

Financial Liberalisation and Financial Fragility in Nigeria

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Abstract

Nigeria's financial liberalisation started in 1987 but this was followed by a banking crisis. The experiences of countries such as Nigeria which have experienced banking crises immediately after financial liberalisation have prompted some authors to posit that liberalisation is responsible for financial fragility and banking crisis. Using an index which measures the gradual progression and institutional changes involved in financial liberalisation, this paper conducts an empirical evaluation of the impact of financial liberalisation on financial fragility in Nigeria. The results show that liberalisation has exerted a significant negative effect on financial fragility in both the short run and long run.

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I. Introduction

The Nigerian government embarked upon financial liberalisation as part of its Structural Adjustment Programme (SAP) in 1987 with the belief that freeing up financial markets would help in stimulating economic growth. There was a banking crisis in the immediate aftermath of the financial liberalisation. The deregulation of interest rates in 1993 resulted in a wide increase in the interest rate spread and the increased lending rates made it difficult for small and medium scale enterprises to secure loans. In addition, the relaxation of entry into banking resulted in the widespread establishment of banks which were poorly-managed and stretched the regulatory capacities of the Central Bank of Nigeria (CBN). The banking crisis was at its most severe stage between 1991 and 1995 and by 1993, insolvent banks accounted for 20 percent of total assets and 22 percent of banking system deposits (Caprio and Klingebiel, 1996). Various measures were put in place to cope with the crisis which included establishment of a deposit insurance scheme, re-regulating interest rates, strengthening the regulatory powers of the CBN and legislations enhancing the speedy trial of erring banking officials.

In this paper we conduct an empirical evaluation of the effects of financial liberalisation on financial fragility in Nigeria. Financial liberalisation has been recognised as a key factor responsible for financial fragility and banking crises (Diaz - Alejandro, 1985; Demirguc - Kunt and Detragiache, 1999; Kaminsky and

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Reinhart, 1999). However, some authors have shown that such fragility after liberalisation occur only in the short-run and that financial liberalisation promotes stability and growth in the long-run (Kaminsky and Schmukler, 2002; Loayza and Ranciere, 2004; Tornell and Westermann, 2004). Thus, we aim to test the effects of financial liberalisation on financial fragility in the long-run. We have developed an index of financial liberalisation which measures the different phases of the deregulation and institution building process involved in financial liberalisation. This index is then included as an explanatory variable in a financial fragility equation to examine the effects of liberalisation on financial fragility in Nigeria. The rest of this paper is organised as follows. The next section provides a review of the literature and section 3 gives an overview of Nigeria's financial sector. The analytical framework is presented in section 4 and this is followed by the econometric analysis in section 5. The last section concludes the paper.

II. Literature Review

II.1 Review of Theory

The theoretical link between financial liberalisation and economic growth has been identified by many authors such as Schumpeter (1912), McKinnon (1973), Shaw (1973), Galbis (1977), and Pagano (1993). Schumpeter (1912) discards the common belief at that time that money's sole function was a medium of exchange and nothing else. This view was summed up in the notion "that the creation of money is merely a technical matter, with no deeper significance for the general theory of economic life" (Schumpeter 1912, p.100). He disagrees with Ricardo's belief that banks cannot contribute to the process of wealth creation but asserts that banks - and indeed all financial intermediaries - are created not only for transporting money but also for granting credit.

Schumpeter asserts that creation of credit by banks is essential for economic development, and makes the assumption that only the entrepreneur needs credit. Credit provides the entrepreneur with purchasing power without which, it would be impossible to produce. Credit can therefore be seen to feed industrial development. However, credit does not just come automatically but has to be borrowed and this can be done only through financial intermediaries. Financial intermediaries are seen to perform the role of bridging the gap between products and means of production and they achieve this by providing the entrepreneur with purchasing power. Economic development can then proceed once the entrepreneur has been empowered by credit.

McKinnon (1973) and Shaw (1973) projected the analysis that financial liberalisation was needed to remedy the problems caused by financial repressive

policies of developing countries. McKinnon and Shaw both identified financial repression as a regime consisting of the imposition of interest-rate ceilings, foreign-exchange regulations, direct credit allocation policies, high reserve requirements, and heavy taxation of the financial sector. They identified many developing countries as pursuing such policies, which had the effect of retarding economic growth in the long run. Such policies they both argued resulted in shallow finance, which reduced the real size of the financial system and, consequently, hampered its role of efficient mobilisation and allocation of resources. McKinnon and Shaw note that the problem with lagging economies is not lack of investment opportunities but unattractive savings. A main feature of shallow finance is that the low level of interest rates discourages agents from saving and consequently, this makes capital for investment hard to come by. Lagging economies are also characterised by manipulation of prices in virtually all markets.

Galbis (1977) extended the analysis of McKinnon and Shaw. He examines an economy comprised of two production sectors with contrasting financial constraints and technological processes, but which produce the same output. There are two sectors: a less efficient sector and a more efficient sector which is more technologically advanced and has higher rates of return on investment. With low deposit rates of interest because of financial repression, investment will take place in the less efficient sector as it would be more profitable for firms to invest rather than increase their bank deposits. Credit will not flow to the more efficient sector. However, with increased deposit rates following financial liberalisation, the low return on investment in the less efficient sector means that firms would prefer to increase their bank deposits – by reducing investment – and this increases credit flowing to the more efficient sector. The higher rate of return on investment in the more efficient sector means that the quality of investment will increase, and this will increase economic growth.

