A DYNAMIC ANALYSIS OF THE BANK LENDING CHANNEL OF
THE MONETARY POLICY TRANSMISSION IN NIGERIA

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Abstract

This study examines the bank lending channel of monetary transmission mechanism in Nigeria during the period 2005-2016. Using Arellano-Bond GMM with annual financial reports of 16 commercial banks in Nigeria, the study explores the existence of the bank lending channel in the monetary policy transmission and checks the role of same in Nigeria. In particular, the study examines the response of commercial banks’ loan supply in Nigeria to bank specific characteristics i.e size, liquidity, capitalization and profitability. Our findings provide strong support for the existence of bank lending channel through the interaction of the reserve requirement and liquidity on the one hand and capitalization on the other hand. We therefore conclude that the liquidity and capitalization seem to play an important role in determining commercial bank loan supply. To this end, the study concludes that bank lending channel exists in Nigeria and that liquidity and capitalization matters.

Keywords: monetary policy, bank lending, asymmetric information, bank size, bank liquidity, bank capitalization

Introduction

Climate Studies have identified different channels of monetary policy transmission, broadly classified as ‘price or interest’ and ‘credit’ transmission channels (Cecchetti, 1995; Bernanke & Gertler, 1995). The applicability of these channels varies across countries, largely due to differences in level of financial sophistication, intensity of government regulation, and macroeconomic and

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structural conditions, among other factors. Therefore, understanding the mechanism through which monetary policy is propagated is pivotal in achieving the key objectives of the central bank and enhancing macroeconomic stability in the economy. This is particularly important for Nigeria, and developing countries in general, where lack of well-functioning financial markets limit the effectiveness of monetary policy actions. According to Cottalerri and Kourelis (1994), financial markets in low-income countries tend to be less flexible to lending rates, thereby, limiting the effectiveness of monetary policy transmission mechanism.

According to the traditional interest rate channel, a change in policy-induced interest rates influences the real economy by affecting various relative prices. If interest rates which is the cost of capital is high, this will require a higher returns to induce investment which will on the other hand reduce investment opportunities and hence, a decrease in output. Changes in interest rates also affect consumption, as higher interest rates decrease the price of future consumption. In the case of a flexible exchange rate regime, interest rate movements affect the nominal exchange rate, price competitiveness and ultimately net exports. However, the interest rate channel theory ignores some important processes in the banking sector.

The credit channel view acknowledges the existence of informational imperfections in the financial markets and assigns an active role to the supply of bank loans in monetary transmission via two "sub channels" – the balance sheet channel, which states that tight monetary policy may worsen borrowers' risk characteristics (i.e the problem of adverse selection moral hazard) and hence, reduces the supply of loans, and the bank lending channel, which states that the central bank policy can affect bank balance sheets and hence also the supply of
loans. This, in other words, contends that after a monetary policy tightening, banks are forced to reduce their loan portfolio due to a decline in total reservable bank deposits (Gambacorta & Marque-Ibanez, 2011). The latter, i.e. the bank lending channel, is of especial interest for us in this paper, as it focuses more specifically on the particular role of banks in the transmission mechanism.

As in Nigeria, empirical evidence on the monetary transmission mechanism (MTM) in SSA countries is limited and equally restricted to aggregate analyses, (Mishra & Montiel, 2012). The limitation with aggregate data analysis is that it obscures individual banks’ asymmetric behavioural response to policy changes and other shocks. This limits the assessment of distributive patterns inherent in individual bank characteristics and how these interact with monetary policy actions to influence lending behavior.

Furthermore, many studies have applied the VAR methodology to explore the bank lending channel in developing countries. This methodology is based on a set of macroeconomic variables that includes an indicator of aggregate demand and the assumed intermediate target of monetary policy (Mishra & Montiel, 2012). However, the use of macroeconomic time series data in studying bank lending channel may cause the difficulty of disentangling loan supply effects from loan demand effects. In Nigeria, the empirical evidence on the bank lending channel is scarce. To our knowledge, existing studies employed aggregate data and the analysis were done on loan demand effect, see Ojo (2001), Adebiyi (2006) and more recently Adeoye, Ojapinwa and Odekunle (2014) rather than the loan supply effect as supported in the literature, (see Erhmann, et al., 2001; Brissimis, Kamberoglou, & Simigiannis, 2001; Juks, 2004; Köhler, Hommel &
Grote, 2005). Moreover, none of these studies examined the impact of bank profitability on commercial bank lending.

