ECCB STAFF RESEARCH PAPER

Risk and Capital Adequacy: A preliminary examination of ECCU Commercial Banks

By

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Abstract

Following the global financial crisis in the first decade of the 21 st century, the Eastern Caribbean Currency Union like small open economies was subjected to its own dose of the economic malaise which affected advanced economies. As a result, several commercial banks within the economic union were threatened and interventions became necessary. Questions as to the risky behaviour engaged in by these commercial banks were raised. Therefore, the article is a preliminary examination between excess capital adequacy ratios and commercial banks risk in the Eastern Caribbean Currency Union. The paper makes use of data from 1996 to 2015 for indigenous banks and incorporates a panel fixed effects approach to determining this behaviour.

JEL classification: G21, G32, E58

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1.0 Introduction

Assessing commercial banking behaviour vis à vis the banks' capital structure and changes in capital held is not a new idea. The literature has shown that bank capital has an essential role to

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play in the creation of liquidity, credit, the enhancement of stability, and determining the banks' clientele (Diamond & Rajan, 2000). Given this and the potential risks to bank capital, the Basel Committee on Banking Regulation and Supervisory Practices in 1988 adopted a risk-based capital standard [2]. The standards effectively made commercial banks' capital requirements "sensitive to the risk held in a bank's portfolio of assets and off balance sheet activities (Jacques & Nigro, 1997)." The 1988 capital standards also specify the risk weights which are applicable to bank assets and provide definitions for what regulators have come to know as tier 1 and tier 2 capital. Further, the Basel I standards consider only credit risk and provide ' *rough'* distinctions for different types of bank assets. These standards have evolved since then to match the evolution of the financial system and the complexities in the banking industry (Tanda, 2015). The implementation of Basel and its various classifications has not been smooth and many territories have not fully adopted all of these regulatory requirements.

The evolution of any financial system brings with it increased potential sources of systemic risk. These risks compounded with exogenous shocks can in the right combination present challenges. Most recently, the ECCU has faced several challenges mainly on account of exogenous shocks to the broad financial system. The first was the 9/11 terror attacks which although affecting the region in a limited way, rewrote the approach to foreign policy and access to financing in some instances. Secondly, the sub-region continues to face on regular basis hurricanes and other natural disasters. Thirdly and perhaps most preeminent of the shocks was the global financial crisis, which was precipitated by the run on Northern Rock. The global financial crisis was followed by monetary policy in industrialised economies which was at the time highly experimental (quantitative easing).

The macro-economy of the sub-region was affected by these exogenous shocks, and consequently, commercial banks with exposures closely aligned to foreign markets (especially through tourism) saw an unwinding of credit over the past few years. The result has been a downturn in the ECCU financial cycle as credit extended was significantly reduced. A financial accelerator effect ensued as the downturn in credit coincided with contractions in GDP

2 The ECCU currently uses the Basel I as established in 1988.

(Bernanke, et al., 1994) [3]. This decline in credit coincided with increased deposits, reduction in risk exposures through write-downs and limited loan extensions.

As commercial banks in the ECCU continued to face pressure from both exogenous and endogenous sources, the ECCB responded through interventions in several commercial banks. These interventions were meant to stabilise an already fragile financial system. In addition to these interventions new policies such as the Banking Act 2015 were developed to mitigate risks within the banking sector. The adequacy of capital for banks was a key issue, and as such, the ECCB sought to increase the levels of capital required. This recapitalisation process plans to: (1) make existing banks stronger (through increased capital) (2) improve regulatory oversight by the ECCB and (3) enhance corporate governance standards within the economic union. It is envisaged that this process would significantly contribute towards a more complete economic union.

A bank's capital structure affects several of its functions including: (a) its liquidity creation function (b) its credit creation functions and (c) its overall stability as a lending institution. The global financial crisis has shown that recapitalisation can impact both the real sector and the banking sector. Banks in response to increased regulatory oversight, especially following financial crises, are likely to adjust their risk taking behaviour in the face of increased capital requirements.

