Does Revenue and Loan Portfolio Diversification Improve Bank Performance & Stability? Evidence from Jamaican Commercial Banks

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This study presents evidence on the interrelationships between revenue and loan diversification, performance and stability by applying a SUR model to Jamaican commercial bank panel data over the period March 2005 to March 2015. Consistent with traditional portfolio theory, the results show that loan portfolio diversification leads to improvements in bank stability, as measured by the Z-score index, as well increases profitability. Notwithstanding these results, the findings further indicate that loan portfolio diversification contributes to deterioration in loan quality which was evidenced for both large and small banks. However, while large banks increase capital buffers to accommodate additional risks connected to diversification, this is not the case for small banks. As it relates to interest revenue and non-interest revenue diversification, both lead to improvement in risk-adjusted profitability as well as reduce the likelihood of insolvency of banks. As such, policies which provide incentives for banks to diversify in these areas may enhance profitability, without jeopardizing the stability of the financial sector. Nonetheless, of note is that increased revenue diversification was found to contribute to deterioration in the value-at-risk measures of commercial banks.

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1.0 Introduction

There is on-going debate in the literature concerning whether diversification produces superior performance and enhances bank stability.[2] Researchers such as Merciera and Schaeck (2007) and Elsas *et al.* (2009) have found that diversification improves bank stability while others such as DeYoung and Roland (2001) and Stiroh (2002) have found contrasting evidence. The recent global financial crisis also re-emphasized the threat that aggressive diversification strategies and increased risk-taking without sufficient capital cushions, can pose to individual institutions and the financial sector in its entirety. In addition, the implications of diversification for bank stability are of great importance given the well-established link between the financial sector and the real economy. King and Levine (1993) as well as other researchers have asserted that long-run economic growth and development rests significantly on the ability of banks to remain stable and more so their ability to allocate funds to the most productive sectors. The soundness of the banking system in emerging market economies is also essential to promoting capital flows as well as accelerating economic convergence.

Concerning Jamaica, over the sample period, the commercial banks in operation have diversified their loan portfolios across various sectors, albeit to varying degrees, as well as diversified revenue across various interest and non-interest earning activities. Regarding non-interest revenue, work by Bailey-Tapper (2010) showed that non-interest income not only leads to increased profitability but also increased variability in performance for Jamaican commercial banks. Craigwell (2006), using data on commercial banks in Barbados, found that as it relates to loan portfolio diversification, this increases loan returns but that extending loans in some sectors increases the riskiness of earnings while others reduce risk in bank earnings. This study adds to the existing literature on diversification and bank stability for the Caribbean by examining not only loan portfolio diversification but also revenue diversification, in particular within interest and non-interest income earnings as well as across both revenue streams.

More specifically, the study involves an assessment of two key relationships. Firstly, there is an investigation of whether large commercial banks in Jamaica are more diversified than small

[2] Diversification occurs when firms extend existing product or service lines from their current traditional ones by embracing new products or services whether related or unrelated (Stern and Henderson, 2002).

banks. The Herfindahl-Hirschman Index (HHI) is utilized to measure various types of revenue diversification as well as loan portfolio diversification while total assets is employed as a measure of bank size. The second relationship evaluated explores the link between revenue diversification, performance and stability in the commercial bank sector. The measures of performance employed in the study are the risk-adjusted ROE and ROA, while stability measures utilized include the ratio of non-performing loans to total loans, value at risk (VaR) and default likelihood (Z-score), still using the HHI to capture the different types of revenue diversification. The two relationships outlined are evaluated using quarterly data for the period 2005 – 2015, spanning the global financial crisis period and also the subsequent two government debt exchange programmes conducted in Jamaica.

The remainder of the paper is organized as follows: section 2 reviews existing literature on diversification. Section 3 provides an overview of the data and methodology employed, while section 4 presents the findings of the models employed. The policy implications of the results and the conclusion are outlined in section 5.

2.0 Literature Review

The issue of commercial banks' loan portfolio and revenue diversification has been widely addressed in the literature. However there exists a lack of consensus on the potential benefits of both types of diversification.

As it relates to the relationship between diversification and size, many studies have shown that larger banks are more diversified than their smaller counterparts. Tarazi and Crouzille (2011), in a study of 39 universal and commercial banks in the Phillipines, showed that larger banks are "generally more diversified" and therefore benefit little from further diversification since gains tend to be less as banks get closer to an ideal size. Afzal and Mirza (2012), in a study of commercial banks in Pakistan also reported that the HHI of loans for small banks was almost double that of larger banks indicating that larger banks are indeed better diversified than smaller banks. The findings also show that while smaller banks were less diversified, these institutions held higher capital cushions (as measured by capital adequacy ratios), presumably to mitigate this concentration risk.

Research on the interrelationships between loan portfolio diversification, revenue diversification and bank stability and performance have generally shown mixed results. As it relates to loan diversification, traditional portfolio theory provides some justification, implying that banks should be as diversified as possible since concentrating loans in a particular sector exposes banks to increased risk. The reason noted is that firms operating in the same industry are more likely to do poorly at the same time as opposed to than firms facing varying circumstance. For Barbados, Craigwell et al. (2006) focused on the relationship between loan portfolio diversification and risk for seven commercial banks over the period 1979 to 2005. Using the HHI to measure diversification and bad debt reserve as a measure of risk and applying cointegration analysis, they found that diversification indeed increases loan returns but that diversification appears to be sector-specific as extending activities in some sectors increase risk while others reduce risk in banks' earnings.

However, Acharya *et al.* (2006) having investigated the relationship between loan portfolio diversification and bank value of 105 Italian banks over the period 1993-1999, showed that increased bank safety or improved performance is not guaranteed by diversification. The HHI is utilized to measure loan diversification while return on assets (ROA) and stock returns are used to measure bank value. It was concluded that diversifying reduces return and increases portfolio risk for banks that are already high-risk while providing only minimal benefit to low-risk banks. The reasons noted are that banks may not have sufficient "monitoring expertise" in new areas they have ventured into or other banks may already be offering loans to these sectors and as such banks just entering are faced with adverse selection.

For Jamaica, Langrin and Roach (2008), in a panel study of the impact of concentration on bank returns, showed that greater returns or lower risk is not guaranteed by loan portfolio diversification. The study found further that loan concentration may in fact be more consistent with achieving minimal systemic risk. Tabak *et al.* (2011), a panel study of the relationship between Brazilian banks' loan portfolio concentration and risk, concurs with this view, stating that loan concentration impacts banks positively by increasing profitability while reducing default risk, thus focusing on a few sectors is more beneficial than diversifying. Nonetheless, Berger et al (2010) using data for Russian banks over the period 1999 to 2006, found that increased loan concentration or reduced diversification is associated with increased profits and

reduced risks but only up to a certain threshold. This finding has important strategic and policy implications for regulators in Russia.

Some studies have investigated revenue diversification between and within interest and non-interest earning activities. Merciera and Schaeck (2007), using data for 755 small banks from 15 European Union member countries, explored diversification into non-interest activities by utilizing the HHI to capture diversification, ROA and ROE as performance measures and the Z-score to measure insolvency risk. The findings showed that diversified revenue streams positively affect average profitability and revenue volatility. In addition, the findings show an inverse relationship between moving into non-interest activities and insolvency risk. Elsas et al. (2009) examined large banks with minimal restrictions on diversification, operating in fully functional financial systems in nine developed countries. The authors found that revenue diversification increases bank profitability which leads to increased market valuations and thereby improves bank value indirectly.

As it pertains to developing economies, Sanya and Wolfe (2011) conducted an examination of 226 listed banks across 11 countries and found that there are benefits to be accrued from diversification both across and within interest and non-interest income activities. The authors also noted that banks in developed countries generally do not benefit from diversification because these banks, which are generally large (as measured by total assets) tend to "overdiversify", that is, diversify above risk efficient levels in order to gain profits in the short term. Using a System Generalized Method of Moments (System GMM), the authors also found that diversifying reduces insolvency risk while increasing bank performance and stability.

