks' loan supply.

Originality/value – Sierra Leone's banking sector presents a unique opportunity to study bank loan supply in relation to bank-specific features in the context of post-war financial reconstruction.

Keywords Bank risks, Portfolio allocations, Bank assets, Banks, Banking, Sierra Leone

Paper type Research paper

1. Introduction

The influx of banks into the Sierra Leonean economy has been a subject of public discussions. The general concern is that given the relatively small size of the Sierra Leone Financial Market, there are too many banks to contend with. Whilst the Bank of Sierra Leone (2009) reinforces this concern, the International Monetary Funds (IMF, 2010) suggests that the low level of intermediation in Sierra Leone may be indicative of limited competition in the banking sector. But from available data, the increased number of banks – mostly of foreign origin and ownership has intensified competition in the system. Market shares are being lost by the three big players[1], interest margins are becoming thinner and foreign exchange rate spreads are being eroded. However, client deposits continue to increase and the well managed banks continue to be highly profitable. Additionally, despite the expansion in the Sierra Leone banking industry, there is still a dearth of bank credit to the private sector. A strict line could therefore be drawn between bank credit availability and accessibility in this market, as the banks' balance sheets show high liquidity of the banks.

The country continues to be characterised by an underdeveloped financial market which constrains financial resource allocation in an efficient manner and hence,



holding economic growth backward (The World Bank, 2010). Understandably, given the difficult conditions in the Sierra Leonean financial market, the banking sector has fallen short of its traditional role of credit allocation to private sector in order to boost growth and development. Thus, the banking system's support to the private sector through credit allocation remains weak. From 1984 to 1987 for example, the Domestic Money Banks' claims on the private sector as a percentage of their claims on government were only 63.78, 32.81, 66.58 and 74.62 percent, respectively, (IMF, 2009). Between 2001 and 2009, the same figure averaged at 56 percent, with 2007, 2008 and 2009 individually recording 61, 66 and 86 percent, respectively. Between 2000 and 2007, the banks' non-performing loans (NPLs) as a percentage of gross loans averaged 22.11 percent (The World Bank, 2010).

The lack of interest by commercial banks in providing loans and advances in the country is not due to liquidity considerations as this sector is seemingly liquid based on the fact that their total deposits nearly double their loan portfolio (Bank of Sierra Leone, 2010). Rather than lending to the perceived risky sector (the private sector), they prefer to invest in government securities such as treasury bills and treasury bearer bonds which earn varying returns and which are also riskless. The banks' holdings of riskless assets (government securities) form a huge proportion of their total financial assets (47.5 percent) (Bank of Sierra Leone, 2010). Access to finance outside the capital city – Freetown, by small and medium scale enterprises and the agricultural sector continues to be grossly inadequate.

The unwillingness of banks to lend to the private sector can be caused by several reasons, among which are the increased capital adequacy requirements imposed by banking regulators; impaired debt-servicing capacity by clients, especially small-to-medium enterprises (SMEs), and risks of a further decline in collateral value. These make the interest rate on loans not to serve as the main determinant of bank credit approval. NPLs have been viewed to constitute one of the most important factors causing reluctance for banks to provide credit to the private sector. In a high NPL condition, banks increasingly tend to carry out internal consolidation to improve the asset quality rather than allotting credit. Although the NPL has witnessed a sharp decline since 2002, when it stood at 48 percent of gross loans and advances, it has been fluctuating and appears to be on the increase[2]. Unavailability of credit to finance firms' working capitals and investments might trigger the second round business failure which in turn exacerbates the quality of bank loans, resulting in an endless vicious cycle of credit crunch. Krueger and Tornell (1999) attribute the credit crunch in Mexico after the 1995 crisis partially to the bad loans. They point out that banks were burdened with credits of negative real value, thereby reducing the capacity of the banks in providing fresh fund for new projects.

One of the preconditions for achieving the strategic priorities of the Second Poverty Reduction Strategy Paper (PRSP II) is growing the private sector through increased access to investible funds[3]. This cannot be accomplished with the banks' failure to adequately direct the much needed credit to the private sector. The issue therefore is what factors are impacting on bank loan supply to the private sector. More specifically, the present study seeks to determine the impact of credit risk such as high NPLs and capital (measured by leverage ratio) on bank loan supply in Sierra Leone. Moreover, the study explores bank specific characteristics such as ownership structure, assets and size as well as the state of economic activities on loan supply.