The importance of financial development to growth has also been highlighted in the endogenous growth models. The endogenous growth theories emphasise the role of financial intermediaries in economic growth. They show how there can be self-sustaining long-run growth as a result of liberalised financial markets and better functioning financial intermediaries. The influence of financial markets on economic growth can be best seen in the simplest of these endogenous growth models. The model of Pagano (1993) may be utilised to make the point. In this framework the 'AK' model, in which aggregate output is a linear function of the aggregate capital stock, can be expressed as:

$$Y_t = AK_t \quad (1)$$

Pagano (1993) assumes firstly that the population is stationary. He also assumes that a single good is produced in the economy, which can be consumed or invested (to depreciate at the rate of δ per period); and thirdly, he assumes that a proportion $(1-\phi)$ of the flow of saving is lost during financial intermediation. Following from these assumptions, gross investment can be expressed in the form below:

$$I_t = K_{t+1} - (1 - \delta)K_t \quad (2)$$

Capital market equilibrium is given by:

$$\phi S_t = I_t \quad (3)$$

This follows from combining the third assumption with the capital market equilibrium condition (saving = investment) that rules in a closed economy with no government.

From equation (2) the growth rate of output, Y , at time $t + 1$ will now be:

$$g_{t+1} = Y_{t+1}/Y_t - 1 = K_{t+1}/K_t - 1$$

Using equation (3) and dropping the time indices the steady-state growth rate can now be expressed as:

$$g = A \frac{I}{Y} - \delta = A\phi s - \delta \quad (4)$$

where $s = S/Y$ is the gross saving rate.

Equation (4) shows that financial development can affect growth in three ways:

- (a) Improving the allocation of capital - by raising A , the social marginal productivity of capital, financial intermediaries improve the allocation of capital. This can be done in two principal ways: first, by inducing individuals to invest in riskier but more productive technologies by providing risk-sharing opportunities; and second, by collecting information and making sure that the most productive investments are financed.

- (b) Channelling funds to firms - by raising ϕ , the proportion of saving channelled to investment, intermediaries can help to increase the growth rate g .
- (c) Affecting the savings rate - by raising s , the private savings rate, the financial system increases the resources available for capital accumulation, and given that returns to capital are non-decreasing, the financial system can permanently raise the rate of growth of output per capita.

The link between financial liberalisation and financial fragility has been highlighted by some authors such as Dell'Ariccia and Marquez (2005), Ranciere, et al. (2005), and Demirguc-Kunt and Detragiache (1999).

Dell'Ariccia and Marquez (2005) showed that financial liberalisation can increase the incidence of financial crisis through a number of ways. The first avenue relates to a changing information structure of financial markets. When the number of borrowers whose financial and credit history are unknown to the banks increases, there is more competition in credit markets and banks stop screening and credit is granted to all borrowers. With increasing and indiscriminate lending, coupled with the fact that it is only credit granted to known borrowers that yield positive profits, banks are increasingly exposed to risk, and the probability of a crisis increases. Second, financial liberalisation, through capital account liberalisation, can induce capital inflows which could result in a fall in deposit interest rates. Such a fall in banks' costs of funds could result in less stringent lending rules and, consequently, lead to a lending boom which would increase financial fragility.

Another way through which financial liberalisation could induce fragility is through the relaxation of entry into banking. Increased competition from new entrants forces the incumbent (which could be a monopoly or oligopoly) to lower lending standards and desist from screening of borrowers to pooling. This will increase credit but at the same time, reduce the bank's loan portfolio and profits which would increase financial vulnerability. The implication of the above is that increased credit due to indiscriminate lending causes deterioration in the loan portfolio of banks and reduces profits. The lending boom also makes the banking system vulnerable to macroeconomic shocks because increased lending makes banks' profits sensitive to fluctuations. The overall effect is that the probability of financial fragility increases following financial liberalisation.

Demirguc-Kunt and Detragiache (1999) show that financial liberalisation increases interest rate risk which can increase banking crisis. This is because interest rate deregulation resulting in increases in short-term interest rates means that banks have to increase deposit interest rates. However, they will not be able to increase lending rates because most long-term loans have fixed interest rates. Thus, banks will be forced to incur losses or at best record lower profits because the interest rates on loans cannot be adjusted quickly. In addition to this, even if lending rates can be increased under short notice, this would cause an increase in non-performing loans. Thus, higher interest rates resulting from financial liberalisation would increase financial fragility. Furthermore, the removal of interest rate ceilings means that loans to high risk borrowers will become possible and could even be profitable. This is because banks can charge higher interest rates for high risk borrowers and, thus, the proportion of high-risk loans will increase. The liberalisation of financial markets relaxes bank supervision and regulation which could result in imprudent practices by banks. The establishment of a deposit insurance scheme can also result into a crisis if banks resort to moral hazard behaviour and lend to customers who are not credit worthy since they feel that the deposit insurance will bail them out in the event of any crisis.