Gamra and Plihon (2011) on the other hand, examined 714 banks from 14 East Asian and Latin-American countries. Based on the findings, there are gains to banks from venturing into non-interest activities. The authors also noted that these gains are more than offset by the cost of additional exposure to this type of income activity, specifically as it relates to the degree of volatility of income earned form trading activities. They also concluded that diversification is only beneficial at moderate risk levels and to larger, well-capitalized and more efficient banks.

3.0 Empirical Model

3.1 Methodology

The relationship between revenue diversification, loan portfolio diversification and bank performance and stability was evaluated using a system of five equations, while an additional equation was estimated to determine the link between revenue diversification and bank size. The frameworks for evaluating both relationships are further discussed in Sections 3.1.2 & 3.1.3, respectively. Four measures of diversification were included in the study, with each equation evaluated using each measure. All revenue diversification measures were computed using the HHI and these measures have been outlined in Section 3.1.

3.1.1 Diversification Measures

Equation 1 shows a measure of diversification across interest and non-interest revenue and is computed as follows:

$$HHI_{REV} = \left(\frac{NON}{Operating\ Income}\right)^2 + \left(\frac{NET-LOAN}{Operating\ Income}\right)^2 + \left(\frac{LOAN}{Operating\ Income}\right)^2 \qquad \textbf{(1)}$$

where NON represents non-interest income, LOAN represents interest from loans, NET – LOAN captures all interest earnings excluding loan interest and Operating Income comprises the sum of interest and non-interest income. The HHI value will fall between 0 and 1 and an increase in the index represents greater concentration or reduced diversification for the banks. Over the sample period, the index has gradually trended upwards, indicative of increased concentration (*see **Figure 3 in Appendix**)*. In addition, interest income, non-interest income and other interest income as a share of operating income averaged 46.0 per cent, 29.0 per cent and 25.0 per cent, respectively, for the sector over the sample period.

Equations 2, 3 & 4 capture HHI measures for loan portfolio, non-interest income and interest income diversification, respectively. The HHI for loans is computed as follows:

$$HHI_{LOAN} = \left(\frac{PUB}{LOAN}\right)^2 + \left(\frac{PERS}{LOAN}\right)^2 + \left(\frac{AGRI}{LOAN}\right)^2 + \left(\frac{CONST}{LOAN}\right)^2 + \left(\frac{DIST}{LOAN}\right)^2 + \left(\frac{MANU}{LOAN}\right)^2 + \left(\frac{MIN}{LOAN}\right)^2 + \left(\frac{TOUR}{LOAN}\right)^2 + \left(\frac{TRANS}{LOAN}\right)^2 + \left(\frac{OTHLOAN}{LOAN}\right)^2 \qquad \textbf{(2)}$$

where PUB is loans to the public sector (central and local government and public entities), AGRI, CONST, DIST, MANU, MIN, TOUR and TRANS captures loans to production sectors, in particular, agriculture, construction, distribution, manufacturing, mining, tourism and transport & communication, respectively, while PERS captures personal loans and OTHLOAN represents other loans. An increase in this index also indicates reduced diversification (increased concentration). Commercial banks loan portfolios have become much more concentrated over the sample period, primarily reflecting increases in personal loans as well as construction and distribution loans *(see **Figures 2A & 2B in Appendix**)*. Against this background, the HHI has steadily increased over the sample period (*see figure 4 in the Appendix*).

Regarding non-interest revenue, the HHI is computed as follows:

$$HHI_{NON} = \left(\frac{FEE}{NON}\right)^2 + \left(\frac{TRAD}{NON}\right)^2 + \left(\frac{FX}{NON}\right)^2 + \left(\frac{OTHOP}{NON}\right)^2 \qquad \textbf{(3)}$$

where FEE is fee and commission income, TRAD is trading income, FX is foreign exchange gain/loss and OTHOP is other operating income. Furthermore, higher values again indicate lower diversification or increased concentration. Non-interest revenue of the commercial banks has also shown increased concentration (*see **Figure 6 in appendix***). More specifically, fee and commission income has increased materially over the sample period, while earnings from all other areas have declined (*see **Figure 2A in Appendix***).

The HHI for interest revenue is calculated as:

$$HHI_{INT} = \left(\frac{LOAN}{NET}\right)^2 + \left(\frac{BOJ}{NET}\right)^2 + \left(\frac{INV}{NET}\right)^2 + \left(\frac{FIS}{NET}\right)^2 \qquad \textbf{(4)}$$

where BOJ is interest gained from BOJ securities, INV is interest from other investments and FIS is interest from banks and other financial institutions. Interest income from loans as a percentage of total interest income for the sector averaged 54 per cent at the beginning of the sample period and has increased to average of almost 80 per cent by end-March 2015. This performance was reflected in a steady upward trend in the HHI (*see **Figure 5 in Appendix***).

3.1.2 Diversification – Size Relationship

To investigate whether large banks are more diversified than their smaller counterparts, equation 5 was estimated across all HHI measures.

$$\left(HHI_{REV\ i,t}, HHI_{LOAN\ i,t}, HHI_{NON\ i,t} HHI_{INV\ i,t}\right) = \alpha_i + \beta_1 Assets_{i,t} + \beta_2 CAR_{i,t} + \beta_3 \left(D/TA_{i,t}\right) + \beta_4 CRISIS_i + \beta_5 JDX_{i,} + \beta_6 NDX_i + \varepsilon_{i,t} \quad \textbf{(5)}$$

Where Assets represents total assets for each bank and is used to estimate bank size. Control variables include the capital adequacy (CAR) and deposits to total assets (D/TA). We expect a positive relationship between the size of banks and the level of diversification which would imply that larger banks are indeed better diversified. Dummy variables, Crisis, JDX and NDX, are used to control for macroeconomic shocks experienced by banks during the sample period, including the recent global financial crisis and the debt exchange programmes. [3]

3.1.3 Stability/Performance – Diversification Relationship

In investigating the relationship between both revenue and loan portfolio diversification and bank performance and stability, equations 9-13 were estimated across all measures of diversification. These equations are shown below:

$$NPL/TotLoan_{i,t} = \delta_i + \theta_1\left(HHI_{REV\ i,t}, HHI_{LOAN\ i,t-1}, HHI_{NON\ i,t}, HHI_{INT\ i,t}\right) + \theta_2 Unemp_{t,i} + \theta_3 \Delta GDP_{i,t} + \theta_4 CAR_{i,t} + \theta_5 INT_{i,t-1} + Crisis_i + JDX_i + NDX_i + \mu_{i,t} \quad \textbf{(9)}$$

$$RAROA_{\ i,t} = \tau_i + \gamma_1\left(HHI_{REV\ i,t}, HHI_{LOAN\ i,t-1}, HHI_{NON\ i,t}, HHI_{INV\ i,t}\right) + \gamma_2\ \Delta GDP_{i,t} + \gamma_3 CAR_{i,t} + \gamma_4 SHARE_{i,t} + \gamma_5 INT_{i,t} + \gamma_6 NPL_{i,t-1} + Crisis_i + JDX_i + NDX_i + \tau_{i,t} \quad \textbf{(10)}$$

[3] The crisis dummy captures the period of the global financial crisis experienced in 2007/2008, from the third quarter of 2007 to the third quarter of 2008. JDX and NDX represent dummy variables for debt exchange programmes conducted in February 2010 and February 2013, respectively. The JDX dummy covers the first three quarters of 2010, while the NDX dummy covers the first 2 quarters of 2013. It is assumed that the time periods chosen for the JDX and NDX dummies represent the periods of strongest impact on bank performance.