The present study differs from previous studies in many respects. First, Sierra Leone's banking sector presents a unique opportunity to study bank loan supply in relation to bank specific features in the context of post war financial reconstruction. This is because conflict exacerbates many of the informational limitations of a country's banking system that can act as impediments to bank risk taking activities. Post war structural modifications such as rapid foreign bank entry provide an added incentive to explore the subject matter of bank lending. Second, instead of using aggregated data, the study uses bank level data from individual banks' balance sheets and income statements. Third, instead of studying individual banks in isolation, the behaviour of the banks is studied in a panel. Fourth, Although several recent studies have focused on the banking competition and efficiency in Sierra Leone (Bathalomew, 2005; Kargbo and Adamu, 2009; Bathalomew and Kargbo, 2009; Decker, 2011), none has specifically explore the issue of bank lending activities and the impact of risk factors and increased capital on loan supply in the country.

The rest of the study is organised as follows: Section 2 focuses on an overview of the banking industry of Sierra in both pre and post war periods. Section 3 presents a review of theoretical and empirical literature in the area of banks allocation of credit while Section 4 considers the methodology, theoretical framework and model specification. Section 5 presents analyses of the empirical results. Section 6 contains the conclusion of the work and policy implications of the findings.

2. Conditions of the banking industry in Sierra Leone: pre and post war periods

Sierra Leone's brutal and protracted civil war (1991-2002) destroyed infrastructure and truncated political, social, and economic development, including disrupting the banking sector in a fundamental way. This resulted in widespread damage to the branch network and banking infrastructure as well as financial loss and loss of customer goodwill and confidence.

Moreover, economic difficulties especially in the second half of the 1980s significantly hampered productivity which culminated into an unhealthy business environment. Business failures had devastating consequences on commercial banks' loan portfolios. The quality of banking services became watered down with portfolio contamination becoming very conspicuous. A good number of the existing banks were concealing their losses. The practice of using "good money" (new loans) to finance "bad money" (doubtful loans or contaminated portfolio) to avoid providing for bad and doubtful debts had become a common thing. This practice is otherwise known as ever-greening. The resultant effect was a gradual disintermediation and severe liquidity problems in the early 1990s.

It is important to note however that the country has made substantial progress in transitioning from a post-conflict nation to a developing democracy that has made notable economic gains. Immediately after the war, the government took immediate steps to reform and strengthened the financial system. A new regulations and legislation were introduced, including the updating of the Bank of Sierra Leone Act 2000 and bringing the legislation in line with other Central Bank legislations in West Africa. The reforms also opened up the banking industry of the country, resulting in a large influx of foreign banks. This has generally culminated in the financial market in Sierra Leone being highly dominated by the banking sector, controlling 75 percent of the total financial sector assets (Bank of Sierra Leone, 2009).

However, the influx of banks into the Sierra Leonean economy has been a subject of public concerns. The general concern is that given the relatively small size of the Sierra Leone Financial Market, there are too many banks to contend with. Whilst the Bank of Sierra Leone (2009) reinforces this concern, the IMF (2010) suggests that the low level of intermediation in Sierra Leone may be indicative of limited competition in the banking sector. But from available data, the increased number of banks – mostly of foreign origin and ownership has intensified competition in the system. Market shares are being lost by the three big players[1], interest margins are becoming thinner and foreign exchange rate spreads are being eroded. However, client deposits continue to increase and the well managed banks continue to be highly profitable.

In 2005, there were only seven commercial banks operating in the market (three local and four foreign banks) with a branch network of 31. Out of the 31 branches, the three local banks accounted for 68 percent. By 2010, the number of commercial banks had increased to 13 (three local and ten foreign), with a branch network of 80 (local banks accounting for 39 percent of it). As at December 2011, additional six branches were opened, making a total of 86 branches (local banks accounting for 40 percent of it). Despite this phenomenal expansion, the market remains shallow, with not much active interbank market. Greuning and Bratanovic (2009) clearly put it that in an underdeveloped financial market where liquidity of financial instruments depends exclusively on their maturities rather than on the ability to sell them, banks tend to hold a relatively high volume of liquid assets.

The average total assets of the Sierra Leone banking system is US\$38 million while the three largest players account for about half of the market share. This proportion had witnessed a persistent drop from the level of 90 percent in 1999 to 88 percent in 2004 and 86 percent recorded in 2005, owing to the influx of foreign banks (Bank of Sierra Leone, 2009). The system happens to be sound with average capital in excess of average total assets by 17 percent. Nonetheless, despite the expansion in the Sierra Leone banking industry, there is still a dearth of bank credit to the private sector. A strict line could therefore be drawn between bank credit availability and accessibility in this market, as the banks' balance sheets show high liquidity of the banks. According to The World Bank (2012) report, the volume of loans to the private sector has been fluctuating since 2009. After increasing from US\$21 million in 2009, to US\$69 million dollars in 2010, it dropped sharply to US\$39.8 million in 2011.

