CAPITAL REGULATION: A PRAGMATIC APPROACH TO MINIMIZE RISING RISK IN THE BANKING INDUSTRY

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Abstract

The banking sector globally is very sensitive in spite of it ultimate goal to generate profit to satisfy a market determined return on equity (ROE). Regulatory intervention seeking to alter the capital structure of banks, transforms the character of some of the endogenous variables (like leverage, assets-capacity etc) to exogenous variables. The paper specifically examined if bank capital regulation has reduced the growth rate of assets of Nigerian banks substantially over the pre- regulation period. It also investigated if higher rate of return on assets is associated with higher risk. The study made use of statistical models and the findings reveal that bank capital like any other business need to be serviced by a certain ROE, which is determined by the market within a risk- return framework. It was also discovered that when the asset generation capacity of banks is restricted by the regulatory capital ratio banks are induced to go beyond their risk tolerance level to seek assets or businesses that provide higher rate of return. We thus recommended that banks should go beyond their risk tolerance level and take a riskier position if the scale of operation is restricted not necessarily by capital- assets ratio but by any other means. More so, the regulators should concentrate on developing monitoring tools for risk management so as to ensure that banks stay within the risk tolerance level.

Key words: Capital regulation, Rising risk, Return on Assests, Return on Equity, Assets Loss.

The Nigerian banking sector is one of the most regulated industrial sectors of the economy. Thirty years ago Buser, Chen and Kane (1981) remarked that, "a bank has

traditionally been conceived as more than just another business firm; it operates under unusual regulatory restrictions ....". Since then the regulatory environment surrounding banks has experienced tremendous changes. When financial market was deregulated in the early 1980s banks were reregulated by more stringent capital regulation which restricted their asset generation capacity. Banking is now the only industry that is subjected to international capital regulation supervised through Basle Capital Accords.

Banks may be seen as special institutions because of the sensitive nature of the services they provide but they are primarily business organizations whose ultimate aim is to generate enough profit to satisfy a market determined Return on Equity (ROE). Capital structure (mix of equity and debt) of any business is an endogenous variable geared towards generating a required level of sales (which is also an endogenous variable) with a certain return from which to earn the required profit to satisfy the required ROE. For banks, sales are analogous to generating banking assets; everything else is same. Regulatory intervention seeking to alter the capital structure of banks, transforms the character of some of the endogenous variables (like leverage, assets-capacity etc.) to exogenous variables. As capital regulation is administered through capital-assets ratio, a rise in the ratio lowers down the sales (banking assets) and generation capacity of banks. A transition from a low capital regime (pre-regulation) to high capital regime (post regulation) 'reduces the banks' future ability to pledge which can lead to a bank run because maturing deposits may exceed what the bank can pledge' (Diamond and Rajan, 2000). With fewer assets available banks may be forced to cross boundaries and reach for high-return-high risk assets which has the potential of endangering the system as a whole.

Specifically, the paper aims at pursuing the following objectives:
1. To find out if bank capital regulation has reduced the rate of growth of assets of Nigerian banks substantially over the pre-regulation period.
2. To investigate if higher rate of return on assets is associated with higher risk

Literature Review

There have been series of arguments for and against capital regulation. According to Ross (1977), Harris and Raviv (1990), Cebenoyan and Strahan (2004), banks are more risky than any other business firm; capital reduces banks risk-taking ability, provides risk-mitigating incentive for bank managers.

Banks are viewed as vulnerable to runs due to provision of liquidity services; the depositors suffer from an asymmetry of information about bank's assets which may cause runs; an all deposit structure could lead to runs when real assets value falls; bank's capital, therefore, provides a kind of cushion against losses for depositors (Diamond and Dybvig, 1983, Jacklin and Bhattacharya, 1988, Bhattacharya and Thakor, 1993, Kashyap, Rajan and Stein, 2002, Morrison and White, 2005). Cooke (1990), Berger, Herring and Szego (1995) believe that Increase in leverage increases the cost of financial distress; cost of financial distress rises with the decline of capital ratio.