II.2 Review of Empirical Literature

A number of studies have been conducted to empirically examine the relationship between banking crisis or financial fragility on one hand, and financial liberalisation on the other hand. There seems to be a consensus from these studies that financial liberalisation increases the incidence of banking crisis and leads to fragility of the financial sector. A review of some of the empirical literature is provided below.

Demirguc-Kunt and Detragiache (1998) conducted a study to examine the determinants of banking crisis using a sample of 65 developing and developed countries. The authors employed data over the period 1980 – 1994 and the estimation involved the use of a multivariate logit model. The dependent variable is a dummy variable for banking crisis where the dummy takes on a value of zero if there is no crisis and the value of one if there is a crisis. Explanatory variables employed include the ratio of private credit to GDP as a proxy for financial liberalisation, the growth rate of real GDP, terms of trade, real short-term interest rate, inflation, rate of depreciation of the exchange rate, and ratio of bank cash and reserves to bank assets. Other variables are a dummy variable for deposit insurance, indexes of the quality of institutions, and per capita GDP. The results of estimation showed a significant positive effect of the private credit ratio on the probability of banking crisis, thereby, implying that financial liberalisation has

increased the incidence of banking crisis in the countries. Other variables which had a significant positive effect on the probability of banking crisis are the real interest rate, inflation, and deposit insurance. The variables that were significantly negatively related to the probability of banking crisis are growth rate of real GDP, terms of trade, per capita GDP, and variables that captured law and order.

Demirguc-Kunt and Detragiache (1999) conducted a study using data for 53 countries to examine the relationship between financial liberalisation and financial fragility. The study period covered 1980 – 1995 and a multivariate logit model was used to examine the probability of a banking crisis. The dependent variable was a dummy variable for banking crisis and the primary explanatory variable was a financial liberalisation dummy variable. The financial liberalisation variable takes on a value of zero prior to removal of interest rate controls and a value of one after removal of interest rate controls. Other explanatory variables include the growth rate of real GDP, terms of trade, real short-term interest rate, inflation, rate of depreciation of the exchange rate, ratio of bank cash and reserves to bank assets, a dummy variable for deposit insurance, indexes of the quality of institutions, and per capita GDP. The results showed a significant positive coefficient for the financial liberalisation variable, thus implying that financial liberalisation is a significant factor leading to financial fragility. Other variables which had significant positive coefficients are the real interest rate, inflation, and lagged total credit growth. The variables which were negatively correlated with financial fragility were real GDP growth, terms of trade, and per capita GDP.

Tornell and Westermann (2004) study sought to examine the relationship between financial liberalisation and financial fragility. The authors employed data for 52 countries over the period 1980 – 1999. The dependent variable is financial fragility which is defined as the negative skewness of credit growth. Financial liberalisation is measured by an index which captures a more liberalised financial system if cumulative capital inflows exceed 10 percent of GDP or if such series experience a trend break. The authors found that financial liberalisation is associated with an increase in the mean of credit growth and a fall in the skewness of credit growth. This has the implication that financial liberalisation leads to increased financial fragility.

Loayza and Ranciere (2004) employed the pooled-mean group estimator to examine the effects of financial intermediation and financial liberalisation on economic growth and financial crisis. The authors used data for 75 countries over the period 1960 – 2000. The results of estimating growth regression showed that

financial intermediation has had a negative effect on economic growth in the short-run but the relationship has been positive in the long-run. Using the standard deviation of the growth rate of the ratio of private sector credit to measure financial volatility arising from financial liberalisation, the authors found that financial volatility increases the incidence of banking crisis and this has had an adverse effect on economic growth. The authors concluded that financial liberalisation increases financial volatility and this increases the incidence of banking crisis.

III. Overview of the Nigerian Financial Sector

The banking system in Nigeria effectively started with the establishment of the African Banking Corporation in 1892. Two years after the establishment of the African Banking Corporation, the Bank of British West Africa (BBWA) (now called First Bank) was established and this new bank acquired the African Banking Corporation. Other banks that were established in this early period were the Anglo-African Bank in 1905¹, Barclays Bank Dominion, Colonial and Overseas in 1917 (now called Union Bank) and the British and French Bank in 1949 (now called United Bank for Africa). The early period of banking in Nigeria was characterised by lax regulations and there were virtually no restrictions or laws guiding the establishment of banks.²

The first indigenous bank was the Industrial Commercial Bank which was established in 1929. Other early indigenous banks were the Nigerian Mercantile Bank established in 1931, National Bank of Nigeria established in 1933, Tinubu Properties Limited in 1937 which later became the African Continental Bank, Agbonmagbe Bank established in 1945, and Nigerian Farmers and Commercial Bank which was set up in 1947. There was a boom in the establishment of banks from the late 1940s into the early 1960s but most of these banks did not last long and failed within a few years. Generally, many of the indigenous banks did not survive, while the expatriate banks fared better. The reasons for this included the fact that many of these indigenous banks lacked the managerial expertise to effectively run the banks. Another reason was the fact that the foreign banks were linked to their head-offices in developed countries, and they had access to more capital and most of the indigenous banks could not compete with them.