$$RAROE_{i,t} = \varphi_i + \rho_1\left(HHI_{REV\ i,t}, HHI_{LOAN\ i,t-1}, HHI_{NON\ i,t}, HHI_{INV\ i,t}\right) + \rho_2 \Delta GDP_{i,t} + \rho_3 CAR_{i,t} + \rho_4 SHARE_{i,t} + \rho_5 INT_{i,t} + \rho_6 NPL_{i,t-1} + Crisis_i + JDX_i + NDX_i + \omega_{i,t} \quad \textbf{(11)}$$

$$ZScore_{i,t} = \phi_i + \chi_1\left(HHI_{REV\ i,t}, HHI_{LOAN\ i,t-1}, HHI_{NON\ i,t}, HHI_{INV\ i,t}\right) + \chi_2 MGMT_{i,t} + \chi_3 \Delta GDP_{i,t} + \chi_4 {}^{D}/_{TA_{i,t}} + \chi_5 SHARE_{i,t} + Crisis_i + JDX_i + NDX_i + \upsilon_{i,t} \quad \textbf{(12)}$$

$$VAR_{i,t} = \varpi_i + \eta_1\left(HHI_{REV\ i,t}, HHI_{LOAN\ i,t-1}, HHI_{NON\ i,t}, HHI_{INV\ i,t}\right) + \eta_2 MGMT_{i,t} + \eta_3 \Delta GDP_{i,t} + \eta_4 CAR_{i,t} + \eta_5 XRATE_{i,t} + Crisis_i + JDX_i + NDX_i + \lambda_{i,t} \quad \textbf{(13)}$$

The HHI indices capture the degree of diversification for each business line. An interest spread variable is utilized (INT) as well as the capital adequacy ratio (CAR). Further, operating expenses as a share of total revenue (MGMT) represents a measure of management efficiency while market power (SHARE) is captured as each bank's deposits as a share of total sector deposits. Macroeconomic variables are also employed, which include growth in nominal GDP, exchange rate volatility (XRATE) and the unemployment rate (Unemp). The non-performing loan to total loans (NPL) variable is used as a measure of potential loan loss or credit risk. This variable is assumed to impact profits with a lag. Profitability measures cover the risk adjusted return on assets (RAROA) and risk-adjusted return on equity (RAROE) and are computed as the quarterly ROA and ROE divided by the rolling three quarter standard deviation of each respective measure. These measures are computed for each bank over the sample period based on equations 6 & 7:

$$RAROA = \frac{ROA}{\sigma ROA} \quad \textbf{(6)}$$

$$RAROE = \frac{ROE}{\sigma ROE} \quad \textbf{(7)}$$

A negative relationship between the NPL ratio and the HHI indices suggests that increased diversification leads to deterioration in credit risk. Regarding the HHI indices and the RAROA and RAROE, a negative relationship suggests that increased diversification leads to increased profitability. Furthermore, the VaR is included as an indicator of market risk. This measure is

defined as the possible maximum loss over a given holding period within a fixed confidence level and is referred to as the standard measure to quantify market risk by Manganelli and Engle (2001).[4] The Z-Score is utilized to capture bank insolvency risk and is the probability of a bank's revenue becoming low enough to erase its capital base. The index is calculated in equation 8:

$$ZScore = \frac{RORAC + \frac{CAP}{ASSETS}}{Std.RORAC} \qquad (8)$$

where RORAC is the banks' return on risk adjusted capital, CAP/ASSETS is regulatory capital to total assets and Std. RORAC is the standard deviation of the return on risk adjusted capital.

Dummy variables, Crisis, JDX and NDX, have also been included. In addition, one lag of the HHI_loan index is used as it is recognized that impacts of increased diversification will only be realized with a lag.

3.2 Data & Estimation Technique

The model outlined in equations 9 to13 was estimated as a system employing the seemingly unrelated regression (SUR) estimation method. These equations were estimated for the commercial banking sector over the period March 2005 to March 2015, utilizing an unbalanced panel of quarterly profit and loss and balance sheet as well as macroeconomic data.

The seemingly unrelated regression (SUR) model specification is used to estimate the risk – diversification relationships outlined in section 3.1.3. A SUR is a system of equations, each having its own dependent variable and potentially different sets of explanatory variables. The equations are associated by the assumption of correlation of disturbances across equations. Additionally, efficiency gains of using a SUR method stem from ability to estimate by integrating information of other equations in the system and to test or impose restrictions on variables across the equations in the system.

The model, as proposed by Zellner (1962) can be represented as:

$$y_i = X_i\beta_i + \varepsilon_i \qquad \text{for i = 1, 2, ……., M} \qquad (14)$$

[4] See Yamai and Yoshiba (2005)

where y_i is a T x1 vector of observations on the i[th] dependent variable, X_i is a T x K_i matrix of observations of K_i independent non-stochastic variables, β_i is a K_i x 1 vector of regression coefficients to be estimated and ε_i is a T x1 vector of error terms.

The system can therefore be expressed as:

$$\begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_M \end{bmatrix} = \begin{bmatrix} X_1 & 0 & \dots & 0 \\ 0 & X_2 & \dots & 0 \\ \vdots & \vdots & & \vdots \\ 0 & 0 & \dots & X_M \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_M \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_M \end{bmatrix} \qquad \textbf{(15)}$$

where Y is of dimension TM x1, X is of dimension TM x K, β is of dimension K x1 and ε = N $(0,\Sigma \otimes I_T)$. Thus the model assumes that error terms in each equation are independent over time (homoskedastic) but there exists cross-equation contemporaneous correlations, that is, E[$\varepsilon_{ir}\, \varepsilon_{is} \mid X$] = 0 where $r \neq s$, whereas E[$\varepsilon_{ir}\, \varepsilon_{jr} \mid X$] = σ_{ij} .

The relationship between bank size and diversification is estimated using fixed effect estimations. The specification was determined more appropriate than the common constant or random effect modeling techniques by the Hausman test. This technique uses dummy variables for each cross-section (bank) on the assumption that "conditional on the observed explanatory variables, the effects of omitted (excluded) variables are basedon individual time-invariant factors such as individual-bank management efficiency, or other technical differences between banks" (Were and Wambua, 2014).

4.0 Empirical Results[5]

Findings show that there is a positive and significant relationship between total assets and all diversification measures, except for the non-interest income measure of diversification (*see **Tables 2 to 5 of the Appendix***).[6]

The results indicate that for larger commercial banks, there is greater concentration as it relates to loan portfolios, revenue earnings as well as earnings from interest income. Of note is that these findings are in contrast to *a priori* expectations. Furthermore, regarding non-interest earnings, the evidence shows that bank size does not influence increased concentration or diversification as it relates to this revenue source. The findings also show that a rise in the deposit funding of assets contributes to increased revenue diversification. In addition, there is also evidence that diversification across banks' revenue streams as well as diversification of interest earnings was negatively impacted by the global financial crisis.

[5] Augmented Dickey Fuller tests are performed on residuals of all estimated equations and all residuals are found to be stationary, thus signaling that the regressions are not spurious but instead have produced valid estimates (see ***Table 1 of the Appendix***).

The variance inflation factors (VIF) of all variables in each equation are also analyzed as a test for multicollinearity. All VIFs ranged between one (1) and four (4), significantly below ten (10) as values of ten (10) and above signal the presence of multicollinearity.

[6] A panel OLS model was used to estimate the relationship between diversification and bank size.

Table 1 outlines results of the SUR Model estimated for the System of Equations (9 to 13) outlined in section 3.