This study is justified by its objective i.e to identify the existence and role of the bank lending channel of monetary policy in Nigeria and how commercial bank specific characteristics determine its loan supply response to monetary policy thrust. This objective is paramount for the Nigeria monetary policy makers especially in this post consolidation era of the financial sector in Nigeria that the central bank aims to achieve soundness, stability and enhance international efficiency of the Nigerian banking industry. The researcher believes that the remarkably limited research on the supply-side effects of monetary policy through capital market imperfections leaves a missing ring in the transmission mechanism and shall devote the paper to an assessment of progress in this direction in Nigeria.

The time series data used in this study is between 2005 which marks the beginning of the bank consolidation exercise in Nigeria and 2016 inclusive (i.e. 12 years). The cross section data is from the Annual Financial Reports of sixteen(16) commercial banks in Nigeria (this represents the commercial banks that have consistently published their annual financial reports in Nigeria). This paper has used the Reserve Requirement rate as monetary policy instruments for empirical analysis. Inflation rate is calculated by the percentage changes in CPI. Real GDP as measure of macroeconomic performance are sourced from the CBN Annual Statistical Bulletin. Four measures of bank specific characteristics used in the study are size, liquidity, capitalization and profitability which were calculated from the annual financial reports of the included banks.
Literature Review

Interest Rate and Credit Channels: a Brief Overview of Theoretical Concepts

Theoretically, the traditional ‘money view’ of the monetary transmission mechanism is based on the money or interest rate channel, featured by the standard Keynesian IS-LM framework. The basic assumptions that characterize this channel are: i) sticky price adjustment to money supply shocks, ii) direct control of the monetary authority on nominal money supply by adjusting reserves, and iii) presence of two assets such as money and bonds where loans are perfect substitutes for bonds. In the context of the last assumption, there is no need to explicitly model bank behaviour in explaining the money-output causation. The interest rate channel theory assumes that financial intermediaries do not play any special role in the economy.

The influence of monetary shocks on real economic activity has two dimensions in the credit view. First, a monetary shock can influence the financial position or the net worth of a borrower firm. A higher net worth of a firm’s balance sheet makes external financing from the loan market possible and, hence, stimulates investment decisions. As the transmission of monetary shocks to the real economy occurs through the borrowers’ balance sheets, this channel is called the balance sheet channel (BSC). Second, a monetary shock can influence the banks’ loan supply to bank-dependent firms. This change in the availability of loans influences the investment decisions of the borrower firms by reducing an external source of finance. The transmission through such a channel is called the bank lending channel (BLC).

Bernanke & Blinder (1988) paved the way for the initial formal treatment of the BLC, assigning greater role of asymmetric information in explaining credit supply and market imperfections. Thus, the banks’ supply of loans creates the
basic link through which monetary policy affects the real economy, according to (Bernanke & Gertler, 1995). With respect to market imperfections, the BLC emerges as the more appealing explanation of monetary policy effects on the economy, based on empirical works of (Kishan, & Opiela, 2000; Kashyap & Stein, 2000). This is the basic distinguishing feature with other monetary policy transmission channels.

In summary, unlike the standard interest rate channel, the impact of monetary policy on the real economy, working through the balance sheet and bank lending channels, has important distributional consequences. Banks of different size, liquidity, capitalization, profit and deposit dependence and firms with different financial positions and dependence on bank loans are unlikely to be equally affected by monetary policy shocks.

Furthermore, the effectiveness of monetary policy through the BLC is expected to reflect the market structure and intensity of competition in the banking industry. According to Vanhoose (1985), the effect of bank market structure on the real economy also depends on the instrument of monetary policy. When the central bank targets monetary aggregates and uses the Treasury bill rate as the instrument of monetary policy, changes in bank competition would have no impact on bank lending. The converse applies if bank reserves are used as the instrument of monetary policy.