The widespread failure of banks necessitated the need for regulation. A commission of inquiry - Paton Commission - was then set up in 1948 to investigate

¹The name of this bank was changed to Bank of Nigeria and it was later acquired by the BBWA

²The only restriction was that they could not issue Bank of England notes

banking in Nigeria and recommend appropriate actions needed for the regulation of the industry. The government acted on the recommendations of the Paton Commission in 1952 when it enacted the 1952 Banking Ordinance. Despite the fact that the 1952 Banking Ordinance put some regulatory control into the banking industry, there were still a lot of concerns that more needed to be done. First, it was felt that the expatriate banks exerted too much control over banking activities and that they were not favourably disposed to the developmental needs of the country. They were seen more as avenues for the expatriate companies to obtain funds and did not serve indigenes well. There was also no recognised body to conduct regulatory and supervisory activities in this sector. There was no central bank and the body that was responsible for issuing currency was the West African Currency Board (WACB). All these concerns resulted in the government setting up the Loynes Commission in 1958 and following the submission of the report of this commission, the Central Bank Ordinance of 1958 was enacted which established the Central Bank of Nigeria.

The Central Bank of Nigeria (CBN) started operations on the 1st of July 1959 with an authorised capital of ₦3.0 million which was paid by the Federal Government. The 1960s marked the beginning of the CBN's regulatory control of banking in Nigeria. There were a number of amendments to the 1958 Ordinance, all of which resulted in more stringent banking regulations and restrictions to entry. For instance, amendments to the 1958 Ordinance were made in 1961, 1962, and 1964 and a new decree was enacted with the 1969 Banking Decree. All these banking legislations further regulated banking and notable developments were the increase of paid-up capital for banks, guidelines regarding liquidation of banks, and stipulation of capital-deposit ratios.

Financial liberalisation started in Nigeria in 1987. The liberalised policies induced a flurry of activities in the financial sector. Most notably, there was a big increase in the number of banks operating in the country. The number of commercial banks operating in the country doubled from 29 to 65 between 1986 and 1992, while the number of branches increased from 1367 to 2275. However, there was a disproportionate concentration of bank branches in the urban areas as opposed to the rural areas with about twice as many bank branches in the urban areas to the rural areas. In addition to this, the number of merchant banks had quadrupled by the mid-1990s from 12 in 1986 to 51 in 1997.

With the proliferation of banks in the aftermath of financial liberalisation, there was an increase in the amount of loans granted by banks. Banks' loans and advances increased from ₦46.9 billion in 1987 to ₦57.6 billion in 1990, and then to

over ₦650 billion by 2000 (Table 1). The table also shows that the composition of banks loans between the private and public sectors has been fluctuating since liberalisation. The credit provided by banks to the private sector was greater than credit to the public sector immediately after liberalisation from 1987 to 1991. This was reversed from 1992 to 1995 when credit to the public sector exceeded private sector credit, but this again changed from 1996 and private sector credit has since been larger than public sector credit.

Lewis and Stein (2002) identified two major factors that induced the increase in the number of banks operating in the country after liberalisation. The factors are the liberalisation of the capital account and the abolition of import licensing. These two policies limited the degree of rent-seeking in the economy, but with liberalisation came the dual foreign exchange mechanism where only banks were allowed to buy foreign currency at an official rate which they then sold at the autonomous/premium rate. This resulted in a shift in the pattern of rent-seeking from trade to financial services. Banking licences were granted based on political connections and the CBN's role was reduced to just granting licences.

Table 1: Banking System Credit To The Economy

YEAR	BANKING SYSTEM CREDIT (N MILLION) TO:			GROWTH OF CREDIT (%) TO:		
	Economy	Private Sector	Public Sector	Economy	Private Sector	Public Sector
1980	10787.5	7190.9	3596.6	21.7	32.8	4.4
1981	16268.5	9654.2	6614.3	50.8	34.3	84.1
1982	21906.8	11371.5	10535.3	34.7	17.8	59.3
1983	28182.1	12353.9	15828.2	28.7	8.6	50.3
1984	31141.6	12942	18199.6	10.5	4.8	15
1985	32680.3	13700.2	18980.1	4.9	5.9	4.3
1986	36820.3	17365	19455.3	12.7	26.7	2.5
1987	46926.4	25476.1	21450.3	27.4	46.7	10.3
1988	57326.3	29773.6	27552.7	22.2	16.9	28.4
1989	49259.1	30942.8	18316.3	-14.1	3.9	-33.5
1990	57674.9	36631	21043.9	17.1	18.4	14.9
1991	83823.7	45325.2	38498.5	45.3	23.7	82.9
1992	171071.1	79958.9	91112.2	65	4	136.7
1993	280657.6	95489.7	185167.9	74.7	19.7	103.2
1994	439113.8	151000.3	288113.5	8.1	47.5	-8.7
1995	474361.4	211358.6	263002.8	8.1	47.5	8.7
1996	332301.2	221835.6	110465.6	-25.4	21.8	-58
1997	321216.8	274958.4	46258.4	-3.3	23.9	-58
1998	485689.7	351760.7	133929	51.2	27.9	188.9
1999	632010.1	455205.2	176804.9	30	29.19	32.01
2000	667621.7	596001.5	71620.2	-23.1	30.9	-162.3
2001	848992.9	854999.4	-6006.5	79.89	43.5	95.16
2002	1394422.7	1023783.5	373639.2	64.6	19.7	-6320.6