Table 1: *SUR Results*

		Revenue Diversification	***Loan Diversification***	***Int. Income Diversification***	***Non_int. Income***
	Dependent Variable: NPL	Coefficient	Coefficient	Coefficient	Coefficient
Equation 1	***HHI*** $^{++}$	**0.0147**	**-0.0537****	**0.0122**	**0.0260****
		(0.580)	(-2.793)	(0.737)	(2.028)
	GDP_Growth(-1)	**-0.1992****	**-0.1925****	**-0.2006****	**-0.2174****
		(-2.036)	(-1.989)	(-2.047)	(-2.230)
	GDP_Growth(-2)	**-0.0946**	**-0.0871**	**-0.0914**	**-0.0902**
		(-1.486)	(-1.378)	(-1.433)	(-1.427)
	GDP_Growth(-3)	**-0.2383****	**-0.2330****	**-0.2330****	**-0.2455****
		(-2.453)	(-2.427)	(-2.390)	(-2.542)
	CAR	**-0.0142**	**-0.0206**	**-0.0127**	**0.0029**
		(-0.684)	(-0.994)	(-0.608)	(0.131)
	Unemp(-1)	**0.3751*****	**0.3458****	**0.3321****	**0.4028*****
		(3.414)	(3.156)	(2.837)	(3.637)
	INT(-1)	**0.7528*****	**0.7354*****	**0.7535*****	**0.7353*****
		(3.991)	(3.942)	(3.974)	(3.946)
	CRISIS	**-0.0035**	**-0.0047**	**-0.0041**	**-0.0035**
		(-0.563)	(-0.762)	(-0.657)	(-0.566)
	JDX	**0.0090**	**0.0092**	**0.0089**	**0.0084**
		(1.422)	(1.480)	(1.405)	(1.343)
	NDX	**- 0.0015**	**-0.0016**	**-0.0015**	**-0.0021**
		(-0.191)	(-0.201)	(-0.180)	(-0.260)
	Dependent Variable: RAROA	Coefficient	Coefficient	Coefficient	Coefficient
Equation 2	***HHI*** $^{++}$	**-11.5897****	**-8.9786****	**-4.8878****	**-4.629***
		(-2.499)	(-2.622)	(-1.696)	(-2.067)
	GDP_Growth(-1)	**18.7539**	**18.5743**	**16.3794**	**20.5774**
		(1.087)	(1.078)	(0.942)	(1.180)
	GDP_Growth(-2)	**19.8264***	**18.6187***	**18.0519**	**17.8823**
		(1.769)	(1.664)	(1.604)	(1.588)
	GDP_Growth(-3)	**15.8777**	**15.1656**	**13.1333**	**15.8021**
		(0.904)	(0.864)	(0.741)	(0.894)
	CAR	**0.2307**	**-0.6434**	**0.9807**	**-0.4057**
		(0.062)	(-0.176)	(0.262)	(-0.106)
	INT	**4.8686**	**17.9757**	**8.9263**	**13.7499**
		(0.132)	(0.4942)	(0.241)	(0.375)
	SHARE	**11.0063*****	**13.3334*****	**13.1608*****	**13.1293*****
		(5.267)	(6.6363)	(6.326)	(6.488)
	NPL(-1)	**-24.7570****	**-27.8924****	**-20.9470***	**-24.7469****
		(-2.188)	(-2.445)	(-1.814)	(-2.172)
	CRISIS	**0.4501**	**0.5808**	**0.4450**	**0.7599**
		(0.435)	(0.563)	(0.425)	(0.734)
	JDX	**-1.8342***	**-1.9419***	**-1.8835***	**-1.8862***
		(-1.615)	(-1.714)	(-1.651)	(-1.652)
	NDX	**-2.8889***	**-2.5061***	**-2.3583**	**-2.4749***
		(-2.102)	(-1.836)	(-1.711)	(-1.799)

Table 1: *SUR Results*

		Revenue Diversification	***Loan Diversification***	***Int. Income Diversification***	***Non_int. Income***
	Dependent Variable: RAROE	Coefficient	Coefficient	Coefficient	Coefficient
Equation 3	***HHI*** $^{++}$	**-12.4990**** (-2.675)	**-9.8288**** (-2.851)	**-5.6618**** (-1.950)	**-4.3971*** (-1.943)
	GDP_Growth(-1)	**14.9345** (0.859)	**14.6432** (0.844)	**12.1288** (0.692)	**16.5616** (0.939)
	GDP_Growth(-2)	**18.3402** (1.624)	**16.9560** (1.506)	**16.3222** (1.440)	**16.2929** (1.431)
	GDP_Growth(-3)	**14.6811** (0.829)	**13.8145** (0.782)	**11.4781** (0.643)	**14.5635** (0.815)
	CAR	**0.4183** (0.111)	**-0.5380** (-0.146)	**1.4119** (0.375)	**-0.1426** (0.037)
	INT	**-33.0637** (-0.888)	**-19.2814** (-0.527)	**-29.1515** (-0.782)	**-22.6367** (-0.601)
	SHARE	**10.4187***** (4.948)	**12.9005***** (6.381)	**12.8832***** (6.1470)	**12.6367***** (6.179)
	NPL(-1)	**-28.2682**** (-2.479)	**-31.7457**** (-2.766)	**-23.7685*** (-2.042)	**-28.4962**** (-2.473)
	CRISIS	**0.0832** (0.080)	**0.2162** (0.208)	**0.0583** (0.055)	**0.4128** (0.396)
	JDX	**-1.5348** (-1.341)	**-1.6456** (-1.443)	**-1.5813** (-1.376)	**-1.6110** (-1.396)
	NDX	**-2.8786*** (-2.0787)	**-2.4619*** (-1.791)	**-2.2844** (-1.645)	**-2.4350*** (-1.752)
	Dependent Variable: Z-SCORE	Coefficient	Coefficient	Coefficient	Coefficient
Equation 4	***HHI*** $^{++}$	**-53.7840***** (-6.512)	**-29.6923***** (-4.818)	**-5.2890*** (-0.996)	**-20.7150***** (-5.431)
	GDP_Growth(-1)	**-4.3171** (-0.150)	**-8.5503** (-0.283)	**-7.6609** (-0.2417)	**2.4038** (0.081)
	GDP_Growth(-2)	**12.7629** (0.674)	**5.9317** (0.298)	**6.8350** (0.328)	**3.0447** (0.156)
	GDP_Growth(-3)	**-6.6946** (-0.227)	**-8.7762** (-0.282)	**-7.4431** (-0.228)	**-6.3845** (-0.210)
	D/TA	**13.0088*** (1.9563)	**11.8360*** (1.739)	**9.6035** (1.342)	**11.2541*** (1.685)
	INT	**7.8667** (1.956)	**71.7592** (1.095)	**74.4336** (1.070)	**56.9615** (0.885)
	MGMT	**-10.7836***** (-4.338)	**-3.7235** (-1.540)	**-5.0302*** (-2.010)	**-7.5800**** (-3.148)
	SHARE	**-18.4991**** (-4.168)	**-5.1408** (-1.204)	**-7.7545** (-1.735)	**-5.6637** (-1.349)
	NPL	**-21.3078** (-1.006)	**-47.1749**** (-2.142)	**-33.6118*** (-1.443)	**-26.1611** (-1.209)
	CRISIS	**-1.6144** (-0.914)	**-0.4332** (-0.234)	**-0.3836** (-0.196)	**0.0401** (-0.022)
	JDX	**-3.0982*** (-1.617)	**-3.4642*** (-1.718)	**-3.6581*** (-1.729)	**-3.3438*** (-1.6947)
	NDX	**-3.3600** (-1.460)	**-1.7089** (-0.709)	**-1.6886** (-0.669)	**-1.3844** (-0.5869)

