Dynamic interaction between inflation and credit Rationing: the case of Nigeria

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Abstract

This study examines the dynamic interaction between inflation and credit rationing in the case of Nigeria for the period 1970-2011. It uses time-series data obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin in its analysis of examining the long run and causal relationship between inflation and credit rationing. In doing so, it employs the Autoregressive Distributed Lag (ARDL) bounds testing procedure suggested by Pesaran et al. (2001) and the Granger causality test suggested by Toda and Yamamoto (1995). Empirical findings reveal that although there is an evidence of a long run relationship between credit rationing and inflation, no pattern of such long run relationship is established. The results reveal further that there is no evidence of causality in either direction between inflation and credit rationing in Nigeria. Consequently, the study recommends, among other policy implications, that financial reforms may be pursued without adversely affecting the purchasing power of the citizenry.

1. Introduction

Developing countries have come to realize the need to put certain mechanisms in place to ensure steady and balanced economic growth and in turn economic development. These factors include well trained and educated labour force, proper regulatory structure, strong political will by the government, and a well developed institutional framework *inter alia.* However, even if all these factors are present, without the adequate working capital and fixed capital, the much needed development would at best be achieved at a very slow pace. This goes on to show that the availability and accessibility of credit facilities is a necessary condition for the attainment of sustainable economic growth and development. Unfortunately, most developing countries are faced with the vicious cycle of poverty and are being addressed with the common development dictum that "a country is poor because the country is poor". This has constantly made most of their development efforts to fall short of desired expectations.

Inflation is a pervasive phenomenon and the existence of financial systems and credit markets in all economies makes credit rationing equally pervasive. The financial system, with its organization and structure, to a large extent, dictates the direction and pace of economic activities. A useful justification and confirmation of this could be traced to the global experience of the global economic crisis, the effects of which are still being felt in varying degrees all across the globe.

Credit rationing as defined by (Driscoll, 1991) refers to situations where borrowers' demand is unfulfilled, although he is willing to pay the ruling market price. In other words, credit rationing is the situation that exists when the demand for loans at the going interest rate

exceeds the supply made available by financial institutions. Simply defined, credit rationing is the non-price restriction of loans (Black, 2003). Analysis of the imperfections created by credit rationing, their effects and control are not only important for financial institutions but also for governments especially in issues of policy formulation, implementation and management. This in turn makes the analysis of the causes, measurement, effects and implications, and control of credit rationing very crucial. Academics, practitioners, professionals, policy makers and analysts have endlessly reiterated the importance of credit for a country not to be poor, and in the same vein, pointed to the economic fact that credit rationing influences the transmission of credit (and monetary policy at large) to the real sector of the economy for improved productivity and efficiency in the whole economy. Two types of credit rationing, equilibrium (aka Type I) and disequilibrium (aka Type II) credit rationing have been identified in the literature.

Evidence from the theory reveals that inflation (anticipated or unanticipated) redistributes income and wealth; the redistribution being much smaller with anticipated inflation than with unanticipated inflation. Studies have shown that possible inflationary thresholds exist for different economies for the attainment of sustainable economic growth and development. On the impact of inflation on financial sector performance, Levine and Smith (2000) posit that an increase in the rate of inflation drives down the real rate of return not just on money, but on assets in general. The implied reduction in real returns exacerbates credit market frictions and since these frictions lead to the rationing of credit, therefore, credit rationing becomes more severe as inflation rises. Wahid, Shahbaz and Azim (2011) further reiterated this point by saying that high rates of inflation worsens the efficiency of the financial sector through financial market frictions and slows down the economic performance. Inflation has a direct (or an indirect) link with financial sector performance, financial development, business cycles, credit markets, economic performance, portfolio allocation in the banking system, economic growth and economic development. Various studies have shown that periods of economic recession marked with high level of inflation, witnessed increased credit rationing (Gao et al., 2012). In other words, credit rationing becomes more severe as inflation rises. Others have shown that inflation below or above certain threshold levels may or may not have significant impacts on the economy (see Lee and Wong, 2005).