Source: CBN Major Economic, Financial and Banking Indicators, 2004

By 1991, the financial sector was experiencing a banking crisis, but the signs of the unstable and volatile nature of the sector had started to emerge in the late 1980s when it came to the attention of the authorities that 8 banks (out of the 66 banks operating then) were technically insolvent. The government took some steps to bolster regulation and the Nigeria Deposit Insurance Corporation (NDIC) was created in 1988 to complement the CBN's efforts in banking supervision and the NDIC was primarily charged with insuring deposits and with bank inspection. Other prudential initiatives were the increase in the minimum paid-up share capital for all banks in 1991.³ This period also saw varying degrees of reversals of the financial liberalisation policy. Interest rate controls were re-introduced in 1991 but were again de-controlled in 1992. The CBN also stopped further bank licensing in early 1991, coupled with new prudential guidelines on asset quality that were put in place which required better and more transparent accounting and loan classification from banks. The CBN Act, and the Banks and Other Financial Institutions Act were promulgated in June 1991 to strengthen the CBN's regulatory powers and granted the CBN more power in licensing banks and sanctioning failing banks. Despite these new steps, the CBN was still effectively answerable to the Presidency and the lack of independence hampered its effective prudential regulation and supervision of banks. The CBN was used more by the government to service its excessive budget deficits which exceeded 10 percent of GDP between 1991 and 1993.

Brownbridge (1998) notes that 60 percent of the total loan portfolios of state-owned banks were non-performing in 1994. The banks were also subject to high operating costs with the state-owned banks incurring costs of 76 percent of net earnings as against 49 percent for other banks (Brownbridge, 1998). Between 1993 and 1996, over N1 billion had been involved in frauds and forgeries in banks (Alashi, 2002). The new prudential guidelines introduced in 1991 made sure banks adequately classified non-performing loans and this provided the first indication of the extent of decay in the industry. State-owned commercial banks' ratio of classified loans (i.e. bad or doubtful debts) to shareholders funds was 2300 per cent, while for the private commercial banks, the ratio ranged between 151 per cent and 282 per cent. Merchant banks had a ratio of over 200 per cent. Classified loans for the whole industry were 45 per cent of total loans and advances (Brownbridge, 1998), and by 1996, classified loans of banks had reached N72 billion (Alashi, 2002).

By 1993, 28 banks were identified as insolvent and a further 26 were in the early

³This was increased from N20million to N50million for commercial banks and N12million to N40million for merchant banks.

stages of distress and the CBN took over six state-owned banks. The political instability with the annulment of elections and the taking-over of power by a military regime did not help matters and bank runs were clearly evident by 1994. This further exacerbated interest rates and interbank rates were over 100 percent in 1994. In a bid to restore some stability in the financial system the government re-introduced interest rate and exchange controls in 1994.

The Failed Banks (Recovery of Debts) and Financial Malpractices Decree was promulgated in 1994. The licences of 2 banks were suspended in 1994 and in 1995 17 private banks had been taken over by the CBN, while in the period from 1992 to 1995, 10 state banks had been taken over. In 1995, the CBN estimated that 60 out of 115 (effectively half the number of banks in the country) were distressed. Overall, 30 percent of total deposits and 20 percent of total assets of the banking system were held by the insolvent banks.

IV. Analytical Framework

The theoretical framework for our analysis of the effects of financial liberalisation on financial fragility draws from Dell'Ariccia and Marquez (2005), Loayza and Ranciere (2004), Tornell and Westermann (2004) and Demirguc-Kunt and Detragiache (1999). Consequently, we make use of a financial fragility equation and include financial liberalisation and some other variables as explanatory variables in the equation.

The financial fragility equation takes the following form:

$$FRAGILITY_t = \alpha_0 + \alpha_1 FINDEX_t + \alpha_2 INFLVOL_t + \alpha_3 GOVCON_t + \alpha_4 CASHBANK_t + \varepsilon \quad (5)$$

where FRAGILITY = financial fragility

FINDEX= financial liberalisation index

INFLVOL= volatility of inflation

GOVCON= ratio of government consumption to GDP

CASHBANK = bank liquid reserves to bank assets ratio

ε = error term

To measure fragility, following other studies (Loayza and Ranciere, 2004) we have used the standard deviation of the growth rate of domestic credit provided by banks. This variable is employed primarily because of the observed infrequent, sharp and abrupt falls in credit growth associated with fragility. These abrupt falls in credit growth have been observed to occur during the banking crisis that are typical of the boom-bust cycles associated with financial liberalisation. The boom

period sees rapid expansion of bank credit coupled with extreme credit risk, which leads to financial fragility and leaves the financial system prone to crisis (Loayza and Ranciere, 2004; Tornell and Westermann, 2004).