Further argument revealed that banks are prone to take extra-ordinary risks; high risk-taking has almost become part of banking culture - a protective equity cushion should vary directly with a bank's risk exposure (Kerkhof and Melenberg, 2004; Lindquist, 2004; Kopecky and VanHoose, 2006, Rajan, 2005, Kashyap, Rajan and Stein, 2002).

Dowd (2000) asserts that capital regulation is necessary for long-term solvency and public credibility - capital acts as a buffer against insolvency; maintenance of a sufficient capital cushion can solve the financial fragility problem and prevent liquidity crisis from occurring.

In the opinion of Cooper and Ross (2002), the absence of sufficient equity 'at stake' banks may make investment decisions which could be sub-optimal for the society, though optimal for the shareholders; banks are motivated to reduce assets risk on the face of higher capital requirement; it induces the banks to choose safer assets, thereby mitigating 'moral hazard' problem that depositors face. Morrison and White (2005) believe that capital regulation has the desirable effect of discouraging unsound and undesirable institutions from setting up operations which often collapse after a while.

On the other hand, there have been a series of arguments against capital regulation. According to Thomson (1991), higher capital ratio does not always predict a lower probability of bank failure - the relationship between the capital ratio and bank safety is often weak. Acharya, (2001), Kopecky and VanHoose, 2004, Estrella, (2004) assert that capital regulation decreases loan supply, dampens entrepreneurial activity, reduces the size of banking industry and quantity of intermediation; it may also exacerbate the business cycle and even accentuate systemic risk while Blum (1999) think it is too costly for a bank to raise equity to meet higher capital standards tomorrow, an alternative is to increase the risk today. In the view of Diamond and Rajan (2009), the countercyclical regulatory capital requirements are inconsistent with 'market capital requirements' prompting banks to escape stricter regulatory norms in good times by regulatory arbitrage, while providing little relief in bad times as banks are held to the higher market norms.

When banks are forced to increase the capital ratio that lowers the expected return, they may respond by choosing assets portfolio with higher risk; higher capital requirement might induce banks to seek higher returns in areas that are high risk or outside their core business (Kim and Santomero, 1988, Rochet, 1992, Gennotte and Pyle, 1991).Consequently, capital regulation, if not based on any consistent economic soundness standards, results in regulatory tax which drives the market to seek alternative ways to reach equilibrium like, regulatory capital arbitrage, innovative and often risky financial instruments etc. (Kane, 1997, Gardner, 1988, Donahoo and Shaffer, 1991, Merton, 1995, Jones, 2000, Pauls and Lacour-Little, 2004).

During recent times, advocates of capital regulation have marched over those against it. Current belief is that bank capital has special purposes not amenable to market laws; when risk goes up banks should increase capital because they need larger

buffer. According to Miller (1995), 'when it comes to banking the market cannot be left to their devices'. In fact, bank capital regulation is based on this premise. Capital regulation is now taken for granted. The question now is not on the efficacy or otherwise of capital regulation but on the arithmetic of calculating capital-assets ratio and the algebra of risk models to determine what should be the appropriate ratio. None of the financial liberalization indexes developed by various researchers considers bank capital regulation as an indicator of financial repression (Abiad and Mody, 2005).

"A banking organization holds capital to guard against uncertainty. Capital reassures institution's depositors, creditors and counterparties -and the institution itself - that an event such as an unexpected surge in losses or an unanticipated deterioration in earnings will not impair its ability to engage in lending to creditworthy borrowers and protect the savings of its depositors".

Literatures published in the aftermath of the recent financial and banking crisis have highlighted the existence of a culture of excessive risk-taking due to high performance pressure on the CEOs of banks resulting in huge investment of short-term fund in exotic mortgage backed securities and other risky loans (Diamond and Rajan, 2009). Fahlenbrach and Stultz (2009) have found that CEOs took exposures that they felt were profitable for their shareholders ex ante but these exposures performed very poorly ex post.