Inflation and credit rationing have got their places in the Nigerian economy. Since her independence in 1960, the Nigerian economy has had several spells of high inflation and few years of single digit inflation rates. Consequently, various structural adjustment policies ranging from the Structural Adjustment Programme (SAP) of 1986 to the current Transformation Agenda (2011-2015) have aimed at containing inflation at single digit, to its bearest minimum. Nigeria's apex financial agency, the Central Bank of Nigeria has also fixed a target of achieving single digit inflation. However and unfortunately, these plans and policies have failed for more years than they have succeeded. The Nigerian economy suffers from both inflation and exchange rate fluctuations, and as such experiences high level of financial uncertainties. Capital accumulation in Nigeria has been very poor. This can be directly observed from the high incidence of poverty in Nigeria, as measured by the international poverty line. Most people live one day at a time; from hand to mouth. The marginal propensity to save in Nigeria is generally low, very low. As such, potential investors, entrepreneurs and business firms find it very difficult to accumulate much saving to finance projects. One may want to suggest that they should alternatively borrow from the credit markets. Yes, they do, but in most cases, they are inevitably faced with the issues of credit rationing, an economic phenomenon begging for attention. Well reasonably enough, one may have not enough reasons yet to agree less that the

cloud is darker for the innocent country. This study uses time-series data and seeks to provide empirically founded answers to two basic questions about the interaction between inflation and credit rationing in Nigeria, and the direction of causality between inflation and credit rationing.

2. Review of Literature

Empirical testing of the interaction between credit rationing and inflation has been very limited. One reason for this might be lack of suitable macroeconomic data with which to undertake direct tests of credit rationing. Driscoll (1991) shows that bank-orientated financial systems seem best equipped to overcome credit rationing and the agency costs associated with market failure resulting from asymmetric information. The study shows that though circumstances can exist in which free credit markets will exhibit credit rationing, evidence on its recent importance in practice is inconclusive. Following the pathway of the relationship between credit rationing and periods of uncertainties, Craigwell and Kaidou-Jefferey (2010) indicate that banks exercise caution in their lending behaviour and are risk averse in an environment of uncertainty (during or following recessionary periods). The study shows that in a credit rationed regime, banks reduce lending and confirms that bank lending to those sectors for which banks have little information (high risk sectors) and those which are unable to provide adequate collateral are more likely candidates of credit rationing. In furtherance of these empirical positions, Mendicino (2011) utilizes model building and analysis based on data collected for different countries, and shows that an increased access to the credit market implies higher asset prices.

In answering the questions about the types of credit rationing that exist and ascertaining their relevance, Berger and Udell (1992) show that information-based equilibrium credit rationing exists, although the study makes it difficult to argue that such rationing constitute an important macroeconomic phenomenon. Following the methodology of Berger and Udell (1992), but with a difference, Crowling (2010) reveals that in the loan market for most small businesses in the UK, credit rationing is not prevalent.

As a way of reiterating Friedman's statement that "Inflation is always and everywhere a monetary phenomenon." Gao, Gu and Hernandez-Verme (2012) show that credit is not rationed for levels of inflation that are either very low or very high; and for the remaining values of inflation, that credit is rationed and the Mundell-Tobin effect holds. Utilizing regression analysis, Druck and Garibaldi (2000) show that an increase in inflation risk creates the incentive to banks to invest in free risk assets, in which case banks reduce the credit lines to firms.

There have been questions about the relationship between inflation and banking sector development. Boyd et al. (2001) reveal that there is a significant and economically important, nonlinear negative relationship between inflation and both banking sector development and equity market activity. The study shows further that as inflation rises, the marginal impact of inflation on banking lending activity and stock market development diminishes rapidly. With evidence of thresholds, the study shows that for economies with inflation rates exceeding 15%, there is a discrete drop in financial sector performance relative to economies with inflation rates below this threshold. Following the same research course, but with a different approach, which involves Tobit analysis of eight countries, coupled with the help of models; Yigit (2002) shows that non-diversifiable risks such as inflation uncertainty will cause financial agents to act in a risk-averse manner, creating grounds for disequilibrium in credit markets directly (by reducing credit availability) and indirectly (by raising the cost of borrowing). The study shows further that inflation fluctuations not only lead to disequilibrium in credit markets, but also negatively affect total amount of credit.