Within the ECCU some commercial banks' capital as a percentage of risk weighted assets fell below the prudential minimum of eight per cent while most have maintained levels considerably above that minimum (excess capital). In addition to changes in the capital requirements, adjustments were also made to risk-weights of assets in investment portfolios. Thus, some instruments due to their susceptibility to shocks and/or default have been reweighted to reflect these enhanced risks. During this time, the financial system recorded declines in excess capital held by commercial banks along with a corresponding decline in net margins. What then can we gain from this? The obfuscated landscape of the financial system provides an opportunity for information to be gleaned. One of the core questions for ECCU policy makers is the likely behaviour to be adopted by commercial banks in an environment where monetary policy is limited, populations are smaller, and government plays a significant role in the affairs of the

3 The credit cycle was defined by the Hodrick-Prescott filter application to the ratio of credit to GDP in the ECCU. A lambda of 400,000 was applied to this data set consistent with the methodology of (Anundsen, et al., 2014). Quarterly GDP was estimated using the method established by (Chow & An-loh, 1971) in EVIEWS.

economy. From a macro-prudential perspective policy makers are able to distinguish the forest from the trees, instead of missing both the forest and trees as was evident in the global financial crisis of 2007/2008.

This paper contributes to the literature by examining the relationship between risk and excess capital within commercial banks. It applies these measures to commercial banks within the Eastern Caribbean Currency Union and shows that there is a positive and significant relationship between these two variables. Moreover, by building the model slowly, the piece reveals additional variables which may influence risk in the absence of a model containing excess capital.

Further, the author aims to illuminate the regulatory landscape by providing the policy makers at the ECCB with a preliminary examination of the risky behaviour exhibited by commercial banks via changes in their excess capital. The research is intended to inform the decisions which are taken regarding supervision of commercial banks in the ECCU and expand the literature in the area. The rest of this paper is organised as follows: Section 2.0 will provide readers with an overview of the literature; Section 3.0 will evaluate the data and methodology used in the analysis; Section 4.0 contains the results and analysis of the methodology and data; and Section 5.0 concludes the piece.

2.0 Literature Review

Capital Adequacy

The minimum capital requirements as implemented under the Basel Capital Accord (currently at Basel III) have evolved since 1988. The capital requirements were implemented as a uniformed approach to capital adequacy calculations thereby strengthening financial stability (Alkadamani, 2015). Myers (1984) and Diamond and Rajan (2000) expounded a great deal on bank capital theory, while Shrieves and Dahl (1992) provided a novel approach to evaluating the relationship between capital and risk. The theory of capital structure suggests that as a precaution to raising equity capital on short notice banks may opt to retain earnings (Myers, 1984). Additionally, Diamond and Rajan (2000) and Gambacorta and Mistrulli (2004) found that a bank's capital structure can affect liquidity, credit creation and stability, and determine the bank's clientele. For

example, lending is influenced by a bank's capital accumulation through the business cycle (Gambacorta & Mistrulli, 2004). Hence, adequately capitalized banks are in a better position to absorb output shocks since fewer adjustments are necessary during economic downturns. Additionally, the authors conclude that there is a negative relationship between excess capital and GDP. Thus, well capitalized banks are less responsive to output shocks since their profits are less sensitive to the business cycle through changes in their portfolio (ex-ante) (Kwan and Eisenbeis, 1997) as cited by (Gambacorta & Mistrulli, 2004). Conversely, well capitalized banks may opt to reduce loan growth following an increase in capital (Bridges, et al., 2014).

Additional inspection of the literature revealed that banks hold capital for a variety of reasons such as: tax obligations, the probability of financial distress, the acquisition of debt, creditors, shareholders, and the nature of information collected on depositors during transactions (Berge, et al., 1995). This capital is generally balanced against assets and is designed to provide a "reasonable margin of protection against losses (Cooke, 1949)." In the early 1990s, US banks began to hold capital in excess of regulatory minimums (Berger, et al., 2008). This high retention of capital may have been associated with the retention of earnings, strategies towards acquisition and economic capital (Myers, 1984) as cited by (Berger, et al., 2008).

Berger et. al, (2008) argues that banks may aim for higher capital ratios during recessions to mitigate insolvency risk. This can lead to a restriction in the extension of credit and potentially exacerbate the recession (financial accelerator effect). Conversely, a bank may aim for lower capital ratios during recessions to maintain lending relationships, but increasing the probability of default. Alternatively, larger institutions may actively target high capital ratios as an opportunistic approach to market conditions. Berger et. al, (2008) concludes that banks actively manage their capital ratios using share repurchases.