However, the issue of NPLs continues to be problematic – 16 percent of total loans (Bank of Sierra Leone, 2010). According to Bathalomew (2005), the present day Sierra Leone Commercial (SL) Ltd came into being in 1973 as a result of the problem of huge NPLs on the books of Intra-Bank (SL) Ltd, with only three years of operation in the market. The market is also characterised by the absence of any credit information agency and no client or bank is noted to be internationally rated. Banks in the industry only rely on their individual internal credit risk assessments in their process of loan allocation. The banks accept deposits in both local currency and three foreign currencies[4]. They are however forbidden by the Central Bank regulations to extend credit denominated in foreign currencies in the domestic market (Banking Act of, 2000). The implication is that a whole of the banks' lending portfolio is in a single currency, except for offshore placements which form a minute fraction of the total interest earning assets (IEA). According to The World Bank (2010), the risk premium in the Sierra Leone financial market averaged 4.59 percent between 2000 and 2008.

Average market bank lending rate to the private sector for the same period was 23.65 percent, average 91 day treasury bills interest rate was 17.84 percent whilst average deposit rate was 9.44 percent for the same period.

3. Literature review

There is wealth of literature providing both theoretical and empirical evidence on the link between bank loan supply to the private sector and a host of predetermined variables, including bank risk measures and capital adequacy. While some authors pay much attention to relationship banking (Kane and Malkiel, 1965), others have focused on four major institution-specific characteristics that are likely to influence traditional lending activities: liquidity, capital, market value and securitization intensity (Montgomery, 2005). Some other studies have suggested that credit creation is influenced by both macroeconomic variables that impact loan uptake as well as internal structures such as the composition of a bank's balance sheet and the demand for loans (Druck and Garibaldi, 2000; Furfine, 2000; Tracey, 2011).

By modifying a Tobin-Markowitz portfolio model to account for the phenomenon of deposit variability, Kane and Malkiel (1965) discover cogent reasons for rejecting formulations of the manner in which certain availability effects operate. They make two additions to the traditional bank portfolio model: deposit variability and consideration of long run profits. Their argument is that given an existing optimum portfolio, a certain class of loan demand creates a dilemma for a bank. Granting such a loan according to the writers, adds to the risk-return ratio, but increases the strength of a bank's client relationship and may increase a bank's expected return, while reducing overall risk. Refusal will nevertheless increase the risk and reduce the expected (long run) return. Their study rejects the hypothesis that credit rationing is purely on the basis of credit risk. Their findings support the assertion that credit rationing is on the basis of client features which entail: the strength of the existing client relationship, the size of the borrower, stability and the prospects for long term growth of deposits, and the existence of profitable future lending opportunities.

Montgomery (2005) investigates the hypothesis that stricter capital adequacy requirements introduced under the Basel Accord caused Japanese banks to alter their portfolios away from heavily weighted risky assets such as loans and corporate bonds and into unweighted assets such as government bonds. Using a panel of Japanese bank balance sheets for fiscal years 1982-1999, the study finds that neither international nor domestic bank asset portfolios are strongly affected by the total regulatory capital ratio. The study explores the sensitivity of various risk weight categories of assets to both total regulatory capital and core regulatory capital and to examine differences in the sensitivity of asset growth to regulatory capital for domestic and international banks in Japan. Moving the argument further, Sawada (2008), attributes bank runs to two alternative views; the random withdrawal theory on the one hand, which considers bank runs as a self-fulfilling phenomenon, and the information based theory which considers bank runs as a phenomenon induced by the market discipline of depositors under asymmetric information on the other hand. To investigate portfolio management with respect to banks exposed to liquidity risk, the study uses micro level data pertaining to the pre war era of the Japanese banking industry (1927-1932), since the study is centred on a market without deposit insurance. The findings show that liquidity risk as captured in the study is negatively and statistically significantly

related at the 1 percent level of significance to the cash-asset ratio, positively related to the security-asset ratio and insignificantly related to the liquid-asset ratio.

In a more related paper studying the effect of bank leverage ratio on credit allocation and bank stability of banks on top of risk-based capital requirements, Kiema and Jokivuolle (2011) finds that both low-risk and high-risk loan rates and volumes remain essentially unchanged. This is because banks previously specializing in low-risk lending can adapt by granting both low-risk and high-risk loans. For sufficiently high LRRs, low-risk lending rates would significantly increase and high-risk lending rates would fall. Similarly, Spinassou (2012) finds that high leverage ratios as required by banking regulators impact on the banks' behaviour either positively or negatively. The study shows that the implementation of a leverage ratio with a risk-dependent capital ratio incites banks to increase their risk-taking. On the other hand this regulation incites banks to hold an adequate level of capital and decreases the banking instability.