It is generally believed that there must be a minimum level of inflation for a country for its economy to perform optimally. However, there is also a maximum threshold level of inflation beyond which the economy would be affected negatively. Motivated on these theoretical backgrounds, Lee and Wong (2005) show that there is one inflation threshold value in Taiwan, there are two in Japan. The study suggests that when the threshold level of inflation is below 7.25%, financial development may promote economic growth for Taiwan. However, when inflation is above 7.25%, financial development will not generate any significant impact on economic growth. Consequently, financial development that promotes economic growth can only be established under low inflation. As for Japan, The empirical results suggest that when the threshold level of inflation is below 9.66%, financial development has a significantly profound impact on economic growth. However, financial development is detrimental to economic growth when inflation is above the threshold level. As a result, the conclusion that financial development may promote economic growth can be established only when Japan's inflation rate is low or moderate. This argument is consistent with the findings of Huybens and Smith (1999), Bose (2002), and Rousseau and Wachtel (2002). Keho (2009) further examined these empirical positions and reveals from the empirical results of the study that no evidence of longrun relationship between inflation and financial development for six countries and no causality for two countries. Also that financial development causes inflation in four countries, with evidence of reverse causation detected for only two countries. The study reveals further that causality patterns vary across countries and, therefore, indicate that it would be unwise to rely on inference based on cross-section countries studies which implicitly impose cross-sectional homogeneity on coefficients. Employing the ARDL bounds testing approach and Error Correction Method (ECM); Wahid, Shahbaz and Azim (2011) further examine the impact of inflation on financial development in case of Bangladesh for period of 1985-2005. They show that high trends of inflation impede the performance of financial markets in the long-and-short runs, establishing and confirming an inverse correlation between inflation and financial development in the case of Bangladesh. Also, that social spending enhances the performance of financial sector in the long run. Alongside, the study establishes that GDP per capita promotes development of financial sector through its causal channels.

3. Model Formulation and Estimation Technique

The test for cointegration between inflation and credit rationing is done using the autoregressive distributed lag (ARDL) bounds testing procedure suggested by Pesaran et al. (2001). Essentially, the advantage of the ARDL bounds approach is that it does not require knowledge of the order of integration or cointegration ranks of the variables and thus avoids the limitations associated with standard tests for unit roots and cointegration. It can be applied irrespective of whether the regressors are I (0), I (1) or mutually cointegrated. The test involves estimating by ordinary least square the following unrestricted error correction model (UECM) considering each variable in turn as a dependent variable:

$$\Delta CR_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta CR_{t-i} + \sum_{i=0}^{q} \gamma_{1i} \Delta INF_{t-i} + \emptyset_1 CR_{t-1} + \emptyset_2 INF_{t-1} + e_{1t}$$

For short run behaviour of the variables, we use error correction version of ARDL model as following:

$$\Delta CR_t = \delta_1 + \sum_{j=0}^{p} \delta_2 \Delta INF_{t-1} + \omega ECM_{t-1} + \varepsilon_t$$

The significance of an error correction term i.e. $t\square 1$ *ECM* shows deviations in regressed variable.

The Toda-Yamamoto Approach to Granger Causality Test

This is an alternative causality testing procedure that fits a standard vector autoregression in the levels of the variables rather than the first differences, as the case with standard approaches (Keho, 2009). More importantly, the Granger causality tests can be implemented regardless of whether the variables are mixed integrated or integrated of an order more than two. Performed directly on the coefficients of the levels VAR, Toda and Yamamoto methodology minimizes the risk associated with possibly wrongly identifying the orders of integration of the series, or the presence of cointegration relationship (Giles, 1997; Mavrotas and Kelly, 2001). The basic idea of this approach is to artificially augment the correct VAR order, k, with d_{max} extra lags, where d_{max} is the maximum likely order of integration of the series in the system. To undertake Toda and Yamamoto version of the Granger causality, we link the two variables in the following VAR system:

$$CR_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} CR_{t-i} + \sum_{j=k+1}^{k+d_{max}} \alpha_{2j} CR_{t-j} + \sum_{i=1}^{k} \beta_{1i} INF_{t-i} + \sum_{j=k+1}^{k+d_{max}} \beta_{2j} INF_{t-j} + e_{1t}$$

$$INF_t = \gamma_0 + \sum_{i=1}^{k} \gamma_{1i} INF_{t-i} + \sum_{j=k+1}^{k+d_{max}} \gamma_{2j} INF_{t-j} + \sum_{i=1}^{k} \theta_{1i} CR_{t-i} + \sum_{j=k+1}^{k+d_{max}} \theta_{2j} F_{t-j} + e_{2t}$$

4. Data and Estimation Results

This study employs quantitative secondary annual data in Nigeria over the period of 1970-2011. In other words, a time series data is used for this study. The data are obtained from the Central Bank of Nigeria's Statistical Bulletin. Expectedly, the series are initially transformed to induce stationarity. The variables used for this study are inflation rate (INF) and credit rationing (CR). Inflation as a measure of prices is an index charting changes in the prices paid by consumers. Credit rationing is a measure of financial development indicator as proxied by credit to private sector as share of GDP.