Low capital ratios or undercapitalisation can be indicative of institutions which are engaging in unsound practices and may warrant further investigation. In the case of undercapitalisation within a banking system, overall capital is augmented through government intervention. There has been some argument, however, that due to the high costs associated with holding capital, managers may hold less bank capital than is required by regulation (Cooke, 1949) (Rime, 2001). Equally, higher capital ratios have additional implications for policy. Banks tend to increase capital ratios during recessions to mitigate insolvency risk (Berger, et al., 2008). This shift in capital ratios leads to a restriction in credit which can then exacerbate the recession.

Banks with lower capital adequacy ratios are therefore expected to be poor stewards of borrowed funds and so will attract fewer deposits than well capitalised institutions (Ghosh & Das, 2005). Thus, when a bank selects its preferred level of capital, the more its capital increases, the greater its attractiveness vis à vis deposits relative to competing banks (Diamond & Rajan, 2000) (Ghosh & Das, 2005).

The changes within the capital structure of commercial banks are also important. Ghosh, et al. (2004) conducted empirical tests on state-owned commercial banks in India and examined bank specific variables such as the risk adjusted capital asset ratio (CAR). Bank capital ratios in this regard may be adjusted through one of three mechanisms, namely "an increase in capital, a reduction in the risky asset profile and/or a decline in total assets (Ghosh, et al., 2004)." The aforementioned variables are themselves affected by a range of factors. Further, these adjustments to the structure of a banks' capital may be applied to adequately capitalised and undercapitalised commercial banks. And, in the absence of regulation or a regulatory body, risk taking becomes self-constrained (managerial risk-aversion) and capital is balanced against assets (Ghosh, et al., 2004).

Adjustments to capital may also affect asset portfolios and lead to reduced lending in an effort to achieve higher levels of capital, given the implementation of new capital requirements (Bank for International Settlements , 1999). Moreover, changes to capital requirements can affect the profitability of financial institutions (Bank for International Settlements , 1999) since increasing the levels of capital lead to higher funding costs.

Finally, the relationship between bank capital and risk has also been evaluated from a static panel approach. A study by Moussa (2015) evaluating a panel of 18 banks in Tunisia found that there was a negative relationship between capital and bank risk. This result is indicative of risk aversion in commercial banks and incentives to raise capital in Tunisia. Positive relationships were highlighted between risk and total loans and advances while negative relationships were recorded between risk and return on assets and capital.

Measuring Risk

Commercial banks in the ECCU have been operated and supervised under the Basel I framework of 1988. This structure's central focus has been on credit risk with associated country transfer risks. The schema also allows for supervisory authorities to include other types of risk. Within

the context of empirical research the definition of risk has been obscure and even more difficult to determine amongst banks whose stocks may not be publicly or even frequently traded (Shrieves & Dahl, 1992). Some studies such as (Moussa, 2015) have sought to create risk profiles for commercial banks. Moussa (2015) determined risk to be a combination of a standard deviation of return on assets, expectation of return on assets and a ratio of equity to total assets (standardized z score). Conversely, (Shrieves & Dahl, 1992) developed a composite index of weighted financial instruments which was then divided by total assets (risk weighted assets).

Rime (2001) in a similar vein as (Shrieves & Dahl, 1992) and (Jacques & Nigro, 1997) used the ratio of risk weighted assets to total assets to capture the timeliness and risk taking of commercial banks. Although 'risk-weighted assets' is a variable which can be easily adjusted by the commercial bank it may not be the correct measure (Heid, et al., 2004). Avery and Berger (as cited in Heid, et al., 2004) noted that the measure of risk exhibited by risk weighted assets under the Basel I regime may be weakly correlated with the economic risk of the asset. Moreover, although this approach is easily garnered from the data, it creates issues associated with endogeneity thereby rendering a panel regression approach potentially spurious. Further, the issue of riskiness encompasses not only on-balance sheet items but off-balance sheet exposure since banks may adjust their risk profile as changes occur in these areas (Ghosh, et al., 2004). Measures of this 'balance sheet' approach to risk outlined by Ghosh, et al. (2004) were the ratio of loans to total assets, the ratio of investments to total assets, and a ratio of off-balance sheet exposure to total assets.

However, risk may not be limited to ratios associated with investments or loans. Research by (Rahman, et al., 2015) indicates that bank credit risk and overall risk is positively related to bank size and profitability while liquidity is found to be statistically significant for credit risk in commercial banks but not overall risk. Bischel and Blum (2004) using the standardized z score approach and building on Black-Scholes (1973) and Merton (1974) modelled risk by using the value of limited liabilities compounded annually at the risk free rate and factored into the Black-Scholes option pricing formula along with the market value of equity (call option approach). The authors' results suggest a positive correlation between levels of capital and risk in commercial banks.