Table 1: *SUR Results*

		Revenue Diversification	***Loan Diversification***	***Int. Income Diversification***	***Non_int. Income***
	Dependent Variable: VaR	Coefficient	Coefficient	Coefficient	Coefficient
Equation 5	***HHI***$^{++}$	**-0.0102***** (-4.404)		**-0.0023** (-1.504)	**-0.0016** (-1.424)
	GDP_Growth(-1)	**0.0040** (0.4433)		**0.0059** (0.618)	**0.0061** (0.643)
	GDP_Growth(-2)	**-0.0036** (-0.585)		**-0.0029** (-.0444)	**-0.0034** (-0.531)
	GDP_Growth(-3)	**0.0019** (0.206)		**0.0033** (0.345)	**0.0031** (0.327)
	CAR	**0.0033** (-1.2518)		**-0.0048** (-1.771)	**-0.0057**** (-2.067)
	MGMT	**-0.0013*** (-1.943)		**-0.0005** (-0.697)	**-0.0006** (-0.966)
	XRATE	**0.0003***** (3.811)		**0.0003***** (3.733)	**0.0003***** (3.879)
	CRISIS	**0.0015**** (2.272)		**0.0015**** (2.193)	**0.0017**** (2.548)
	JDX	**0.0022***** (34.020)		**0.0021***** (3.774)	**0.0022***** (3.883)
	NDX	**-0.0009** (-1.393)		**-0.0008** (-1.121)	**-0.0008** (-1.177)
	Determinant Residual Covariance	**6.44E-06**	**1.74240**	**8.17E-06**	**7.26E-06**

T-statistics are in parenthesis
***, **, * indicate statistical significance at the 1%, 5% and 10% levels respectively
++ - The diversification index for loans (HHI_{LOAN}) is lagged once.

Results from estimating equation 1 indicate a negative and significant relationship between the HHI for loans and loan quality (see ***Table 1***). This result implies that increases in loan portfolio concentration or reduced loan diversification contribute to improvements in commercial banks' loan quality. The result also supports the finding that larger commercial banks have more concentrated loan portfolios and the benefits of experienced risk monitoring in specialized sectors may have reduced credit risk in the overall loan portfolio for the sector. Notwithstanding, the findings show that increased loan portfolio diversification contributes to deterioration in loan quality and was evidenced for both large and small banks.[7] However, while large banks increase

[7] In the SUR models, large banks represent institutions with asset size in excess of J$100 billion while small banks are characterized as institutions with assets which fall below this value.

capital buffers to accommodate additional risks connected to diversification, this is not the case for small banks (see ***Tables 6 to 13 in the Appendix***).

There is a positive and significant relationship between the HHI for NII and loan quality, suggesting that reduced concentration or increased diversification in non-interest earning activities decreases NPL. This may be as a result of reduced reliance on non-interest income from fees and commission as well as fee reductions. These fee reductions may therefore result in lower delinquency regarding the repayment of commercial banks' loans. In addition, consistent with *a priori* expectations, increased unemployment and an increase in commercial bank interest rate spreads also produces higher NPLs while improved macroeconomic conditions reduces the level of NPLs.

Findings from estimating equations 2 & 3 show the impact of diversification on profitability, which was measured by the risk adjusted ROA and ROE. The results indicate that increased diversification in commercial banks' loan portfolios positively impacts risk-adjusted profitability, as evidenced by negative and significant coefficients on the loan concentration indices of both equations (see ***Table 1***). In addition, increased diversification as it relates to interest and non-interest earning activities contribute to improvement in risk-adjusted profitability of the commercial banks. Furthermore, this finding was the same for large banks; however, interest and non-interest revenue diversification had no impact on profits for small banks (see ***Tables 14 & 15 of the Appendix***). The results also indicate that market share is positively associated with risk adjusted return on assets and return on equity, that is, bigger banks are generally more profitable. In addition, consistent with a priori expectations, increases in NPLs adversely impact risk-adjusted profitability. Additionally, the coefficients on JDX and NDX are negative and significant in equations 2 & 3, indicating that commercial banks experienced weaker profitability against the background of the debt exchange restructuring.

Evidence based on equation 4 shows that increased diversification contributes to an increase in the Z-Score or a decline in the probability of insolvency, across all measures of diversification. This was also the case for large and small banks (see ***Tables 14 & 15 of the Appendix***). Furthermore, as it relates to revenue diversification, a higher market share results in a decrease in the Z-Score or increased risk of insolvency. This may be reflective of increased variability in profits and/or lower capital cushions as institutions gain market share. Also, the findings show

that increased management efficiency is positively and significantly associated with lower levels of insolvency risk while increases in non-performing loans contribute to increased probability of insolvency.

The results based on equation 5 show that there is a negative and significant relationship between revenue diversification and commercial banks' value at risk measure, indicating that increased revenue diversification leads to deterioration in market risk. As a result, gains to commercial banks from increased investment in areas outside of traditional lending activity is associated with increased exposure to market risk, especially in volatile periods.

Additionally, increased exchange rate volatility is associated with higher market risk. Further, increases in the commercial banks' capital adequacy ratios are associated with declines in the VaR measure and may be reflective of safer investments by institutions which have stronger capital positions. Finally, both the period of the financial crisis and the JDX negatively affected commercial banks by increasing market risk. The effect of the JDX has nonetheless been more severe as represented by higher coefficients and higher levels of significance in all VaR equations.

5.0 Conclusion

This study analyzed two key relationships in the context of the Jamaican commercial banking sector. More specifically, there was an investigation of whether larger commercial banks have more diversified loan portfolios and revenue streams than smaller commercial banks. In addition, there was an examination of the degree to which diversification impacts commercial banks' performance and stability. The results showed that larger commercial banks have greater revenue and loan concentration. With regards to the interrelationship between diversification, stability and performance, the investigation revealed that, for all banks, increased diversification in commercial banks' loan portfolios is associated with increased risk-adjusted profitability and reduction in the likelihood of insolvency, as measured by the Z-score Index. However, increased loan portfolio diversification contributes to deterioration in credit risk and this was evidenced for both large and small banks. Furthermore, while large banks increase capital buffers to accommodate additional risks connected to diversification, this is not the case for small banks. Against this background, increased diversification should be associated with continued careful monitoring of credit risk indicators by regulators, particularly for small banks.

The findings showed that increased diversification of interest and non-interest revenue contribute to improvements in risk-adjusted profitability of the commercial banks as well as declines in the probability of insolvency. As such, policies which provide incentives for banks to diversify in these areas, for instance asset restrictions, may enhance profitability, without jeopardizing the stability of the financial sector. Regarding revenue diversification, a higher market share results in a decrease in the Z-Score or increased risk of insolvency. This may be reflective of increased variability in profits and/or lower capital cushions as institutions gain market share. As such, regulators and policymakers should continue to carefully monitor these developments, and implement capital tools, if necessary, to mitigate systemic risks within the financial system.

Concerning the impact of diversification on market risk, there is a negative and significant relationship between revenue diversification and commercial banks' value at risk measure, indicating that increased revenue diversification leads to deterioration in market risk. Thus gains to commercial banks from increased investment in areas outside out their traditional line of

business is associated with increased exposure to market risk, especially in volatile periods. In addition, increases in the commercial banks' capital adequacy ratios are associated with declines in the VaR measure and may be reflective of safer investments by institutions which have stronger capital positions.

Macroeconomic variables and other bank specific variables included in the study impact commercial bank performance and stability as expected. In particular, increased unemployment, interest rate spreads and exchange rate volatility exposes commercial banks to increased credit and market risk respectively while GDP growth benefits banks by reducing credit risk and improving profitability.