The first point that is missed in the debate is why is there a change in banks' risk-taking behavior? Bankers are known to be conservative people. They are used to operate within a narrow risk band and do not normally accept greater risks for higher margins (Bourke, 1990). Why then during the past two decades they have crossed the boundary and reached for high-risk high-return assets? What is the immanent cause behind such a high 'return pressure' on CEOs of banks?

The second point is the virtual unconcern about servicing the capital that banks hold, or are required to bring in to conform to the capital standards. As in any other firm it is the stockholders who supply the risk-capital to banks. The required return on banks' capital depends on the market portfolio plus premiums for banks' exposure to default risk, liquidity risk, yield curve risk etc. (Dewnter and Hess, 1998). Banks' scale of business must be such as to meet the required return. When the scale of business is restricted banks may be forced to seek assets with higher yield to meet the required return.

It is often said that the banks should be subjected to market discipline. But equity holders are often not considered as constituents of the 'market'. For example, Flannery and Rangan (2004) define market as bank counterparties, which comprise 'depositors, guarantee beneficiaries, FX and derivative traders' but not the equity investors1.

Some of the literatures mentioned above have cited financial deregulation, competition, financial market developments, impact of information technology and return to scale etc. while explaining dismal performance of banks that has led to the

recent crisis. We have, instead put forward a single variable (capital regulation) explanation for the rising risk of banking industry.

Inter-Relationship among Capital, Assets, ROA and ROE

The basic equations that capture the relationship among equity capital(C), assets (A), net earnings (E), return on assets (ROA) and return on equity (ROE) are given by,

$ROE = E/C$……………….. (1)

Or, $E = ROE*C$………… (2)

E is further defined as A*ROA. Equation (1) can now be rearranged as,

$A * ROA = ROE * C$ ………..(3)

The following equations are derived from EQ. 3

$C = (A*ROA)/ROE$ ………… (4)

$C/A = ROA/ROE$ …………… (5)

$A = ROE(C/ROA)$ …………… (6)

$ROA = (ROE*C)/A$ ……………. (7)

Eq. 5 is an accounting identity the LHS of which is Capital-Assets Ratio (CAR). Hence,

$ROA = ROE * CAR$ …………… (8)

Reciprocal of capital-assets ratio (CAR) is the capital multiplier which we denote as M. It determines the level of assets for a given amount of capital. Hence Eq. 6 can be rearranged and restated as

$A = C * M$ ………………………(9)

As income and assets strategies of a bank are determined ex-ante (explained below) henceforward, we shall be taking the income and assets variables at before income/assets loss like, Assets before loss (ABL), Earnings before loss (EBL), Return on assets before loss [ROA (?)], Return on equity before loss [ROE (B)] etc.

Return on Equity

ROE of an industry is market determined in a risk-return framework. ROE should remain constant or change slowly over a long period. When there is a substantial shift in the required ROE, it can be presumed that market has altered the risk-return characteristics of the industry

In this study we have used accounting ROE which may be different from a market determined ROI. We assume that accounting ROE is the book value return expected by the bank/investor to satisfy the required market return. Hence, accounting ROE is considered as a proxy for the market ROE.

ROE is not dependent on the amount of capital but on the risk characteristics of the business. It is, therefore, not advisable to establish a functional relationship between ROE and capital. However, variation in ROE (B) can be measured indirectly by establishing a functional relationship between EBL and capital as in EQ. 1.

Income Strategy of Banks

   With the ROE thus fixed (and it is risky for a bank to alter the ROE as capital may move out or move in to the disadvantage of the bank) the earnings of a bank should rise or fall in response to the rise or fall in capital.