Finally, categorization of banks with respect to the asymmetry in their costs of raising external funds would be a basis for revealing the disproportionate effects of monetary policy on bank balance sheets and, hence, on bank lending.
Discovering Asymmetries in Bank Lending Behaviour: A Brief Overview of Previous Empirical Studies

The issue of the bank lending channel has received special attention of researchers in the last two decades. Early empirical studies focused on macroeconomic evidence, as perhaps the simplest implication of the lending channel is that bank loans should be closely correlated with monetary policy measures. For instance, Bernanke & Blinder (1988) find that increases in the US federal funds rate urge banks to slow down the loan growth (pp 435-439). However, while correlations between policy indicators, bank loans and activity are consistent with the credit view, such evidence cannot provide unambiguous support to the lending view. Kashyap & Stein (1995) argue that another way to read these results is that: A tight monetary policy operates through standard interest rate channels to depress economic activity and to reduce the demand for credit. Consequently, there can be an induced correlation between activity and bank lending even if there is no lending channel.

The use of microeconomic data has become the dominant empirical method of investigating the existence of bank lending channel in recent years. The empirical evidence in support of a bank lending channel, in most countries, is mixed. In the United States, Kashyap & Stein (2000) found that small and less-liquid banks are more responsive to monetary policy actions. Ashcraft (2006) argues that though bank loans are special for small firms, they are not special enough to make the lending channel important for monetary transmission in the United States.

Bank heterogeneity (size, liquidity, capitalisation), which in turn depends on institutional and regulatory environment, matters for the observed asymmetric lending behaviour of commercial banks, especially in developing countries (Mishra & Montiel, 2012). Kishan & Opiela (2000) found that: Conditioning for
bank size, capital regulatory policy acting through banks’ capital leverage ratio helps explain monetary policy effects on loan growth. In the Europe, results vary across time and countries. In a case study, Favero, Gavazzi and Flabbi (1999) find no evidence for the bank lending channel following the tightening of monetary conditions in 1992 in France, Germany, Italy and Spain. Subsequent studies for the same countries, however, show that liquidity has a significant effect on loan supply, while capitalization and size don’t matter. Liquidity appears to be an important factor in determining the effects of monetary policy in most countries, except Finland and Portugal. In addition, loan supply of well-capitalized banks is less responsive to monetary policy shock in the Netherlands and Portugal (Erhmann, et al., 2003). Bank size is found to make a difference in Greece (Brissimis, Kamberoglou, & Simigiannis, 2001). Gambacorta (2001) reports that in Italy the average bank response to monetary policy mainly depends on its liquidity and not size.

Regarding dependency of borrowers on bank loans, it is usually explained by the fact that banks play a special role in the financial system because they are particularly well positioned to solve asymmetric information problems in credit markets. According to Mishkin, (1996), “the bank-dependent borrowers – small and medium sized firms and households – suffer most from the asymmetric information problems”. The higher the share of such borrowers in the credit market, the higher the bank-dependency ratio is. Relatively low capital market capitalisation compared with the bank assets and loans implies higher bank dependency and stronger bank lending channel of monetary transmission.

**Research Methodology**

The Bernanke & Blinder, (1988) model extends the IS-LM framework to incorporate the BLC. However, the BLC transcends the IS-LM framework in which prices are assumed to be temporarily fixed.
They argue that there are three conditions for the existence of the *bank lending channel*, that is: first, imperfect substitution between bank loans and bonds for borrowers; second, the central bank should be able to affect the supply of bank loans by changing the quantity of reserves and third, the existence of imperfect price adjustment that prevents any monetary shocks from being neutral. Using the traditional IS-LM model, where IS curve was replaced by the credit-commodity curve (CC), they formulated the CC-LM model, in which monetary policy is deemed to affect economic activity via credit channel or bank loan channel.