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Appendix

Table 1: ***Results of Stationarity Tests for Residuals***

Equation	*Fisher - (ADF)*		*Order of Integration*
	χ^2	p-value	
Size – Diversification Relationships			
HHI_rev	31.4394	0.0017	*I (0)*
HHI_loan	30.7533	0.0021	*I (0)*
HHI_int	37.3891	0.0002	*I (0)*
HHI_non	59.0986	0.0000	*I (0)*
Diversification – Risk Relationships (SUR Systems)			
HHI_rev : *NPL*	36.6911	0.0003	*I (0)*
HHI_rev : *RAROA*	38.9900	0.0001	*I (0)*
HHI_rev : *RAROE*	43.5771	0.0000	*I (0)*
HHI_rev : *Z_Score*	39.6284	0.0001	*I (0)*
HHI_rev : *VAR*	34.6556	0.0005	*I (0)*
HHI_loan : *NPL*	36.5338	0.0003	*I (0)*
HHI_loan : *RAROA*	47.2310	0.0000	*I (0)*
HHI_loan : *RAROE*	51.9416	0.0000	*I (0)*
HHI_loan : *Z_Score*	32.3248	0.0012	*I (0)*
HHI_int : *NPL*	36.6850	0.0003	*I (0)*
HHI_int : *RAROA*	39.1921	0.0001	*I (0)*
HHI_int : *RAROE*	44.1423	0.0000	*I (0)*
HHI_int : *Z_Score*	34.0778	0.0007	*I (0)*
HHI_int: *VAR*	27.2645	0.0071	*I (0)*
HHI_non : *NPL*	38.9996	0.0001	*I (0)*
HHI_non : *RAROA*	40.5188	0.0001	*I (0)*
HHI_non : *RAROE*	44.3510	0.0000	*I (0)*
HHI_non : *Z_Score*	40.0468	0.0001	*I (0)*
HHI_non: *VAR*	25.6071	0.0122	*I (0)*

Table 2: ***Size & Revenue Diversification***

Dependent Variable:	***HHI_rev***			
Variable	***Coefficient***	***Standard Error***	***T-statistic***	***P-value***
C	0.1160	0.2122	0.5468	0.5851
LOG(Assets)	0.0203*****	0.0115	1.7759	0.0771
CAR	0.1952*******	0.0514	3.7960	0.0002
D/TA	-0.1573******	0.0598	-2.6290	0.0092
CRISIS	-0.0198*****	0.0111	-1.7868	0.0753
JDX	0.0044	0.0129	0.3377	0.7359
NDX	-0.0166	0.0158	-1.0480	0.2958
R-squared	*0.4369*			
Adjusted R-squared	*0.4088*			
F-statistic	*15.585*			
Prob(F-statistic)	*0.0000*			

***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively.

Table 3: ***Size & Loan Portfolio Diversification***

Dependent Variable:	***HHI_loan***			
Variable	***Coefficient***	***Standard Error***	***T-statistic***	***P-value***
C	-0.143605	0.235195	-0.610578	0.5421
LOG(Assets)	0.021159*	0.012697	1.666482	0.0970
CAR	0.236028***	0.056999	4.140948	0.0000
D/TA	-0.066860	0.066327	-1.008032	0.3145
CRISIS	-0.022721*	0.012274	-1.851134	0.0655
JDX	0.000792	0.014319	0.055342	0.9559
NDX	0.018268	0.017555	1.040567	0.2992
R-squared	*0.5960*			
Adjusted R-squared	*0.5759*			
F-statistic	*29.640*			
Prob(F-statistic)	*0.0000*			

***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively.

Table 4: *Size & Interest Income Diversification*

Dependent Variable:	***HHI_int***			
Variable	***Coefficient***	***Standard Error***	***T-statistic***	***P-value***
C	-1.8784***	0.3008	-6.2455	0.0000
LOG(Assets)	0.1364***	0.0162	8.4005	0.0000
CAR	0.3501***	0.0729	4.8039	0.0000
D/TA	-0.1370	0.0848	-1.6157	0.1076
CRISIS	-0.0466**	0.0157	-2.9657	0.0034
JDX	0.0121	0.0183	0.6602	0.5098
NDX	0.0364	0.0225	1.6233	0.1060
R-squared	*0.5848*			
Adjusted R-squared	*0.5641*			
F-statistic	*28.292*			
Prob(F-statistic)	*0.0000*			

***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively.

Table 5: Size & Non-Interest Income Diversification

Dependent Variable:	***HHI_non***			
Variable	***Coefficient***	***Standard Error***	***T-statistic***	***P-value***
C	1.0255**	0.4446	2.3069	0.0220
LOG(Assets)	-0.0090	0.0240	-0.3746	0.7083
CAR	-0.1364	0.1077	-1.2660	0.2069
D/TA	-0.5213***	0.1254	-4.1581	0.0000
CRISIS	-0.0053	0.0232	-0.2291	0.8190
JDX	0.0048	0.0271	0.1754	0.8609
NDX	0.0349	0.0332	1.0527	0.2936
R-squared	*0.4192*			
Adjusted R-squared	*0.3903*			
F-statistic	*14.501*			
Prob(F-statistic)	*0.0000*			