Though the literature points to varied approaches to measuring risk, the factors affecting the variable remain relatively certain. Kochubey and Kowlczyk (2014) evaluate the relationship between liquidity, capital and risk. Defining liquidity as the ratio of liquid assets to total assets, Kochubey and Kowlczyk (2014) reveal that adjustments to liquidity are likely to have a negative

impact on risk and capital alterations. Ergo, having greater amounts of liquid assets on a bank's balance sheet may lead to *safe* portfolios.

From the literature reviewed, we see the approaches which can be used for evaluating ECCU banks. Although approaches such as the call option approach remain appealing, their applicability remains limited. Thus, this piece will make use of the measure set by Moussa (2015) and Bischel and Blum (2004) which uses a standardized Z score or the number of standard deviations that a bank is away from its default point [4]. By using this technique, the endogeneity associated with other variables such as risk-weighted assets is reduced significantly. In addition to this, risk will comprise of on-balance sheet line items only.

3.0 Data and Methodology

3.1 The Data

In this section the sources of data for variables included within the regression model along with a preliminary examination of the data will be undertaken. The empirical analysis contained in this paper is based on a panel of sixteen (16) commercial banks in the ECCU (14 indigenous banks and 2 foreign branch banks). This quarterly data was compiled over the period March 1996 to June 2015. Within the ECCU, all 14 indigenous banks are required to maintain adequate levels of capital. Foreign branch banks on the other hand typically maintain a pooled capital arrangement. These types of banks included in the test are an exception and so, maintain adequate levels of capital.

Using a scatter-plot diagram the author shows the relationship between the size of commercial banks in the ECCU and the nature of their business (figure 1). Of the 16 banks included within the paper and as at the end of the sample period (June 2015) only two have a business mix that is concentrated towards investments while the other 14 banks maintain a portfolio structured towards loans and advances. These two institutions themselves vary in size; the larger of these two institutions is also the biggest commercial bank within the sample set with an estimated size of $3.6b XCD and 82.7 per cent of its portfolio concentrated in investments while the smaller has an asset base of $268.1m XCD and 75.0 per cent of its portfolio concentrated away from loans and advances. The remaining 14 banks within the sample set have developed a business mix concentrated in loans and advances. This mix ranges from 46.7 per cent to an upper limit of 83.6 per cent, while the smallest of these 14 banks has an asset base of $140.7m XCD and the largest maintains an asset base of approximately, $2.1b XCD.