Amidu (2006) examines whether bank lending is constrained by monetary policy in Ghana. Using panel cross-sectional data covering the period from 1998 to 2004, the study models the share of loans and advances in banks' total assets as a function of the growth rate of real GDP, the rate of inflation, the Central Bank of Ghana prime rate, broad money supply, bank size measured as the logarithm of a bank's total assets, and liquidity as measured by the share of a bank's liquid assets to total assets. Among the findings, the study shows that during the period of the investigation, Ghanaian banks preferred to invest in risk-free government treasury bills and bonds to secure higher profitability. However, in Sierra Leone, Bathalomew (2005) using a panel of seven banks with monthly data collected between March 1999 and December 2004 finds some mixed results. Estimating three equations to test the collusion hypothesis, the efficient market hypothesis and a joint hypothesis of collusion and efficient market hypotheses, he confirms support for the collusion hypothesis for the dominant banks, suggesting the role of monopoly power in driving dominant commercial banks' profitability in Sierra Leone, but rejects same for the fringe banks. His study however suggests that smaller banks derive profits from efficiency and not from monopoly rent. The study uses three measures of profitability; return on equity, return on capital, and return on assets for analytical purposes.

Tracey (2011) employs an ordinary least square (OLS) model to ascertain the minimum and maximum threshold points for NPLs at which commercial banks become risk adverse in the disbursement of loans. Using the study by Hou and Dickinson (2007) as the launching pad, the study looks at the risk aversion of banks in supplying loans through the modelling of loan supply on balance sheet variables such as the growth rate of the ratio of NPLs to total loans, its square, the growth rates of deposits, other earning assets and capital. The study detects some level of evidence that at higher level of NPLs/loan ratio, banks become more risk adverse in loan disbursement. It is also observed that the two countries used have varying level of risk aversion behavioural patterns. The deposits growth rate is found to move in the same direction as loan supply.

The literature also finds the influence of bank specific factors such as bank ownership on credit supply. Evidence abounds to suggest that state-owned banks display lending behavior different from private banks in many countries (Dinc, 2005; Jia, 2009). Dinc (2005) shows how lending of state-owned banks correlates with the electoral cycle in a cross-country study. State-owned banks boost lending in election years relative to private banks, suggesting a different objective function for both types of banks. In a related vein, Jia (2009) analyzes the relationship between ownership and

the prudential behavior of banks in China by comparing state-owned and joint-equity banks. He observes that state-owned banks are less prudent in lending. This finding suggests that in times of crisis state-owned banks are more reluctant to pare back lending than other banks. Again, there is also evidence to suggest that foreign owned banks display lending behavior different from domestic banks. For example, Fungáčová *et al.* (2011) find that relative to domestic private banks, foreign-owned banks reduced their credit supply more and state-controlled banks less. This supports the hypothesis that foreign banks have a “lack of loyalty” to domestic actors particularly during economic downturns or crisis, as well as the view that an objective function of state-controlled banks being more development oriented leads them to support the economy during economic downturns.

4. Theoretical framework and model specification

Following the works of Druck and Garibaldi (2000), Furfine (2000), Montgomery (2005) and Sawada (2008), we modify the general credit supply determinant model that is given below to reflect the unique characteristics of the banks and the country in context (Table I for the description of the variables below):

$$\ln CPS_{it} = \lambda_0 + \lambda_1 \ln RP_{it} + \lambda_2 NPL_{it} + \lambda_3 ADR_{it} + \lambda_4 CAR_{it} + \lambda_5 \ln VRL_{it} + \lambda_6 \ln TA_{it} + \lambda_7 \ln D_{it} + \varepsilon_{it} \quad (1)$$

In order to control for the bank specific effect such as management quality, bank policies and procedures that do not readily change with time and the time specific effect such as macroeconomic conditions in Sierra Leone which has seen significant changes aftermath of the war, but which also have fixed effects across banks, we specify a fixed effect model where E_i is the bank specific effect such as management quality, and τ_t is the time specific effect such as macroeconomic conditions as GDP growth rate. More specifically, the time and bank specific fixed effect model is given as:

More specifically, the time and bank specific fixed effect model is given as:

$$Y_{it} = \beta_0 + \beta X_{it} + \gamma_2 E_2 + \dots + \gamma_n E_n + \delta_2 \tau_2 + \dots + \delta_t \tau_t + u_{it} \quad (2)$$

E_i in equation (2) is an entity (bank) dummy that takes a certain value from 1 to n (where n is the number of cross-sections) for a given bank and zero otherwise. $n - 1$ bank dummies are included in the model. τ_t is a binary time variable (dummy) that takes a certain value from one to T (where T is the number of observed years) for a particular year and zero otherwise; $T - 1$ time dummies are also added to the model. It is worth noting that these bank and time dummies are introduced by the econometric software, Stata, not the researcher.

The final model that is estimated is of the form:

$$\ln CPS_{it} = \lambda_0 + \lambda_1 \ln RP_{it} + \lambda_2 NPL_{it} + \lambda_3 ADR_{it} + \lambda_4 CAR_{it} + \lambda_5 \ln VRL_{it} + \lambda_6 \ln TA_{it} + \lambda_7 \ln D_{it} + \sum_2^N \gamma_i E_i + \sum_2^T \delta_i \tau_i + \varepsilon_{it} \quad (3)$$

Furthermore, suspecting that the variables NPL ratio and ADR could be endogenous in the equation (3), based on their computations, we will conduct a test to verify its presence.