Income strategy of a bank in the absence of capital regulation should be as below:

When there is no restriction to assets growth, and assuming that there are enough investment opportunities available in the market at a given risk-tolerance rate, the required earnings can be achieved by increasing assets proportionately without altering the standard ROA(B). When regulatory capital-assets ratio (CAR) restricts the growth in assets by a certain capital multiplier (M), [which is the reciprocal of CAR], the bank has to increase earnings (EBL) by investing in assets with higher returns (which may fall beyond the existing risk-tolerance level of the bank). Income strategy of the bank, therefore, changes during the regulation period as shown below:

In period I (pre-regulation) Assets (I) grow freely with the rise in capital at a given ROA(I). In period II (post-regulation), growth of assets is lower than in period I as it is restricted by the capital-multiplier (M). When capital increases in period II earnings shall increase to ROE * C, ROE remaining constant, but assets could be increased only up to C * M which is less than Asset I. Consequently, return on assets increases to level II.

Hence, ROA (II) = E7 (C * M) or, (ROE * C')/ (C *M) or, ROE/M.

We can now rewrite the pre-and post- regulation strategies of banks in terms of capital-multiplier (M) as follows:

Pre-Regulation

Required To be achieved

$C * ROE (B) = EBL = ROA (B) * C * M_u$

Post-Regulation

Required To be achieved

$C * ROE (B) = EBL = ROA (?) * C * M_r$

Subscripts u and r denote unrestricted and restricted level respectively.

The following two propositions follow from this:

1. When $M_u/M_r > 1$, ROA_r will increase (decrease) by the same ratio, i.e., $<ROA_r = ROA_u * (M_u/M_r)$.

It follows from Proposition 1 that when Mr = Mu there is no change in ROA. Banks have no incentive to go beyond their risk-tolerance level and contract assets with higher return (and higher risk) as they are able to meet the required ROE.

Impact on assets growth

Pre-regulation period

Equation 9 can be modified as below:

$ABL_u = C*M_u$………… (10)

where OM_u. Subscript $_u$ denotes 'unrestricted'. An examination of the equation indicates the following.

When both C and M changes, assets (ABL) will change by the following equation/rules.
$a\^sub\ u\^ = C\ m\^sub\ u\^ + M\^sub\ u\^\ c + m\^sub\ u\^c$ …………(11)
where a, m, and c are respective changes in assets (ABL), capital multiplier (M) and capital (C).

During the pre-regulation period there was no restriction to assets growth except what was endogenously determined by the banks. The level of capital was a matter of capital structure policy of a banking organization. Assets policy, on the other hand, was determined more independently of capital except that it must be sufficient to service the capital by a given ROE. $M\^sub\ u\^$ could be varied to achieve a desired level of assets growth without changing the level of capital ($9ABL\^sub\ u\^/eM\^sub\ u\^ = C$).
Equations 9, 10 and 11 also tell us that when there is a change in both C and Mu, even by the same percentage, change in ABLu will be more than proportional to change in C provided the change is in the same direction.

Banks also have the option not to change Mu while allowing capital to change in which case change in assets (ABLu) will be proportional to change in capital. When banks change the $M\^sub\ u\^$ keeping capital fixed change in ABLU will be proportional to the change in M". All the options mentioned above were available only in the pre-regulation period.

In the regulation period M is determined exogenously by the regulated capital-assets ratio which also remains fixed for a certain period. Banks can increase assets only by increasing capital. When Mr is fixed change in assets w.r.t change in capital is determined by sABL/sC = Mr. Hence, growth of assets will be proportional to the growth of capital. Besides, when Mr is fixed the first and third term of the RHS of Eq. 13 will be zero. We also find that $M\^sub\ r\^ < M\^sub\ u\^$ hence, $a\^sub\ r\^ < a\^sub\ u\^$, which suggests that the growth of assets during the regulation period will be lower than the growth of assets during the pre-regulation period.