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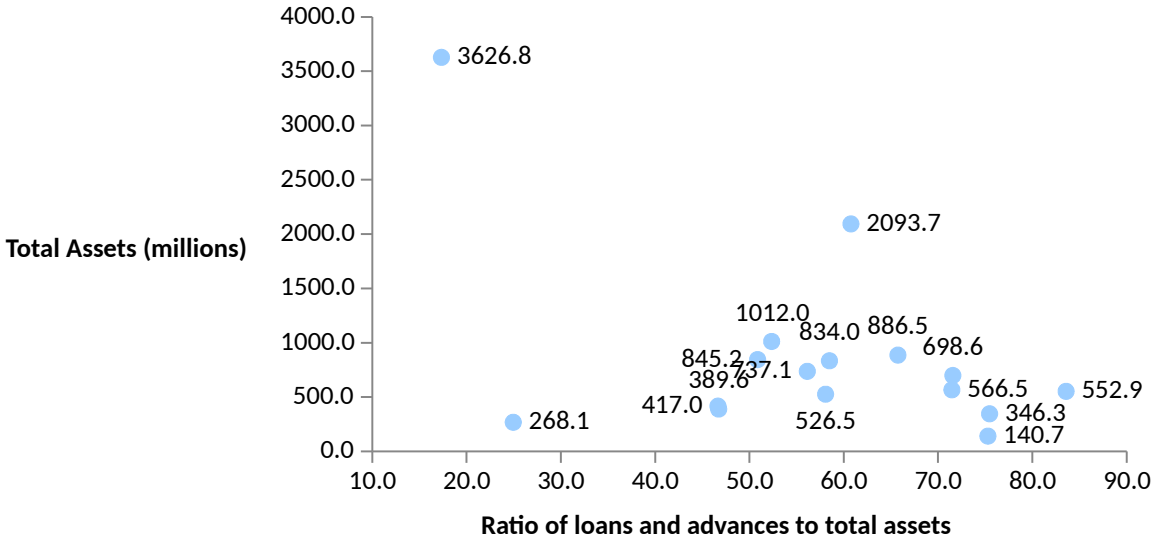
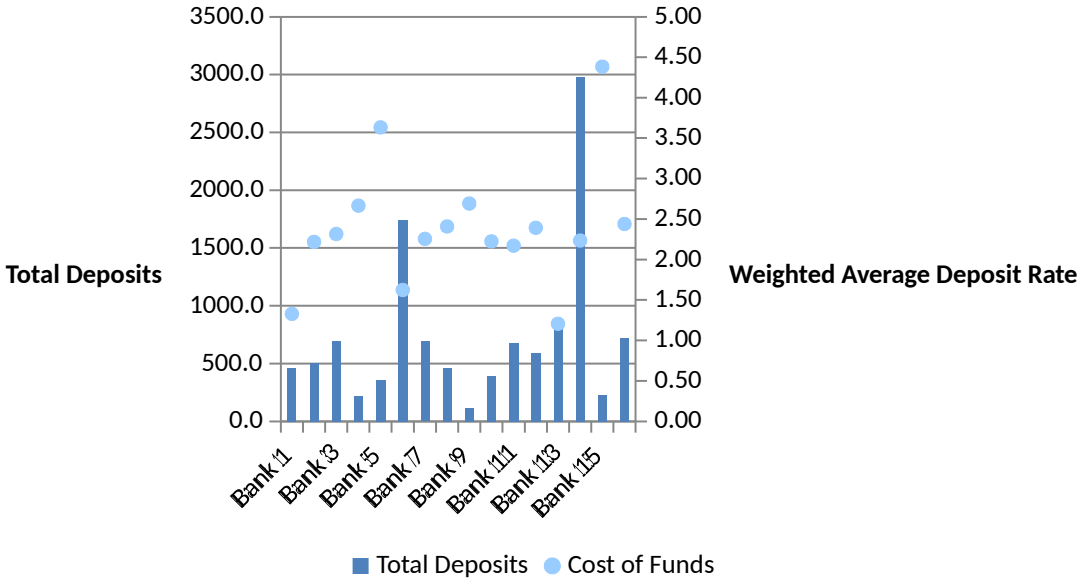
4 The $|z|$ is also called the 'distance to default. The value is related to the default probability of a bank in the ECCU. The higher the probability of default, the higher the value of 'z'

Figure1: Commercial Banking in the ECCU



The cost of funds – defined by the weighted average deposit rate – in the ECCU was estimated at 2.3 per cent at 30 June 2015. The minimum savings deposit rate in the ECCU was reduced to 2.0 per cent in 2015. An examination of the cost funds amongst commercial banks in this sample shows that even amongst banks with higher levels of deposits (close to or above $1.0b XCD), the cost of funds are approximately 2.4 per cent (figure 2). There are outliers to this exercise of course. Bank 13 with deposits over $800.0m XCD has the lowest estimated cost of funds within the ECCU, 1.2 per cent, while bank 15 which has one of the lowest deposit holdings at $225.0m has a high weighted average deposit rate of 4.4 per cent.

Figure 2: Cost of Funds amongst ECCU Commercial Banks



Another key to our research is the measure of risk for each commercial bank in the ECCU. This risky behaviour is thought to exhibit itself through the ratio of risk weighted assets to total assets. Thus the change in this ratio is highlighted as an increase or corresponding decrease in risk. Despite the importance of this variable, its inclusion into the system is expected to increase the correlation between variables, given its relationship to the Capital Adequacy Ratio. Thus, the author derives a standardized Z score for measuring risk defined as;