Financial liberalisation is the primary explanatory variable of interest. It is increasingly being recognised that the traditional measures of financial development such as the broad money ratio, ratio of credit to the private sector, and ratio of liquid liabilities do not give any indication of the progression and institutional changes involved in financial liberalisation policies. Consequently, recent studies have developed indexes that explicitly measure the progression made with liberalisation and track the different institutional changes involved with reforms (Bandiera, et al., 2000; Laeven, 2000; Arestis, et al., 2002; Kaminsky and Schmukler, 2002; Abiad, et al., 2004). In line with these studies, we have developed an index of financial liberalisation (FINDEX) which is derived from the method of principal components. Principal component analysis is useful for reducing the dimension of a data set and extracting the main relations from it. This method has been used in the financial liberalisation literature to obtain an index which measures the different phases of the deregulatory and institution-building process (see Bandiera, et al., 2000). What we do is to identify seven major indicators of moves towards liberalisation which are: bank denationalisation and restructuring, interest rate liberalisation, strengthening of prudential regulation, abolition of directed credit, free entry into banking, capital account liberalisation, and stock market liberalisation. We then allocate to each of these variables a value of 0 prior to liberalisation. After liberalisation, the indicators take on values from 1 and this increases depending on the progress made for each specific liberalisation policy. We get a matrix of 7 variables and then apply principal components analysis. We use the first principal component as our index of liberalisation, and this first component accounts for 78% of the total variation.

Following Demirguc-Kunt and Detragiache (1998) the other explanatory variables included in the financial fragility model are the volatility of inflation, the ratio of government consumption to GDP, and the ratio of bank liquid reserves to bank assets. The volatility of inflation is included to take account of macroeconomic uncertainty. Increased macroeconomic uncertainty and a government that has lost control of managing the economy can increase volatility in the financial system and, hence, banking crisis. The government consumption ratio is a proxy for fiscal policy of the government. A government whose fiscal position is in bad shape may not be able to bail out banks experiencing difficulties and this can result in a full blown crisis as more banks experience difficulties. The ratio of bank

liquid reserves to bank assets is used to measure liquidity of the banking system. Adverse macroeconomic circumstances should be less likely to lead to crisis in countries where the banking system is liquid (Demirguc-Kunt & Detragiache, 1998).

V. Econometric Analysis

V.1 Methodology and Data

The methodology that will be employed in this paper is based on the Autoregressive Distributed Lag (ARDL) framework of Pesaran, Shin and Smith (1996), Pesaran and Shin (1999), and Pesaran, Shin and Smith (2001). The ARDL method has a number of advantages over other cointegration techniques. First, it allows the use of variables that are integrated of different orders in estimating long-run relationships. Specifically, variables that are $I(0)$ or $I(1)$ can be included in the same cointegrating equation. Another advantage that follows from this is that there is no need for unit root testing of the variables. All that is needed is that the variables be either integrated of order 0 or 1.

The ARDL procedure comprises of two steps. The first step involves testing the null hypothesis of no long-run relationship among the levels of the variables. In order to do this, an F-test with a non-standard distribution is employed. Pesaran, Shin and Smith (1996) have provided two sets of asymptotic critical values for this test for the cases when all the variables are $I(1)$ and for cases when all variables are $I(0)$. If the computed F-statistic exceeds the upper critical value, then the null hypothesis of no long-run relationship can be rejected. On the other hand, if the F-statistic is lower than the lower critical value, the null hypothesis cannot be rejected. If the F-statistic falls within the upper and lower bounds, then the result is inconclusive and there is a need for unit root tests to be conducted to ascertain if all the variables are $I(1)$ and $I(0)$. If all variables are either $I(1)$ or $I(0)$, then the null hypothesis can be rejected, and otherwise, the null hypothesis cannot be rejected.

If a long run relationship exists, then the second step can be implemented. This involves estimation of the ARDL model using either the AIC or SBC to select the maximum order of lags to obtain long run coefficients. This method involves the estimation of an error correction model (ECM) of the ARDL model. Thus, equation 5 above has to be changed to the ECM form. The financial fragility equation now becomes:

$$\begin{aligned}
\Delta FRAGILITY_t = & \alpha_0 + \sum_{i=1}^k \alpha_{6i} \Delta FRAGILITY_{t-i} + \sum_{i=0}^k \alpha_{1i} \Delta FINDEX1_{t-i} + \sum_{i=0}^k \alpha_{2i} \Delta INFLVOL_{t-i} + \\
& \sum_{i=0}^k \alpha_{3i} \Delta GOVCON_{t-i} + \sum_{i=0}^k \alpha_{4i} \Delta CASHBANK_{t-i} + a_1 FRAGILITY_{t-1} + \\
& a_2 FINDEX1_{t-1} + a_3 INFLVOL_{t-1} + a_4 GOVCON_{t-1} + a_5 CASHBANK_{t-1}
\end{aligned} \tag{6}$$

Accordingly, the null hypothesis of no cointegration is tested against the alternative using the F-test from Pesaran, Shin and Smith (1996). The null hypotheses for the equation are:

$$H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 0$$

Annual time series data from the World Development Indicators (WDI) CD-ROM 2008 have been used for the econometric analyses and the data ranges from 1970 to 2006.