Variable name	Description	Expected sign
<i>LnCPS</i>	The natural logarithm of the stock of bank credit to the private sector as a percentage of the stock of IEA	+
<i>lnRP</i>	The natural logarithm of the difference between the risky rate of return on loans (risky asset) and the return (annual percentage yield) on 91 days treasury bills (riskless assets), used as a measure for risk premium. Banks are seen to be risk averse. As such, an increase in the risk premium provides an incentive for banks to lend more to the private sector	-
<i>NPL</i>	The ratio of NPLs in the stock of gross bank credit to the private sector (quality of bank loans) used as a measure for clients' credit or default risk. An increase in the NPL ratio in the stock of credit to the private sector raises the level of client credit risk and hence reduces the level of private sector lending by banks	-
<i>ADR</i>	A ratio of a bank's gross loans and advances to local currency deposits, used as a measure for liquidity risk. Higher values imply higher position of illiquidity. The higher the ratio of private sector loans to total local currency deposit liabilities, the more illiquid the bank becomes and the less inclined the bank would be to lend to the private sector	-
<i>CAR</i>	A bank's tier 1 capital as a proportion of total assets (leverage ratio). The higher the bank's level of equity capital relative to total assets (higher leverage ratio), the more capitalised or sound the bank is said to be in terms of capital adequacy and can therefore expand its lending portfolio at any given extra loan demand	+
<i>lnVRL</i>	The natural logarithm of the variability of the interest rate on loans and advances as a measure of market risk. Higher variability of earnings is a deterrent factor for investment	-
<i>lnTA</i>	The natural logarithm of a bank's total assets, used in the study as a measure for a bank's size (a bank specific observed variable). Large banks may have a comparative advantage in lending to large customers as they can exploit scale economies in evaluating the hard information that is available on such customers, and vice versa	+
<i>lnD</i>	The natural logarithm of local currency deposits of a representative bank, borrowed from the work of Tracey (2011). Banks with larger deposit base are likely to lend more to the private sector relative to banks with smaller deposits base	+
<i>TYPE</i>	TYPE that takes the value of 1 for a state owned bank (TYPE 1), 2 for a private domestic bank (TYPE 2) and 3 for a foreign bank (TYPE 3), while using TYPE 2 as the reference group	±
<i>GDP_t</i>	GDP (real GDP growth rate) as a control for economic activities and hence, bank loan demand	+

Table I.
Definition of variables

The presence of endogeneity is tested in this study using the Davidson-MacKinnon test of exogeneity via instrumental variables. Actual provisions for bad and doubtful debts and profit before tax are used as instruments for that purpose. A rejection of the null hypothesis of the Davidson-MacKinnon test of exogeneity would indicate the presence of endogeneity. Similarly, the presence of the time specific fixed effects makes it difficult to add cross-section invariant variables such as GDP growth rate. To account for the effect of such important variables on bank loan supply, a dummy variable, TYPE that takes the value of 1 for a state owned bank (TYPE 1), 2 for a private domestic bank (TYPE 2)

and 3 for a foreign bank (TYPE 3), while using TYPE 2 as the reference group, and GDP (real GDP growth rate) as a control for economic activities and hence, bank loan demand are added to equation (3) and estimated using a random effects model.

Data sources

The study makes use of secondary data collected from various sources. The principal data source is the individual banks' balance sheets and income statements as submitted to the Central Bank of Sierra Leone for supervisory purposes. Complementary sources include the Central Bank of Sierra Leone monthly economic reviews (various issues), their Semi-annual bulletins, the World Bank development indicators and the international financial statistics (IFS) year books (various issues) published by the IMF. The data set consists of an unbalanced panel of all 13 Commercial Banks operating in Sierra Leone, observed over a period of ten years (2002-2011).

5. Estimation results and discussions

Test for endogeneity

Before estimating the derived model, it is important to first test the appropriateness of the techniques employed. What is tested here is not endogeneity *per se*. We have employed the Davidson-Mackinnon test of exogeneity. The null hypothesis tested is that OLS Fixed Effect would yield consistent estimates. The test result is as presented in Table II. Three cases were tested:

- Case 1: that *NPL* and *ADR* are exogenous in the model.
- Case 2: that *NPL* is exogenous in the model.
- Case 3: that *ADR* is exogenous in the model.

We failed to reject the null hypothesis at all conventional levels of significance (based on the probability values in Table I) that an OLS fixed effects estimation of equation (3) would yield consistent estimates. In effect, this explains that *NPL* and *ADR* are not endogenous in the model as perceived from first sight.