Impact on Return on Assets
Equation 8 explains the behavior of ROA. The modified form is given below.
ROA (B) = ROE (B) * C/ABL …………….. (14)
The equation tells us that when ROE(B) is fixed (as we have observed before) the rate of change of ROA(B) depends upon the ratio, C/ABL. That is, if the ratio increases/decreases ROA (B) will also increase/decrease.
The ratio can be increased by
1. (a) Increasing C keeping ABL constant;
(b) Decreasing ABL keeping C constant;
(c) Increasing both C and ABL but the rate of increase in C must be greater than the rate of increase in ABL;
(d) Decreasing both C and ABL but the rate of decrease in ABL must be greater that the rate of decrease in C.
The ratio can be decreased by;

2. (a) Decreasing C keeping ABL constant;
(b) Increasing ABL keeping C constant;
(c) Decreasing both C and ABL but the rate of decrease in C must be greater than the rate of decrease in ABL;
(d) Increasing both C and ABL but the rate of increase in ABL must be greater than the rate of increase in C.

In case of l. (a) the rate of change of ROA(B) w.r.t C is given by 9ROE(B)/9C = ROE(B) * 1/ABL. But ABL cannot be held constant when capital changes because any change in C is reflected by a corresponding assets flow on the other side of the balance sheet. Similar is the case with 2.(a). As both l.(a) and 2.(a) are not obtainable in real-life situation we are excluding them from our analysis.

Capital (C) is constant in both l.(b) and 2.(b). With the ROE(B) already fixed, the rate of change of ROA(B) w.r.t ABL should be in the opposite direction of ABL i.e., [sROA(B) / sABL] = -[ROE(B)*C] / ABL2. That is, when ABL decreases/increases ROA (B) will increase/decrease; the rate of change however increases with the increase in ABL.

Options l.(b) and 2.(b) were particularly available during the pre-regulation period but these were not typically exercised as such, though post-facto realization/observation might appear to be so, because in absence of regulated capital-assets ratio determination of the level of capital and assets was virtually independent of each other; the only consideration being servicing the capital by a given ROE.

During the regulation period banks might choose option l.(b) to increase the ratio by pruning the assets instead of going for additional capital. When the assets base is thus lowered the ROA(B) would increase as indicated by the partial derivative shown above. During this period banks can also exercise options l.(c) and l.(d) which would have similar effect on the ROA(B).

The ratio could be decreased under options 2.(c) and 2.(d). Both the options were available during the pre-regulation period.

Impact of Capital-assets Ratio

The ratio C/A discussed in the earlier sub-section is the most talked about capital-assets ratio of the regulation period popularly known as CAR or CAR(B) for our purpose. Equation 8 defines ROA in terms of CAR. The modified form is as below.

ROA(B) = ROE(B) * CAR(B) (14)

Above equation gives rise to following equation/rules.

1. When both ROE(B) and CAR(B) changes the change in ROA(B) is given by the following equation.

r = ROE(B) *c + CAR(B) * e + c*e (15)

where, r, c and e are respective changes in ROA(B), CAR(B) and ROE(B).

As ROE(B) is constant the second and the third term of RHS of Eq. 15 will be zero. Hence, the rate of change of ROA(B) w.r.t CAR(B) will be given by ROE(B). In other

words, increase/decrease in ROA(B) will be proportional to increase/decrease in CAR(B).

2. When CAR(B) changes but ROA(B) has to be maintained at the previous level, ROE(B) should be ROA(B) / CAR(B). For example, if there is an increase in CAR(B), as is the case in the post-regulation period, then ROE(B) must fall by the above ratio so that banks are not required to contract assets with higher return (and higher risk). But it is difficult to do so because a fall in return on equity would have adverse reaction in the market.

3. When ROE(B) changes but ROA(B) has to be maintained at the previous level, CAR(B) should be ROA(B) / ROE(B). For example, when ROE(B) is increased but banks do not want to increase ROA(B) then CAR(B) must fall by the above ratio. While banks do not have the option to change CAR(B) in the regulation period, this option was exercisable by banks during the pre-regulation period in order to remain within the bounds of standard ROA(B).