V.2 Presentation and Discussion of Results

We first conducted unit root tests on the variables included in our model. Although unit root tests are not compulsory for the ARDL approach, we feel it is still necessary to make sure that all the variables satisfy the conditions under which the ARDL approach can be employed, that is, that all variable be either I(0) or I(1). The augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests were carried out for all variables in the model and the results are presented in Table 2. From Table 2, both the ADF and PP tests show that three variables are integrated of order 1. These variables are: financial liberalisation index, bank liquid reserves and bank assets ratio, and government consumption. The two tests also jointly conclude that one variable: volatility of inflation is integrated of order 0. However, the two tests give different results for the financial fragility variable. While the ADF test suggests this variable is stationary in levels, the PP test suggests it is stationary in first differences. However, since both tests come to the conclusion that all variables are either I (0) or I (1), the conditions for the ARDL approach are satisfied.

Table 2: Unit Root Tests

Variables	Levels		First Difference		Conclusion
	ADF	PP	ADF	PP	
fragility	-3.21**	-2.52	-4.59*	-4.79*	I(0)/I(1)
findex	-1.01	-0.89	-3.49**	-3.52**	I(1)
inflvol	-2.75***	-2.71***	-6.16*	-8.46*	I(0)
govcon	-1.84	-1.92	-5.53*	-5.58*	I(1)
cashbank	-2.23	-2.51	-4.17*	-3.93*	I(1)

Notes: the null hypothesis for each column is the presence of unit roots.

* indicates significant at the 1% level, ** significant at the 5% level, *** significant at the 10% level

all the tests were conducted with constant and no trend

We next conduct cointegration tests to establish the existence of a long-run relationship between the variables by computing the F-statistic for the joint significance of lagged levels of the variables. Because annual data is used in this analysis, the maximum lag length was set to two and the Akaike Information Criterion (AIC) was then used to determine the appropriate lag length. The F-statistic obtained is 2.5429 and this suggests the existence of a long-run relationship between financial fragility and the explanatory variables. The F-statistic falls within the lower and upper bounds at the 90% significance level⁴. Since all variables are either I (0) or I (1) from Table 2, we can conclude that a long-run relationship exists for the variables in equation 6.

Since the F-statistics suggest that a cointegrating relationship exists between the variables, we can now move on to the next stage of the ARDL procedure by estimating equation 6. The results of the regressions are presented in equations 7 to 8.

The long-run coefficients are presented in equation 7 and we see that financial fragility is negatively related with financial liberalisation. The financial liberalisation index has a negative coefficient which is statistically significant. This offers support for the theory that financial liberalisation induces financial fragility. The variable measuring the ratio of bank liquid reserves to bank assets is positive and significant and this is as expected, that financial fragility will be less likely to occur the more liquid a banking system is.

⁴The critical value bounds are from Table B in Pesaran, Shin and Smith (1996) (with an intercept and no trend). They are 2.425-3.574, 2.850-4.049, and 3.817-5.122 at the 90%, 95%, and 99% significance levels, respectively.

$$\text{FRAGILITY} = -20.27 - 9.82\text{FINDEX} + 0.12\text{INFLVOL} - 1.22\text{GOVCON} + 4.93\text{CASHBANK}$$

$$\begin{matrix} (-0.49) & (-2.23)** & (0.09) & (-0.56) & (4.51)* & (7) \end{matrix}$$

Notes:

* indicates that a coefficient is significant at the 1 percent level, ** significant at the 5 percent level, and *** significant at the 10 percent level.

Figures in parenthesis () are t-ratios.

Equation 8 presents the estimates of the error correction form of the ARDL model and the results are quite similar with those from equation 7. The coefficient on the dynamic component of the liberalisation proxy is significant negative, thus implying that short-run changes in financial liberalisation lead to short-run changes in financial fragility. The volatility of inflation and government consumption ratio are insignificant, just like in the long-run estimation. Also, the ratio of bank liquid reserves to bank assets is positive and significant.

Thus, financial liberalisation has had a negative impact on financial fragility in both the short and long run in Nigeria. This result confirms what was observed after Nigeria's financial liberalisation where the lending boom due to indiscriminate lending heralded a period of banking crisis. Our results are consistent with the studies that have found financial liberalisation as a determinant of financial fragility (Demirguc-Kunt and Detragiache, 1998, 2000; Kaminsky and Reinhart, 1999). Although some studies find that financial liberalisation should enhance stability in the long-run (Loayza and Ranciere, 2004; Tornell and Westermann, 2004), our results are in contrast with these as we find that financial fragility still has a significant negative relationship with financial liberalisation in the long-run.

For the diagnostic tests, the R^2 is about 0.54 which suggests a reasonable fit of the error correction model to the data. The F-statistic suggests the joint significance of the explanatory variables, and crucially, the error coefficient term ($\text{ecm}(-1)$) is negative and statistically significant which shows that the long run coefficients are jointly significant. This further supports the existence of a long-run relationship between the variables. The coefficient on the error correction term (the speed of adjustment) of -0.67 means that there is a quick adjustment back to equilibrium after a shock. Specifically, the coefficient implies that about 67% of the previous year's deviation from long-run equilibrium will be corrected within a year.

$$\Delta\text{FRAGILITY} = -13.54\Delta C + 0.27\Delta\text{FRAGILITY}(-1) - 6.56\Delta\text{FINDEX} + 0.08\Delta\text{INFLVOL} -$$

$$\begin{matrix} (-0.48) & (1.83)*** & (-2.04)*** & (0.09) \\ 0.82\Delta\text{GOVCON} + 3.29\text{CASHBANK} - 0.67\text{ECM}(-1) \\ (-0.57) & (3.83)* & (-4.9)* & (8) \end{matrix}$$

$$\text{Adj. } R^2 = 0.54$$

$$\text{DW} = 2.36$$

$$F(6,27) = [0.001]$$

Notes:

* indicates that a coefficient is significant at the 1 percent level, ** significant at the 5 percent level, and *** significant at the 10 percent level.