Test for time specific fixed effects

Before the final model is estimated, it was tested for the presence of any significant time specific fixed effects to see if time fixed effects are needed when running the fixed effects model. For this purpose, a fixed-effects (within) regression with 94 observations and 13 groups including $T - 1$ year dummies was estimated. The test performed is a joint test to see if the dummies for all years are equal to zero. If they are, then no time fixed effects are needed. Given that $F(9, 65) = 5.23$ and $\text{Prob.} > F = 0.0000$, we rejected the null hypothesis of no time fixed effects (Table III).

Case	F and χ^2 -statistics	p -value
1	$F(2, 74) = 0.0235051$	(0.9768)
2	$\chi^2(1) = 0.033$	(0.8564)
3	$\chi^2(1) = 0.33$	(0.8561)

Source: Authors' computation using Stata version 11

Table II.
Results of the
Davidson-Mackinnon
test of exogeneity

Variable	Mean	SD	Minimum	Maximum
CPS	0.5182	0.2494	0.0003	1.0000
RP	0.0039	0.1119	-0.2020	0.3538
NPL	0.1377	0.2233	0.0000	0.6935
ADR	0.7451	0.6788	0.0013	5.6039
CAR	0.2696	0.1811	0.0694	0.9127
VRL	0.0060	0.0041	0.0000	0.0173
TA ^a	133	132	5	582
D ^a	62	70	0.142	331

Note: ^aThe values are expressed in billions of Leones

Source: Authors' computations

Table III.
Descriptive statistics of
the data used in the
regression analysis

Regression results and analysis

For the purpose of clarity and juxtaposition, equation (3) was estimated in two forms. The first form entails the estimation without any correction for heteroskedasticity (result in Table IV), whilst the second estimation is the form with correction for heteroskedasticity (result in Table V). The second form is said to have a robust standard error to account for groupwise heteroskedasticity.

Next, the model was augmented as discussed earlier, and estimated using a random effects model. All the seven explanatory variables in equation (3) were used in all regressions so as to compare the magnitudes, directions and significance of the coefficients. The `areg` command (with the option to absorb bank id) was used in the first two regressions, since the model was found to be a fixed effects model with both bank and time fixed effects.

From the result in Table IV, six out of the seven explanatory variables included in the estimation process ($\ln RP$, NPL , ADR , CAR , $\ln TA$ and $\ln D$) are found to be significant determinants of the proportion of a bank's IEA that is allocated to the private sector (without correcting for groupwise heteroskedasticity). Among the statistically

Number of obs.	94			
$F(16, 65)$	11.46			
Prob. > F	0.0000			
R^2	0.8760			
Adj. R^2	0.8225			
Root MSE	0.1051			
$\ln CPS$	<i>Coef.</i>	<i>SE</i>	<i>t-stat.</i>	<i>Prob. > t </i>
$\ln RP$	1.425873	0.367597	3.88	0.0000
NPL	0.217684	0.078227	2.78	0.0070
ADR	-0.12544	0.033827	-3.71	0.0000
CAR	0.35522	0.189283	1.88	0.0650
$\ln VRL$	8.879144	6.028977	1.47	0.1460
$\ln TA$	-0.3107	0.060347	-5.15	0.0000
$\ln D$	0.12611	0.037262	3.38	0.0010
<code>_cons</code>	3.655637	0.847751	4.31	0.0000
<code>id</code>		$F(12, 65) = 8.7310$		0.0000

Source: Authors' computation

Table IV.
Linear regression
results 1 of determinants
of loan supply

Number of obs.	94			
$F(16, 65)$	18.73			
Prob. > F	0.0000			
R^2	0.8760			
Adj. R^2	0.8225			
Root MSE	0.1051			
<i>lnCPS</i>	<i>Coef.</i>	<i>Robust SE</i>	<i>t-value</i>	<i>Prob. > t </i>
lnRP	1.425873	0.438076	3.25	0.0020
NPL	0.217684	0.063446	3.43	0.0010
ADR	-0.12544	0.055998	-2.24	0.0290
CAR	0.35522	0.195035	1.82	0.0730
lnVRL	8.879144	5.829454	1.52	0.1330
lnTA	-0.3107	0.080188	-3.87	0.0000
lnD	0.12611	0.048493	2.6	0.0120
_cons	3.655637	0.987396	3.7	0.0000
id	Absorbed (13 categories)			

Table V.
Linear regression
results 2 of determinants
of loan supply

Source: Authors' computation using Stata 11

significant variables, only *CAR* is found to be weakly significant at the 10 percent level; all the others are significant at the 1 percent level. *lnVRL* is found to have a negligible or an insignificant influence on bank credit supply to the private sector in Sierra Leone for the period considered, and its sign is contrary to expectations. When corrections are made for groupwise heteroskedasticity, the result does not change much as shown in Table VI. The explanatory power of the model remains the same in both cases. The reasons underpinning the behaviour of these variables are discussed ahead in this chapter.