***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively.

Figure 1A

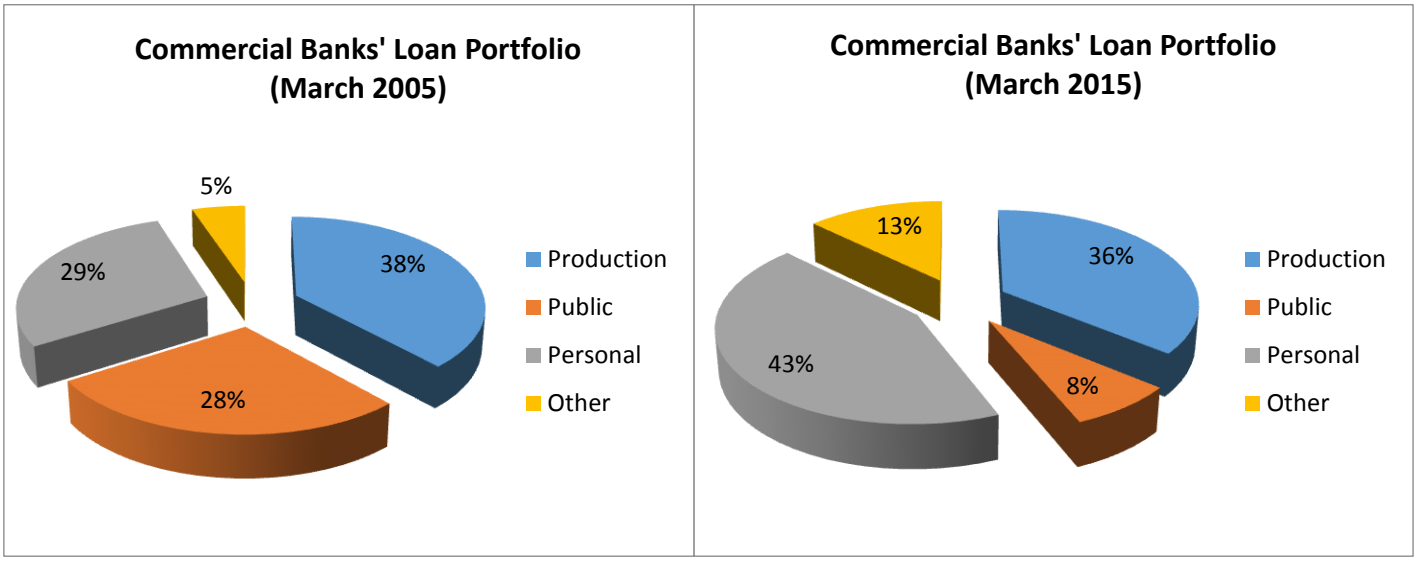


Figure 1B

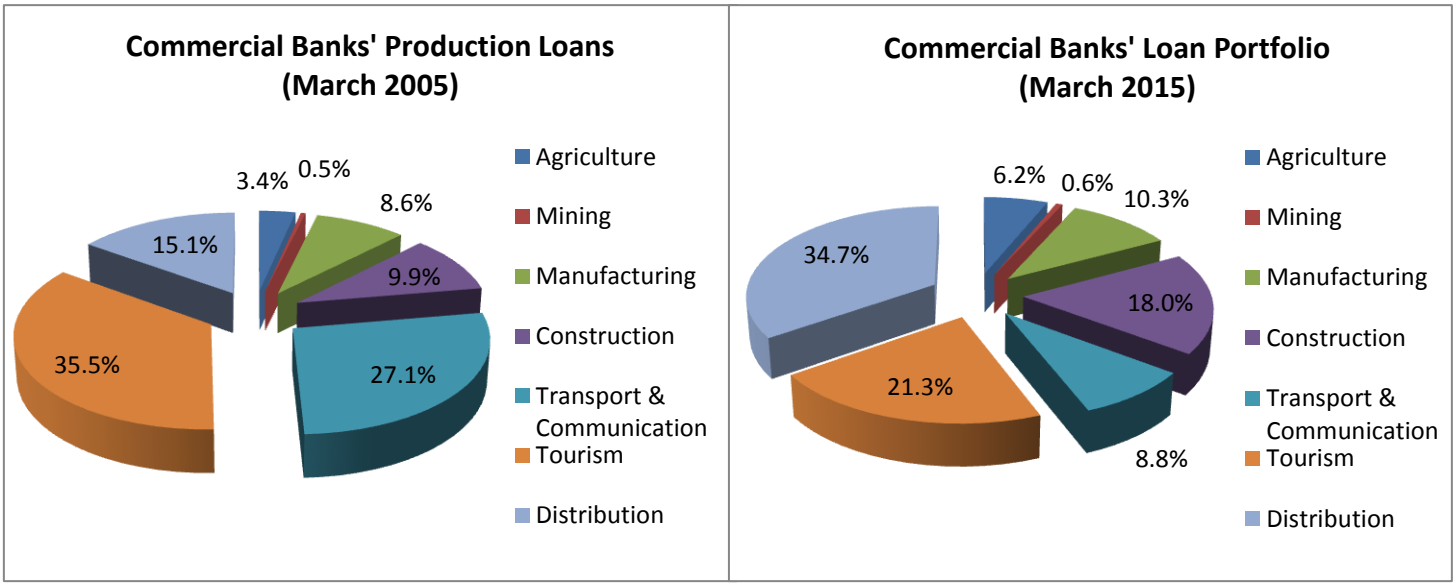


Figure 2A

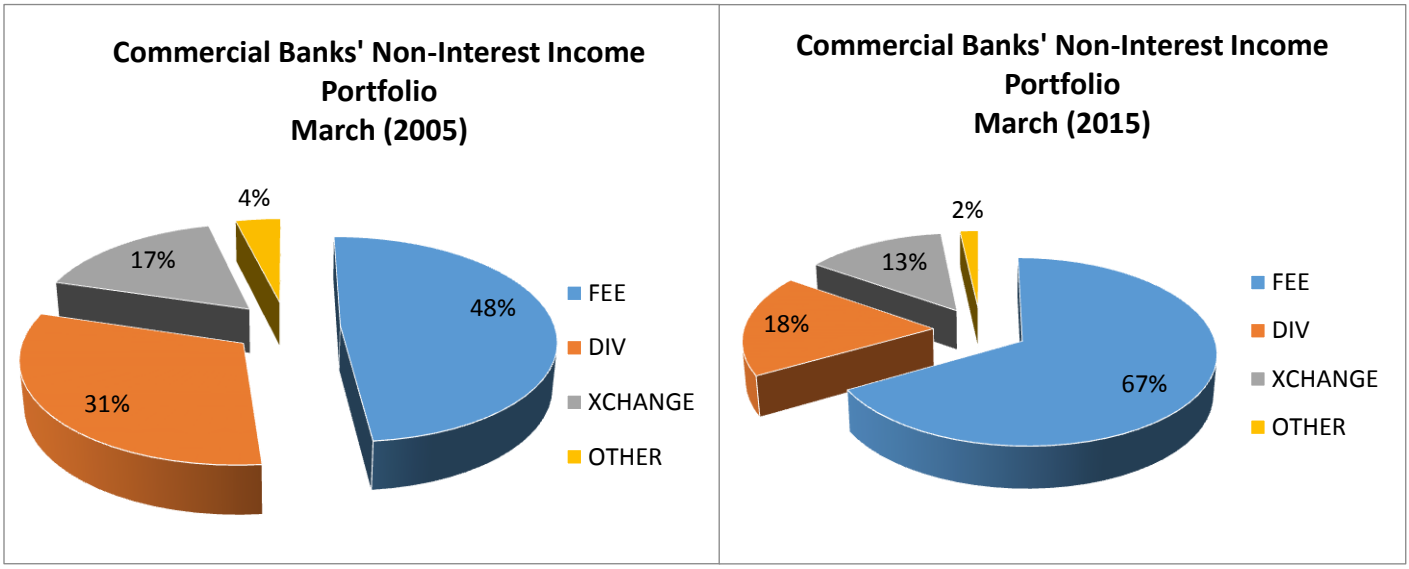


Figure 3

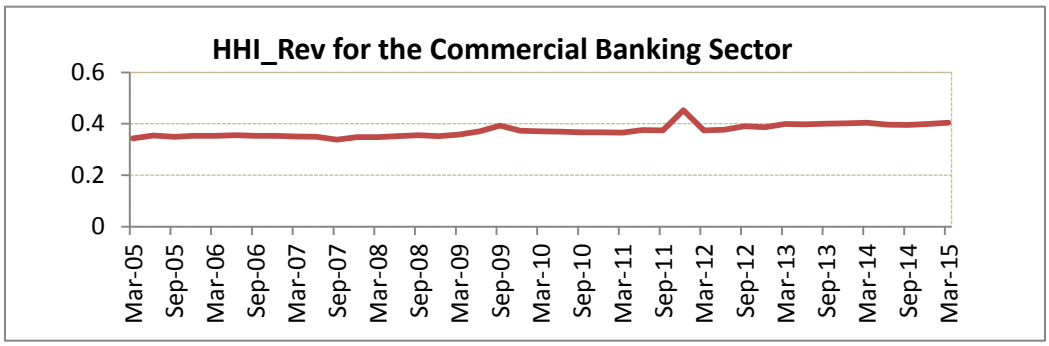


Figure 4

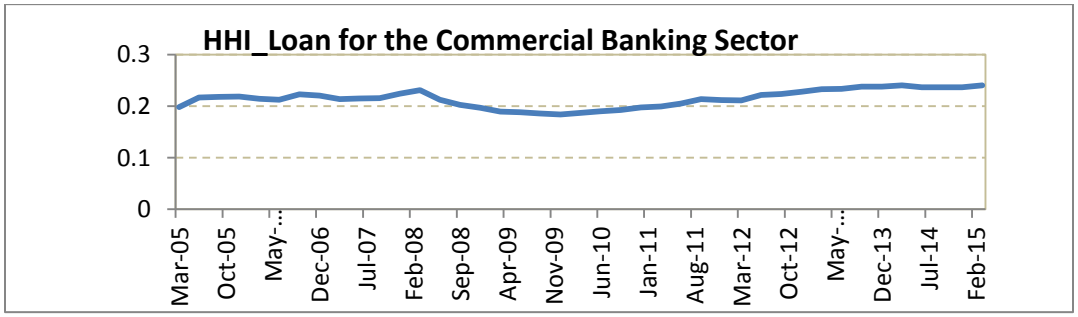


Figure 5

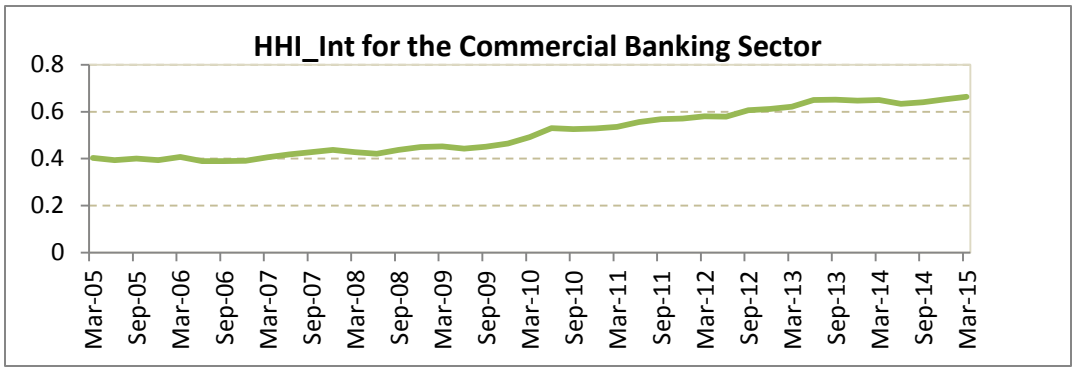
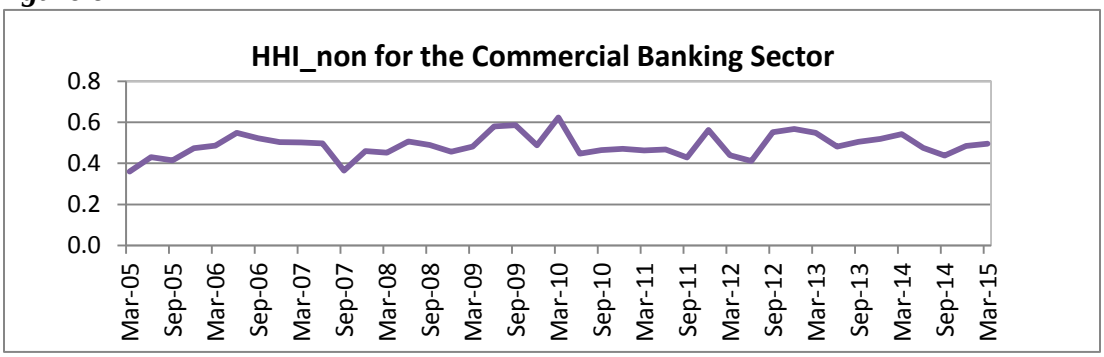


Figure 6



CAR EQUATIONS (LARGE BANKS):

Table 6: ***CAR & Revenue Diversification***

Dependent Variable:	***CAR***			
Variable	***Coefficient***	***Standard Error***	***T-statistic***	***P-value***
C	0.347716***	0.065157	5.336620	0.0000
HHI_REV	-0.303725**	0.092967	-3.266999	0.0017
GDP_GROWTH	0.031052	0.075855	0.409360	0.6835
RAROA	-0.000114	0.000383	-0.298666	0.7661
SHARE	-0.227952	0.123405	-1.847193	0.0688
NPL	-0.033112	0.200242	-0.165361	0.8691
CRISIS	-0.012574	0.007210	-1.743815	0.0855
JDX	0.015004*	0.008642	1.736137	0.0868
NDX	-0.017129	0.010482	-1.634170	0.1066
R-squared	*0.366333*			
Adjusted R-squared	*0.287124*			
F-statistic	*4.624921*			
Prob(F-statistic)	*0.000077*			

Table 7: ***CAR & Loan Diversification***

Dependent Variable:	***CAR***			
Variable	***Coefficient***	***Standard Error***	***T-statistic***	***P-value***
C	0.268259***	0.064695	4.146506	0.0001
HHI_LOAN	-0.257466*	0.148903	-1.729090	0.0881
GDP_GROWTH	0.030590	0.079799	0.383336	0.7026
RAROA	-0.000187	0.000407	-0.459144	0.6475
SHARE	-0.148867	0.126558	-1.176271	0.2434
NPL	-0.063027	0.244239	-0.258054	0.7971
CRISIS	-0.004178	0.008020	-0.520950	0.6040
JDX	0.012390	0.009285	1.334367	0.1863
NDX	-0.017085	0.011333	-1.507465	0.1361
R-squared	*0.301406*			
Adjusted R-squared	*0.214082*			
F-statistic	*3.451580*			
Prob(F-statistic)	*0.001384*			

Table 8: ***CAR & Interest Income Diversification***

Dependent Variable:	***CAR***			
Variable	***Coefficient***	***Standard Error***	***T-statistic***	***P-value***
C	0.385326***	0.040129	9.602270	0.0000
HHI_INT	-0.196304***	0.023092	-8.500951	0.0000