Above analysis has established that there exists a causal relationship between ROA and CAR (B. A general conclusion that can be reached from the above findings is that the regulatory capital-assets ratio has contributed significantly to the high growth of ROA during the post-regulation period.

Increase in Assets Loss

In the last Section, we have shown that during the capital regulation period rate of return on assets, particularly the incremental rate of return, has increased substantially over the pre-regulation period. Apparently, this is in conformity with the established economic principles: when regulation lowers down the lending capacity of banks they tend raise the equilibrium return on financing until the required return on equity is achieved. But this does not explain why it should lead to banks taking riskier positions.

We are aware that higher expected return is associated with higher risk. When rate of return increases the probability of losses also increases (Eugene, Fama and James, 1973). Assume now that before capital regulation, when there was no restriction to assets growth, the equilibrium level of net earnings to satisfy the required ROE(B) could be achieved by selecting an assets portfolio with a certain ROA(B) and risk probability of say, s?. During the regulation period, when assets-growth is limited by CAR, banks would attempt to raise the equilibrium return by rearranging their portfolio with a higher ROA(B) and risk probability of say, s2. Assuming further, that all risks mature ex-post at the estimated s2, assets loss will be higher. Although theoretically banks can still meet the required ROE, the banking system moves to a higher risk level. Observing a rising trend in charge-offs FDIC (2003) has also noted that rising loan losses reflect a gradual shift to higher (credit) risk in US banking. Besides, when banks move to high risk areas there always remains a chance that the ex-ante estimation of s of ROA(B) may turn out to be less or more in the ex-post realization (which we denote as

ROA). In the former case, banks' reserves increases but in the later case the vulnerability of banks increases. If the difference between ex-ante s and ex-post s is very high it is likely that banks are moving towards a crisis. One of the strategies in such a situation is to reduce the ROE but bank managers are often reluctant to do so for fear of a backlash in the board room and in the market as well. This aggravates the crisis. The following equation explains the situation analytically.

Loss/ABL = LOA = RO A(B) – ROA (16)

Where, ABL and ROA (B) are ex-ante variables and ROA is ex-post variable.

Assuming that all variables are positive the following will hold.

ROA(B) > ROA, LOA is positive

ROA(B) <ROA, LOA is negative

ROA(B) = ROA, LOA is zero.

Equation 16 also tells us that larger the positive difference between ROA(B) and ROA the higher the LOA; the smaller it is the lower the LOA. This shows that LOA is negative in the pre-regulation period while it is (considerably) positive during the regulation period. The findings support the view taken by Fahlenbrach and Stultz (2009) that bank CEOs took exposures that they felt were profitable for their shareholders ex ante but these exposures performed very poorly ex post.

Conclusion

Bank capital, like any other business capital, needs to be serviced by a certain ROE, which is determined by the market within a risk-return framework. Mean ROE remains more or less constant over a long period. Normally, the required ROE is satisfied by making investment in assets with rates of return determined within the risk-tolerance limits of banks. When the assets-generation capacity of banks is restricted by the regulatory capital-ratio banks are induced to go beyond their risk-tolerance level to seek assets or businesses that provide higher rates of return. As higher risk is associated with higher returns, the risk of the banking industry is increased.

Recommendations

`It appears that binding capital-assets ratio is based on 'gone concern' approach while banks operate as 'going concerns' with an eye to required profitability. They may go beyond their risk-tolerance level and take a riskier position if the scale of operation is restricted not necessarily by capital-assets ratio but by any other means. When capital-assets ratio is chosen as a regulatory tool it encourages rather than deters the banks from taking high risk positions, more so because banks are obliged to meet the required ROE for the stock holders. It is time that bank regulators reduce the incentive of bank managers to engage in high-return-high-risk banking by freeing them from binding capital-assets ratio. Instead, the regulators should concentrate on developing monitoring tools for risk management so as to ensure that banks stay within the risk tolerance level.

Diamond and Rajan (2000) have rightly observed that diversification and risk management are substitutes for capital.

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