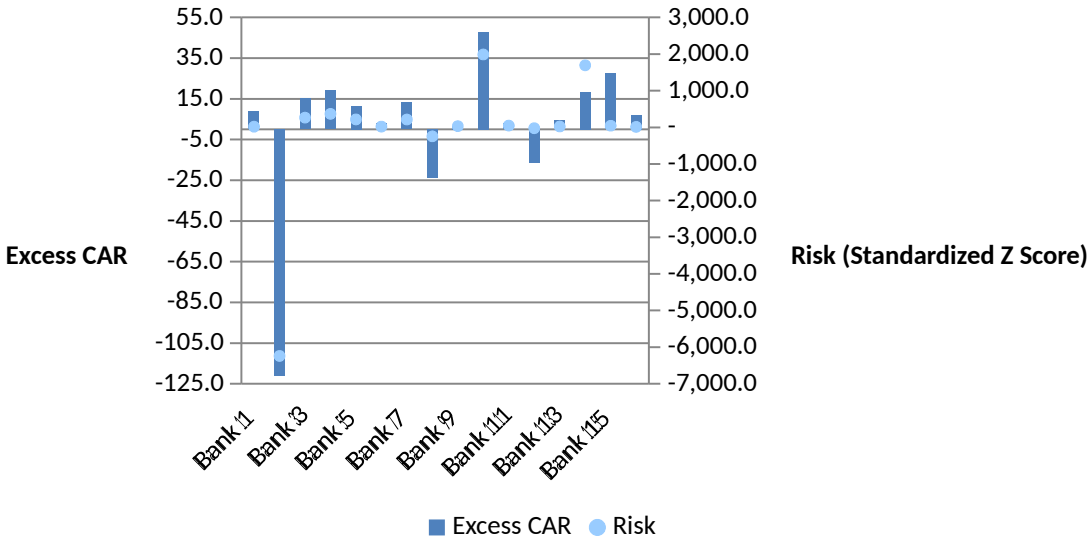
Eq1.

$$Z = \frac{(XSCAR + \mu ROA)}{(\sigma ROA)}$$

Where Z is equivalent to *Risk*, ROA is defined as the return on assets and μ and σ are the mean and standard deviation respectively.

A simple plot of the standardized Z score (risk) and excess CAR provides us with some information on bank behaviour from the sample set. We see that banks with higher levels of excess CAR are likely to assume a higher Z score. Further, banks which have accumulated excess CAR above a threshold of 15.0 per cent receive a higher risk score on average than banks which fall below that threshold.

Figure 3: Excess CAR and Risk



3.2 The Model

The model being used in this study estimates the relationship between risk and excess CAR amongst commercial banks. The model is defined initially in its panel regression form and makes use of effects in its estimation.[5]

Eq 2. $$Y_{it} = X\beta_{it}^{1} + C_i + \varepsilon_{it}$$

To examine the relationship between risk and excess CAR we build a model based on the specifications set forth by (Shrieves & Dahl, 1992) and (Rime, 2001), and (Moussa, 2015). These models provide an indication as to the relationship between the variables of interest to the author.

We assume a basic linear relationship such that:

Eq 3.

5 Following a Hausman specification test, the model will be estimated using either fixed or random effects.

$$Risk = f\left(stewardship, profitability, liquidity, business\,mix, excess\,CAR, ¿\,GDP\right)$$

Where the variable *Risk* is the standardized Z score. The author assumes that in estimating risk, several factors will be considered. The first is a managerial element, defined by the variable *stewardship* and interpreted as the ratio of operating expenses to gross income. The second element is bank profitability as given by the return on assets (the ratio of net income to total assets). Thirdly, the commercial bank may engage in riskier activity given its liquidity levels, defined as the ratio of cash to total assets. Fourth, a distinction between banks whose core focus is the provision of loans and those whose core focus may be investments and other undertakings is made. This distinction is achieved through the use of the ratio of total loans and advances to total assets and is illustrated above (figure 1). The fifth factor considered in this equation is the level of excess CAR.

The use of excess CAR is a key tenet of this article as it assumes that commercial banks are likely to respond to not only the prudential minimum held but adjust risk based on the excess capital held. This *excess* is defined as the actual CAR less the CAR prudential minimum (8.0 per cent). The cost of funds held (deposits) are also considered in this estimation. Following on from this, the author considers two variables closely related to size, which are total assets and total deposits. Finally, macroeconomic considerations are added. These are reflected in the quarterly interpolation of real GDP. Table 2 below provides additional information on the expected signs associated with each of these variables.