**Dynamic Model Specification**

This study has employed the empirical model of Ehrmann et al. (2001), which basically depends on the model of Bernanke and Blinder (1988), to analyze the bank lending channel of monetary policy in Nigeria. However, this is adapted to an emerging economy with nascent financial markets and reflects heterogeneity in interbank market players. In particular, the framework recognises the dependence of firms on bank loans (bank-based system) in the absence of an active and well developed capital and stock markets. Thus, we posit that, changes in monetary policy that affects banks’ reserves would be reflected in adjustment of supply of loans.

\[
L_i = \frac{\Psi_1}{2} GDP + \frac{\Psi_2}{2} \text{Inf} - \frac{\Psi_0 \mu (1 - \lambda)}{2} RS + \frac{\Psi_0 \theta (1 - \lambda)}{2} x_i RB_i - \frac{\Psi_0}{2} \frac{\partial \Psi_i}{\partial L_i} \quad (1)
\]

Equation (1) is the standard loan equation in which monetary policy tightening through an increase in interest rates (RS) leads to a reduction in deposits (D). The bank can however keep the asset side of its balance sheet unchanged if it increases other sources of fund. However, the interest rates that the bank has to
pay for these funds were increased by the policy of monetary tightening. Banks pass at least part of this higher cost to the borrowers through increase in their loan rate \( (RB_i) \), which in turn reduces the demand for loans. It is therefore expected that the monetary policy variable \( (RS) \) in equation (1) will have a negative sign, indicating that loans decline when a tight monetary policy stance is implemented.

At the individual bank level, loan supply is also influenced by bank specific characteristics, such as bank size \( (\text{Size}_i) \), liquidity \( (\text{Liq}_i) \), bank capitalization \( (\text{Cap}_i) \) and profitability \( (\text{Pro}_i) \). These bank characteristics denoted by \( (X_i) \) are interacted with the monetary policy variables. For example, interacting bank-liquidity with a monetary policy variable will help explain how the bank-loan supply responds with the bank-liquidity after monetary policy tightening. Therefore, the augmented loans equation in the dynamic panel data based on equation (1) is specified as given in equation (2).

\[
\log(L_{it}) = \beta_i + \sum_{j=1}^l \phi_j \log(L_{i,t-j}) + \sum_{j=1}^l \lambda_j RS_{t-j} + \sum_{j=1}^l \delta_j \log(RGDP_{t-j}) + \sum_{j=1}^l \alpha_j Inf_{t-j} + \beta X_{it-1} + \sum_{j=1}^l \phi_i X_{it-j} RS_{t-j} + \mu_i + \nu_{it}
\]

From the equation above, the supply of bank loans \( (L_{it}) \) is determined by the lagged dependent variable \( (L_{it-j}) \), monetary policy stance defined by \( (RS) \), real gross domestic product \( (RGDP) \), inflation \( (Inf) \), bank specific characteristics \( (X_i) \), and the interaction term of bank characteristics and the monetary policy variable \( (X_i.RS) \). \( \mu_i \sim \text{IID}(0, \sigma^2_\mu) \) is bank specific effect while \( \nu_{it} \sim \text{IID}(0, \sigma^2_v) \) is the remainder error term. The total error term is therefore given as: \( \epsilon_{it} = \mu_i + \nu_{it} \).
On the assumption of the homogenous reaction of loan demand across banks, this model also incorporates fixed effects across banks, as denoted by the bank specific intercept, $\beta_i$. Then, under the assumption that the demand addressed to each bank is homogenous with respect to its interest rate elasticity, the $\varphi_i$ interaction coefficients can be interpreted as a reflection of the heterogeneity of loan supply responses across banks (Loupias et al., 2001). As an indicator of the monetary policy shocks, changes in reserve requirement rate are used to capture the effect of monetary policy on bank lending. With the availability of only annual data on macroeconomic variables, the time unit of analysis in the study is yearly and, thus, the maximum lag (l) used in model estimation is two. This choice of lag (l) may be consistent with the fact that monetary policy shocks propagate up to two years.

**Justification for the Choice of Variables**

Regarding the monetary policy instruments, this paper has used the Reserve Requirement rate as monetary policy instruments for empirical analysis. Inflation rate is calculated by the percentage changes in CPI and the size of the economy captured by the log of real GDP as calculated from the CBN Annual Statistical Bulletin.