In both outputs (Tables IV and V), 88 percent of the total variations in the dependent or predicted variable are explained by variations in the predictor variables as included in the model. Nevertheless, with adjustments made for the number of cases and the number of included variables, the explanatory power of the model drops to 82 percent as indicated by the adjusted R^2 . A test (F) to see whether all the coefficients in the model are different from zero gives Prob. > $F = 0.0000$, which is an indication that the model is a good one, since all the included variables are jointly significant at the 1 percent level (in both results).

<i>lnCPS</i>	Fixed effects coefficients	Prob. > t	Random effects coefficients	Prob. > z
lnRP	1.425873	0.0020	0.09999	0.417
NPL	0.217684	0.0010	0.13732	0.0140
ADR	-0.12544	0.0290	-0.21872	0.0000
CAR	0.35522	0.0730	0.564994	0.0340
lnTA	-0.3107	0.0000	-0.16222	0.0540
lnD	0.12611	0.0120	0.132029	0.117
GDP	-	-	-0.53293	0.0580
TYPE1	-	-	-0.17753	0.0000
TYPE3	-	-	-0.22076	0.0000

Table VI.
Fixed and random effects
results compared

Source: Authors' computation

From Table V, it is deduced that for a given bank, as the level of risk premium (RP) increases across time by a percentage, the share of the bank's IEA that is allocated to loans and advances to the private sector (CPS) increases by 1.43 percent, all other determinants remaining the same. This confirms that commercial banks operating in Sierra Leone like any other normal commercial bank in the world are risk averse, willing to venture out to the perceived risky sector of the economy only when the risk premium is sufficiently appreciable.

NPL ratio shows a positive and statistically significant influence on banks' loan supply to the private sector at the 1 percent level. For a given bank, as the share of NPLs in total loans increases across time by 1 percent, the share of loans in the bank's IEA increases by 0.22 percent, all other determinants of bank loan supply remain the same. The sign of the coefficient is contrary to expectations. Two reasons may account for this behaviour. The first is the concept of ever-greening or loan rescheduling. Here, new loans are advanced by banks in order to encourage repayment of doubtful debts. In such a case, as the level of NPLs increases, so is the amount of outstanding loans and advances in the market. The second point is that the actual provisions that banks make for bad and doubtful debt is so small relative to the size of NPLs, so that its effect on loan supply to the private sector is infinitesimal.

ADR is also a statistically significant variable at the 5 percent level in the second regression as shown in Table V. It has a negative influence on bank loan supply as expected. It is observed from the result that an increase in a bank's *ADR* by 1 percent reduces the share of in the bank's earning assets by 0.13 percent over time, other factors remaining the same. The negative relationship between *ADR* and *CPS* is explained by the fact that the liquidity of a bank loan as evident in the market is dependent on the loan's behavioural maturity profile, making banks less inclined to give out more loans relative to local currency deposits.

In the same vein, at the bank level, the supply of bank loans to the private sector moves in the same direction as the level of a bank's leverage ratio or tier 1 capital asset ratio (*CAR*) – a measure of the bank's capital adequacy, albeit at the 10 percent level of significance in both results. The result indicates that for a given bank, loan supply to the private sector rises by 0.36 unit, for any 1 unit increase in the *CAR*. This comes in as expected. Capital is always required to absorb the risks undertaken by a bank. For variability of loan interest rate (*VRL*), it turned out to be an insignificant variable in the model, and has a positive influence on bank loan supply, contrary to expectations. The measure of bank size (*lnTA*) is found to have a statistically significant negative relationship with bank loan supply (at the 1 percent level), against our postulations. The result shows that large banks hold higher proportions of other earning assets and less of loans to the private sector in their asset portfolio. On the contrary, bank loan supply in this study has been found to be positively responsive to growth in a bank's local currency deposit base, consistent with the finding of Tracey (2011).

From Table IV, the last row shows that overall, the share of loan supply to the private sector in banks' IEA are significantly different across individual banks as shown by the *F*-statistic. This explains the effect of individual bank's unobserved heterogeneity such as a bank's policies and procedures. Also, all the time coefficients turned out to be positive, an indication that on the average, credit to the private sector relative to banks' holding of total IEA increased over the time period considered. For example, in 2005, the proportion of bank loan supply in total IEA increased by 14 percent relative to 2002, taking the effects of all other variables as given.