Table 1: Summary Statistics

	Mean	Median	Std. Dev.	Observations
Risk	212.28	81.12	979.69	1149
Operating Expenses to Gross Income	45.94	39.25	122.88	1150
Cash to Total Assets	1.23	1.10	0.66	1150
Total Loans and Advances to Total Assets	58.24	61.15	14.79	1150
Excess CAR	10.99	8.99	16.76	1150
Deposits to Total Assets	79.35	80.64	9.67	1150
Total Assets	549,175.00	406,735.00	514,385.90	1150
Real GDP	425.18	444.36	250.61	1248

Table 2: Regression Variables and Definitions

Determinants of Risk in ECCU Commercial Banks		
Variable	**Expected Sign**	**Interpretation**
Bank specific variables		
Stewardship (Operating Expenses over Gross income)	+	This variable reflects management's ability to minimize expenses relative to gross income.
Profitability (ROA)	+	The variable return on assets is used as a measure of overall bank profitability.
Liquidity	+	Liquidity is defined as the ratio of cash to total assets of each commercial bank.
Business Mix	+/-	This variable is defined as the ratio of loans and advances to total assets. The bank may engage in either mostly lending services or investment services.
Excess CAR	+/-	Prudential minimum[6] (CAR) less Actual CAR.
Size		
Total Assets	+/-	The change in total assets of each commercial bank.
Deposits	+	Total deposits of each commercial bank as a share of total assets
Macroeconomic characteristics		
Real GDP[7] (the percentage change in Quarterly Real GDP)	+	Quarterly real GDP was interpolated using the method established by (Chow & Lin, 1971)

6 The prudential minimum as determined by the Eastern Caribbean Central Bank under an enhanced Basel I regime is currently 8.0 per cent.

7 Quarterly GDP was estimated using the method established by (Chow & Lin, 1971) in EVIEWS. The data was interpolated using seasonal indicators including stay-over arrivals, US quarterly GDP and manufacturing as references for quarterly macroeconomic performance in ECCU territories.

Our measurement of risk (standardized Z score) provides the model with some degree of endogeneity. Using this measure places excess capital on both the right hand and left hand sides of the equation. The expectation is that the Z-score should be highly correlated and significantly related to the right hand side variable excess CAR. A review of the literature above suggests that this problem persisted, given the use of risk-weighted assets to total assets as a measure of risk along with the use of total assets and total qualifying capital (includes total assets).

The approach to estimations of the panel data makes use of a fixed effects model. Within a fixed effects model if individual effects are considered fixed or different across individuals, then there must be some strict multicollinearity between the effects and other time invariant variables (Hsiao, 2003). The fixed effects model is appropriate when focusing on a specific set of organizations and revealing the behaviour among these institutions (Baltagi, 2005). Additionally, the fixed effects results are estimated over intervals at the sacrifice of degrees of freedom.

Alternatively, a random effects model may be completed if there are too many parameters in the fixed effects model which can lead to a loss of degrees of freedom. The random effects model is most appropriate when drawing *N* individuals randomly from a large population. This approach is intended to verify the consistency and stability of the coefficients. Following on from the arguments the author refers to Hausman (1978) to determine the effects to be incorporated into the study (panel fixed or panel random effects model) [8]. The selection of a panel fixed effects model matches closely the approach taken by Moussa (2015).

4.0 Results and Analysis

The paper employs a panel fixed effect model across 16 commercial banks in the ECCU. The results of the panel fixed effects regression analysis are found in the table below (table 2). To

[8] Some authors have recommended a theoretical justification for the use of a fixed or random effects model. Though a compelling alternative, Hausman (1978) ought to be used in this determination.

determine the most appropriate responses to the variable risk, the model is developed slowly using two variables at a time. Evaluating the variables used in the exercise we see that the variable *business mix* maintains a negative relationship in the first four models and a positive relationship in model five. Additionally, in model, the variable is significant at the 10 per cent level of significance. The variables *liquidity* and *deposits* were then added and evaluated. The variable *liquidity* maintains a negative relationship throughout the tests but is only significant in the fourth variation of the model. Conversely, the variables *deposits* maintain a negative and significant relationship in models two, three and four – losing its significance in the fifth model.

The variables *total assets* and *real GDP* were included and the results indicate either a negative and no significant relationship in the case of both variables. *Stewardship, profitability and excess CAR* were estimated in the final round of testing. The results of the variable *stewardship* indicate a negative and insignificant relationship with the author's measure of *risk*, while the variable profitability shifts between a positive relationship and negative relationship in the fourth and fifth phases of testing. *Excess CAR* which was included last was revealed to have a positive and significant relationship with the dependent variable *risk,* while all other variables in the model became insignificant and/or changed signs.