Four measures of bank specific characteristics used in the study - size (Siz), liquidity (Liq), capitalization (Cap) and profitability (Pro) and denoted by X in the equation - are from the Annual Financial Reports of the sixteen (16) Commercial Banks in our study, which are calculated as:

Bank size is measured by the log of total assets, ($A_{it}$). Liquidity is measured by the ratio of liquid fund ($L_{it}$) to total assets, and capitalization is defined by the ratio of capital and reserves ($C_{it}$) to total assets and profitability is measured by the ratio profit ($P_{it}$) to total asset. Bank characteristics will be normalized with respect to averages across all banks in the respective sample so that they sum up.
to zero over all observations. This implies that the average of the interaction term, $X_{i,t-1}.RS_{t-j}$ is zero and, as a result, the parameters $\phi_1$ in equation (2) is directly interpretable as the overall monetary policy effect.

**Statistical Criteria Test and Econometric Test**

In the Arellano and Bond model, the consistency of GMM estimator requires the validity of instruments and no second-order correlation for the disturbances of the differenced equation. Thus, this paper employs the specification tests proposed by Arellano and Bond (1991) and Arellano & Bover (1995), and. At first, we examine the hypothesis that the error terms are not serially correlated. Under the null hypothesis of no second-order correlation, the statistic associated with this test has a standard-normal distribution. The second test is the Sargan test of over-identifying restrictions for the instruments. This test examines the overall validity of instruments and thereby confirms the absence of correlation between the instruments and the error terms in the models. The null hypothesis for the Sargan test is that the instruments are valid. Under the null hypothesis of the valid instruments, the test statistic is distributed with $\chi^2(L-K)$, where L is the number of instruments and k is the number of parameters in the model.
Results and Discussion of Findings

Table 4.1: Empirical Result of the Arellano-Bond One-step GMM Dynamic Estimates for Commercial Banks in Nigeria

<table>
<thead>
<tr>
<th>Dependent Variable: Annual loan supply to non-bank private sector</th>
<th>Models estimated with different bank characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Size, liquidity, capital &amp; profit</td>
</tr>
<tr>
<td>$L_{it}(-1)$</td>
<td>0.036502 (0.3715)</td>
</tr>
<tr>
<td>$L_{it}(-2)$</td>
<td>-0.218546 (0.0000) *</td>
</tr>
<tr>
<td>$RS_t$</td>
<td>-4.660515 (0.0000) *</td>
</tr>
<tr>
<td>$RGDP_t$</td>
<td>0.648943 (0.0000) *</td>
</tr>
<tr>
<td>$Inf_t$</td>
<td>-0.025924 (0.0734) ***</td>
</tr>
<tr>
<td>$X_{it}$ (bank specific characteristics)</td>
<td></td>
</tr>
<tr>
<td>$Siz_{it}$</td>
<td>-0.678611 (0.0915) ***</td>
</tr>
<tr>
<td>$Liq_{it}$</td>
<td>0.000937 (0.9306)</td>
</tr>
<tr>
<td>$Cap_{it}$</td>
<td>-0.030599 (0.0685) ***</td>
</tr>
<tr>
<td>$Pro_{it}$</td>
<td>0.007712 (0.1139)</td>
</tr>
<tr>
<td>$X_{it}$ * $RS_t$ reserve requirement interaction with bank specific characteristics</td>
<td></td>
</tr>
<tr>
<td>$Siz_{it}$ * $RS_t$</td>
<td>1.719563 (0.0054) *</td>
</tr>
<tr>
<td>$Liq_{it}$ * $RS_t$</td>
<td>-0.044586 (0.2026)</td>
</tr>
<tr>
<td>$Cap_{it}$ * $RS_t$</td>
<td>0.199521 (0.0173) **</td>
</tr>
<tr>
<td>$Pro_{it}$ * $RS_t$</td>
<td>-0.054735 (0.0532) ***</td>
</tr>
<tr>
<td>No of Banks</td>
<td>16</td>
</tr>
<tr>
<td>No of Observations</td>
<td>111</td>
</tr>
<tr>
<td>AR(1), p-value</td>
<td>0.09 0.05 0.03 0.03 0.1250</td>
</tr>
<tr>
<td>AR(2), p-value</td>
<td>0.0360</td>
</tr>
<tr>
<td>F-statistic (p-value)</td>
<td>28.86678 (0.000)</td>
</tr>
<tr>
<td>Sargen test (p-value)</td>
<td>173.2007 (0.346)</td>
</tr>
<tr>
<td>J-statistic Prob(J-value)</td>
<td>103.8252 (0.00000)</td>
</tr>
</tbody>
</table>

Note: *, ** and *** reflect a statistical significance at the 1%, 5% and 10% respectively.