Table VI shows the fixed effects result with robust standard errors alongside the result obtained from the random effects estimation. The focus on the random effects result is to show how bank loan supply in Sierra Leone responds to the proxy for loan demand (real GDP) and ownership. The result shows that increasing loan demand leads to credit rationing in Sierra Leone as shown by the negative coefficient of the variable. Looked at from another angle, slowing down of economic activities does not deter banks from lending out credit, because their capital levels can well accommodate any needed provisions for bad and doubtful debts. Also, it is shown that state-owned banks hold on the average, less loans to earning assets ratio by 18 percent, relative to the private domestic bank. Similarly, foreign banks hold 22 percent less of CPS relative to the private domestic bank.

6. Concluding remarks

The general purpose of this work has been to investigate the factors that influence banks' credit supply in Sierra Leone. Specifically, the study has looked into the effects of risk premium, loan risks as well as capital adequacy on bank loan supply in Sierra Leone between 2002 and 2011.

Using annual bank level data on an unbalanced panel of 13 banks in the market for the study period, and employing a time and bank specific fixed effects model, the principal hypothesis that the level of risk premium influences the share of loans to the private sector in interest earning asset of banks has been confirmed. Additionally, the study has shown that NPLs, tier 1 capital ratio and local currency deposit levels positively and statistically significantly affect banks' loan supply to the private sector, while ADR and bank size have significant negative effect on the dependent variable. Also, using a random effect model estimation, bank loan demand (also a control for economic activities) as proxied by real national income growth rate, and bank type are found to be significant determinants of bank portfolio composition. Nevertheless, the market risk component of the model (VRL rate) was found to play a negligible role in shaping banks' loan supply.

On the basis of the findings, the study therefore recommends the following: first, bank loan supply as a fraction of bank IEA has been found to be positively responsive to risk premium. To that end, government should play the needed role for risk premium to be sufficient enough for banks to lend more to the private sector, relative to acquiring government securities. After all, banks are in the business of taking calculated risk to make money. Admittedly, this policy advice in no way advocates for a rising loan interest rate, because that would have the negative effect of adverse selection and moral hazard. One way to enable the interest rates on treasury bills and treasury bearer bonds to be appreciably lower than the returns on loans and advances is for government to exercise fiscal discipline in line with the West Africa Monetary Zone's benchmark. That would reduce the amount of government's public sector borrowing requirements so as to bring down the yield on government securities through the interaction of demand and supply.

Second, NPL ratio is found to have a positive influence on bank loan supply in Sierra Leone. We have advanced in this study that this may be because actual provisions for loan losses are far less than the value of NPLs on the banks' books which makes banks lend more to encourage repayment of doubtful debts. NPLs do not show in the banks' audited accounts (the usual accounting practice). What is reported in the banks' income statements is "net recoveries/(impairment losses) on loans and advances", a figure that

is far less than the value of NPLs of the banks. This underestimates the portfolio risk of a bank. Banking supervisors should pay keen attention to the level of the banks' actual value of NPLs so as to truly capture the magnitude of the potential default rate of borrowers.

Third, the study finds a negative relationship between the loan-deposit ratio and a bank's loan supply. This is because banks cannot sell loans off their books, once they have originated it. We recommend that the Central Bank of Sierra Leone should play a parental role in strengthening the depth of the Interbank Market operations. This will have the effect of increasing access of banks to short term liquidity for intraday position management, enhance market depth to beyond the traditional overnight to one week tenor, and subsequently promote financial stability through confidence building. The availability of more funding sources other than client deposits reduces the risk of adverse deposits shocks.

Fourth, a positive relationship has been established between bank loan supply and a bank's leverage ratio measured by a bank's equity divided by total assets, albeit at the 10 percent level of significance. On this note, the current effort of the Central Bank of Sierra Leone to double banks' capitalisation by 2014 should not be relented upon. This is not justifying any increases in the risk capital requirements for the individual risk categories. Instead, we recommend a reduction in the risk capital requirements for fully secured credit exposures. Further, banks should be encouraged to have capital in excess of the minimum paid up capital (capital buffers) so as have more room to absorb the inherent risk in the business of banking.

In conclusion, we suggest any future studies should investigate the determinants of the sectoral allocation of bank credits. Additionally, with the availability of data, a time series analysis of this topic using aggregated data is advisable, where an impulse response analysis can be carried out.

Notes

1. They include Standard Chartered Bank (SL) Ltd, Rokel Commercial Bank (SL) Ltd and Sierra Leone Commercial Bank Ltd.
2. The value drastically fell to a level of 9.5 percent at the industry level in 2003, but gradually soared to a peak of 21 percent in 2007. It is again on the increase (12 percent in 2011) from a level of 9 percent in 2009.
3. The Sierra Leone Integrated Household survey conducted in 2003/2004 indicates that around 70 percent of the population live below the poverty line and poverty remains pervasive and endemic. In 2008 the government launched the second phase the poverty reduction framework dubbed, PRSP II: Agenda for Change 2008-2012.
4. GBP – The Great British Pound, USD – the United States Dollars, and EUR – the Euro.

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