Over the five phases of testing conducted, the overall fit of the model remains low – ranging from 0.11 to 0.23. This fit is expected, given the nature of the data and the variables in use. Further, the F-statistic produces mixed results, beginning initially at 9.91, dipping to 11.32 and increasing to 15.29 in the final phase. The results of the estimates suggest that an alternative measure for *risk* may be used to determine the relationship with *excess CAR*. Further, the variables used in the model for the most part exhibit some relationship with the estimate of *risk* losing that relationship as more variables are added but maintaining their sign. This suggests that though their significance may have been low in the outer phases of development, there is an opportunity for further evaluation of these relationships without the presence of the variable *excess CAR*.

Table 3: Models and Results

Independent Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
Constant	472.130	[2.629]***	3052.226	[9.129]***	3362.457	[8.363]	3226.495	[7.451]***	340.895	[0.655]
Business Mix	-4.316	[-1.441]	-3.661	[-1.242]	-5.074	[-1.582]	-5.788	[-1.774]*	1.327	[0.410]
Liquidity			-89.035	[-1.371]	-97.771	[-1.696]*	-82.549	[-1.406]	-76.177	[-1.346]
Deposits			-31.551	[-8.792]***	-33.206	[-8.548]***	-32.846	[-8.212]***	-4.015	[-0.812]
Total Assets					0.000	[-0.828]	-5.330	[-0.383]	0.000	[1.299]
Real GDP					-0.052	[-0.145]	-0.080	[-0.230]	-0.326	[-0.924]
Stewardship							-0.288	[-1.236]	-0.245	[-1.093]
Profitability							128.475	[1.891]*	-15.649	[0.232]
Excess CAR									25.780	[9.304]***
Summary Statistics										
R-Squared	0.124		0.184		0.185		0.190		0.248	
Adjusted R-Square	0.111		0.170		0.170		0.173		0.232	
Durbin Watson	1.647		1.772		1.779		1.793		1.937	
F-statistic	9.911		13.232		12.064		11.323		15.292	

*** Indicates significance at a level of 0.01
** Indicates significance at a level of 0.05
* Indicates significance at a level of 0.10

These results suggest that although significance may have been lost in the final stage of the model, that variables such as *deposits, business mix* and *profitability* play an important role in determining risk within ECCU commercial banks. Interestingly, the macroeconomic environment was not a significant variable and so it is likely that managers – within the context of this variable system – adjust their portfolios based on credit extended and the level of profits and deposits held by their bank.

5.0 Conclusion

Within the context of commercial banking literature and crafting an understanding of commercial banking behaviour, capital and risk were determined to have significant relationships. Other variables were often added to these studies to assist in defining this relationship and as such the results were often mixed. In the same manner, this piece attempts to craft an understanding of commercial banking behaviour in the ECCU. More specifically, the author examines the relationship between risk and excess capital in addition to several other variables deemed pertinent in determining risk. In this instance, *risk* was determined using a *standardized Z score* . Variables were added to account for changes in liquidity, the economic environment, and management of commercial banks, the banks' size and the level of deposits it held. The paper applied a fixed effects model in order to make this determination.

The results do match somewhat the results seen in several pieces including Moussa (2015) and Ghosh, et al. (2004). The positive relationship between capital and risk in this instance cannot be ignored. To closely evaluate the changes in risk, supervisors may need to evaluate more closely the changes to portfolios. The results of this work suggest that there exists a significant relationship between excess capital held by commercial banks and risk (as measured by the standardized Z score), however, all other variables although exhibiting positive and negative relationships were less significant (above the 10.0 per cent level). The model provides the author with several questions. Are there variables which may exist (on or off the balance sheet) which have a more significant relationship than the ones contained within this study? Are the commercial banks sufficiently heterogeneous in their banking activities to produced differentiated behaviour which can be easily analysed?

In addition to the above, the research paper provides some guidance to policy. In early 2015, the ECCB produced the Revised Banking Act which was meant to address several areas such as corporate governance and bank capital requirements. More specifically, the Act required banks to increase their paid-up capital from $5.0m to $20.0m over a designated period of time. The

result of this would be an increase in the CARs of commercial banks and consequently, excess CARs for those institutions over and above the prudential minimum of 8.0 per cent. From the results above, we can infer that an increase in CAR is likely to influence risk associated with commercial banks in the ECCU. This change in risk may manifest itself in the structure of risk weighted portfolios held by commercial banks or to a lesser extent loans and advances.

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