Source: author’s computation

In Table 4.1 above, the one-step GMM estimator result have been reported taking different bank characteristics. The coefficient of monetary policy variable is negative, implying the negative relationship between the bank lending and
monetary policy rate. For instance, the coefficient of the monetary policy rate i.e Reserve Requirement rate (RR) is -4.660515 implying that an increase (decrease) in the reserve requirement rate by one percentage leads to decrease (increase) in the amount of bank lending by 4.66 percent. This indicates that monetary tightening reduces the loan supply in the long-run.

The interaction term between the size and monetary policy indicator is found significant and positive, implying that lending volume of larger banks are less sensitive to monetary policy conditions than that of smaller banks. This result also supports the predictions of Cecchetti (1999) that healthy banks are not sensitive to policy because their reserve contraction can be readily offset with alternative forms of financing without involving reserve requirements.

The interaction term between the monetary policy and liquidity is positive but statistically not significant.

The interaction term of bank capitalization with monetary policy is positive and is statistically significant. The statistical significance of the interaction term implies that bank capitalization is a source of asymmetric response of banks to monetary policy stance. This implies that banks with lower capitalization are more likely to cut back their lending in response to a change in monetary policy stance. One reason for the statistical significance and thus implication of the existence of a bank lending channel operating through banks' degree of capitalization could be the changes in the provision of capital regulations and accordingly discontinuous steps in meeting the paid-up capital taken by some of the banks in the study period. One of the conditions for bank capital to have an impact on lending is that breaking the minimum capital requirement should be costly and accordingly, banks should tend to limit the risk of future capital inadequacy (Gambacorta & Ibanez, 2011).
The interaction term of bank profitability with monetary policy has the expected sign but is statistically insignificant. The statistical insignificance of the interaction term implies that bank profitability is not a source of asymmetric response of banks to monetary policy stance. One reason for the statistical insignificance and thus implication of no existence of a bank lending channel operating through banks' degree of profitability could be the nefarious activities of commercial banks in declaring false profit figure through balance sheet dressing.

The test statistics satisfies the specification requirements. Based on the results above, we can reject the null hypothesis of no first order autocorrelation in all specifications, but it is not possible to reject the null hypothesis of no second order autocorrelation in all models. The instruments used in these models are valid as the Sargan statistic is insignificant in all the models. **Recommendations and Conclusion**

The study explores the role of the bank lending channel in the monetary policy transmission and concludes that bank lending channel exists in Nigeria and in particular, the study examine the response of commercial banks’ loan supply in Nigeria to bank specific characteristics i.e size, liquidity, capitalization and profitability. While our findings provide strong support for the existence of bank lending channel through the interaction of the liquidity and reserve requirement on the one hand and capitalization and reserve requirement on the other hand. We therefore conclude that the liquidity and capitalization seem to play an important role in determining commercial bank loan supply. To this end, the study concludes that monetary policy operate in Nigeria through the bank lending channel.

The attendant policy implication from the above exercise is that the results lend strong credence to the monetary policy framework based on commercial reserve
rate targeting as a tool for strengthening effectiveness of monetary policy. Furthermore, the empirical results obtained in this study highlights a number of key issues that can improve the effectiveness of monetary transmission mechanism through the bank lending channel.

I. The monetary authority should explore the use of Reserve Requirement Rate as against the traditional Open Market Operation in achieving its macroeconomic objectives.

II. The monetary authority should regulate the asset holding of commercial banks in Nigeria. This will ensure that commercial banks do not deviate from its primary role of mobilizing money and providing loan facilities to the public.

III. The monetary authority should set up an independent team to audit the financial statements of the commercial banks. This will help to reduce nefarious act of commercial banks in declaring false profit.
References