The results of the various tests carried out are presented as follows:

Time Series Properties of the Data

As a usual practice in most studies in economics, the data are examined and tested for unit root problem and their orders of integration using Augmented Dickey-Fuller (ADF) unit root test.

Table 1. Unit Root Analysis

Variables	ADF at level		ADF at 1st difference	
	Intercept	Prob-values	Intercept	Prob-values
CPS	-0.3492	0.0466	-2.1622	0.0000
INF	-0.4512	0.0159	-1.4148	0.0000

Source: Researcher's computations

In testing the order of integration of the variables, the ADF unit root test is applied. As reported in the table-1, the variables are stationary both at level and at 1st difference. It follows therefore that none of the variables are I (2) and as such we can apply the ARDL bounds testing approach to cointegration to test long run relationship between the variables. The unit root test was primarily carried out to ascertain that the variables are not stationary at higher order. It should be noted that ARDL does not require pretesting of stationarity.

Bounds Testing

In line with the aim of this study, the bounds testing procedure seeks to investigate the evidence of long run relationship between the two variables. To this end, the Wald test is employed and the results are reported thus:

Table 2. Wald Test Results

Test Statistic	Value	Df	Probability	5% Critical Value Bounds	
				I(0)	I(1)
Chi-square	12.76723	1	0.0004		
F-statistic	12.76723	(1, 36)	0.0010	3.15	4.11

The Wald test results are also used to obtain the bounds test results. As reported in table-4 the chi-square value and the F-statistic value are greater than the critical bound values at 5% level of significance both at I(0) and I(1). Alternatively, the probability values are less than 5% and as such we reject the null hypothesis of no cointegration, meaning that the null hypothesis is false and there is an evidence of long run relationship between inflation and credit rationing.

Cointegration Test

There is need to ascertain the reliability of results obtained from the series which have the same order of integration, in this case, I(0). This involves examining whether the two variables are cointegrated or not by verifying the existence of at least one linear long run relationship among the variables. In the light of this, the Unrestricted Cointegration Rank Tests are employed and the results are presented below:

Table 3. Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.296590	14.07264	14.26460	0.0536
At most 1*	0.166905	7.304298	3.841466	0.0069

Max-eigenvalue test indicates no cointegration at the 0.05 level

**denotes rejection of the hypothesis at the 0.05 level*

***MacKinnon-Haug-Michelis (1999) p-values*

The results shown in table-5 reveal that the variables do not have any cointegrated relation, meaning that no pattern of long run relationship is established.

Toda and Yamamoto Granger Causality Test

As a way of achieving one of the objectives of this study, which is examining the direction of causality between inflation and credit rationing, the Toda and Yamamoto approach to Granger causality test is used and the results are presented below:

Table 4. Toda and Yamamoto Granger Causality Test

Lag length (k)	CPS causes INF		INF causes CPS		Direction of causality
	Wald stat	p-value	Wald stat	p-value	
1	0.9892	0.3199	0.4033	0.5254	No causality

The results of the test at 5% level of significance shown in table-6 reveal that neither does inflation cause credit rationing nor does credit rationing cause inflation. This is as evident from the probability values obtained from the test, which denote statistical insignificance at 5%.

5. Conclusion

This study empirically examined the dynamic relationship between inflation and credit rationing in Nigeria between 1970 and 2011. We employed the framework of Pesaran *et al*. (2001) bounds test approach and Toda and Yamamoto (1995) Granger causality analysis. From the results of the bounds test and cointegration test, it comes out clear that while there is an evidence of a long run relationship between credit rationing and inflation, no pattern of such long run relationship is established. The results of the Toda and Yamamoto Granger Causality test reveal that there is no evidence of causality in either direction between inflation and credit rationing in Nigeria. This result is crucial to financial policies which could be faced with the contradictory choice of either increasing or decreasing prices. It follows from these results that financial reforms may be pursued in Nigeria without adversely affecting the purchasing power of the populace. Also, that policy makers should seek improved and substantial private sector participation which has the tendency of curbing inflation in Nigeria. Much more importantly, that policy makers in Nigeria should give support to the UEMOA criteria aiming at keeping inflation rate below the threshold of 3% as a prerequisite for sustainable growth and real convergence. This policy option follows from the fact that although there is no causality between inflation and credit rationing in Nigeria, there is still the need to contain inflation at a particular threshold level in the economy as it significantly affects other aspects of the economy.

It is however worthy of note that future studies on this subject matter could include interest rate as an intervening variable between inflation rate and credit rationing. This suggestion becomes very important given the roles of interest in process of credit allocation and credit demand.

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