Figures in parenthesis () are t-ratios, [] are p-values.

V.3 Parameter Stability Test

We have conducted parameter stability tests to ensure that the estimated parameters of our model are not varying over time. This is important because unstable parameters can result in a misspecification of the model and this could lead to biased results (Hansen, 1992). To test for parameter stability we use the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests given in Pesaran and Pesaran (1997). The null hypothesis of these tests is that the regression equation is correctly specified. Figures 1 and 2 present the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) graphs, respectively, to test for model specification and parameter constancy. The pair of straight lines in each figure indicates the 5 percent significance level and if the plotted CUSUM and CUSUMSQ graphs remain inside the straight lines the null hypothesis of correct specification of the model can be accepted, otherwise the null hypothesis is rejected and it can be concluded that the regression equation is misspecified. We see from the two figures that the CUSUM and CUSUMSQ plots stay within the lines indicating the 5 percent level of significance and we can, therefore, conclude that our equation has been correctly specified and there is the absence of instability of the coefficients.

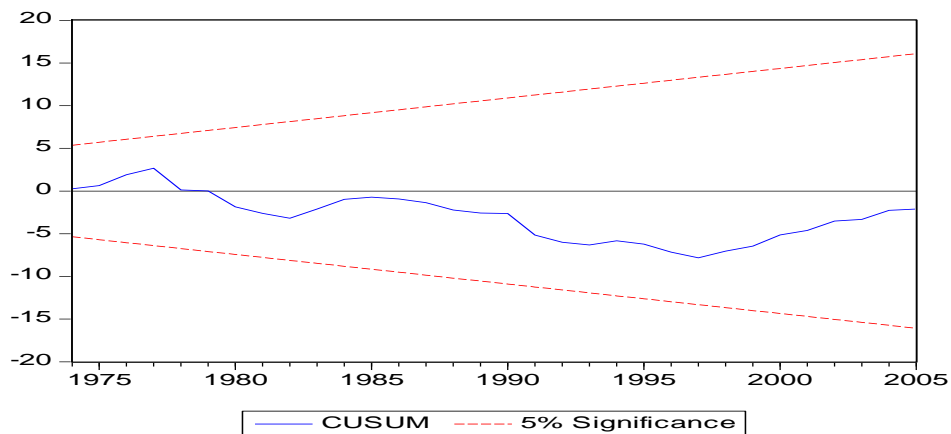
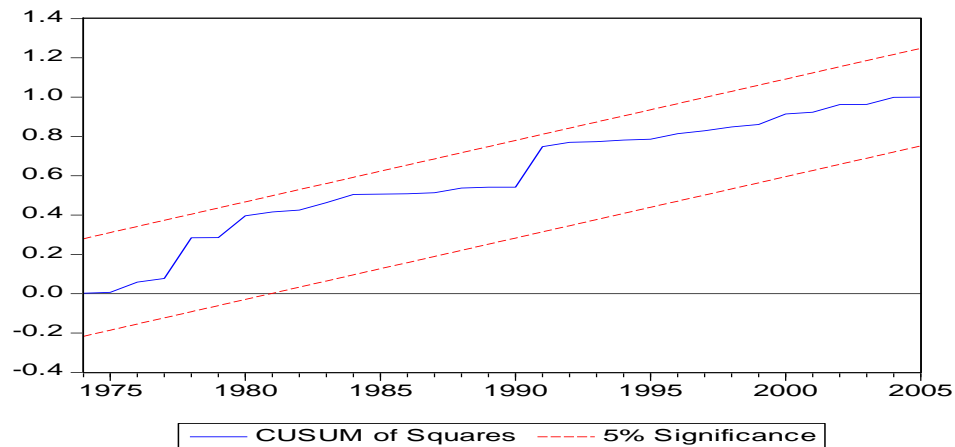
Figure 1: CUSUM Test

Figure 2: CUSUMSQ Test

VI. Conclusion

In this paper we conducted an empirical analysis of the effects of financial liberalisation on financial fragility in Nigeria. Nigeria's financial liberalisation started in 1987 and this was followed by a banking crisis from the late 1980s to early 1990s. This is similar to the experiences of some Latin American countries and has prompted some authors to assert that financial liberalisation leads to financial fragility.

In order to properly measure the gradual progression and institutional changes involved in financial liberalisation, we developed an index which is a summary measure of seven (7) liberalisation policies. The results of including this liberalisation index and some control variables in a financial fragility equation showed that financial fragility has had a negative relationship with financial liberalisation in both the short-run and long-run. This result confirms what was observed after Nigeria's financial liberalisation where the lending boom due to indiscriminate lending heralded a period of banking crisis. Our results are consistent with the studies that have found financial liberalisation as a determinant of financial fragility (Demirguc-Kunt and Detragiache, 1998, 2000; Kaminsky and Reinhart, 1999).

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