GDP_GROWTH	0.020397	0.057367	0.355555	0.7232
RAROA	-6.59E-06	0.000290	-0.022745	0.9819
SHARE	-0.409000***	0.095368	-4.288633	0.0001
NPL	0.491333**	0.165903	2.961572	0.0041
CRISIS	-0.011555**	0.005407	-2.136977	0.0360
JDX	0.017236**	0.006542	2.634712	0.0103
NDX	-0.001134	0.008230	-0.137807	0.8908
R-squared	*0.636870*			
Adjusted R-squared	*0.591479*			
F-statistic	*14.03068*			
Prob(F-statistic)	*0.000000*			

Table 9: ***CAR & Non-Interest Income Diversification***

Dependent Variable:	***CAR***			
Variable	***Coefficient***	***Standard Error***	***T-statistic***	***P-value***
C	0.225964***	0.048795	4.630869	0.0000
HHI_NON	-0.054150**	0.026857	-2.016254	0.0475
GDP_GROWTH	0.028685	0.079118	0.362564	0.7180
RAROA	-9.44E-05	0.000399	-0.236647	0.8136
SHARE	-0.107547	0.120966	-0.889068	0.3769
NPL	-0.319037*	0.185225	-1.722424	0.0893
CRISIS	-0.010106	0.007452	-1.356115	0.1793
JDX	0.018015*	0.009072	1.985782	0.0509
NDX	-0.020365	0.010844	-1.877961	0.0644
R-squared	*0.311284*			
Adjusted R-squared	*0.225195*			
F-statistic	*3.615822*			
Prob(F-statistic)	*0.000918*			

CAR EQUATIONS (SMALL BANKS):

Table 10: ***CAR & Revenue Diversification***

Dependent Variable:	***CAR***			
Variable	***Coefficient***	***Standard Error***	***T-statistic***	***P-value***
C	0.106397*	0.053923	1.973144	0.0505
HHI_REV	0.359681**	0.110533	3.254067	0.0014
GDP_GROWTH	-0.016571	0.238889	-0.069365	0.9448
RAROA	-0.000451	0.002614	-0.172383	0.8634
SHARE	-0.734551	0.534555	-1.374136	0.1716
NPL	-0.322687	0.251439	-1.283365	0.2015
CRISIS	0.011292	0.023850	0.473472	0.6366
JDX	0.000660	0.026302	0.025082	0.9800
NDX	-0.047428	0.032016	-1.481380	0.1408
R-squared	*0.305493*			
Adjusted R-squared	*0.250133*			
F-statistic	*5.518360*			
Prob(F-statistic)	*0.000000*			

Table 11: ***CAR & Loan Diversification***

Dependent Variable:	***CAR***			
Variable	***Coefficient***	***Standard Error***	***T-statistic***	***P-value***
C	0.169616***	0.039001	4.349060	0.0000
HHI_LOAN	0.321886**	0.097043	3.316945	0.0012
GDP_GROWTH	0.046491	0.238432	0.194987	0.8457
RAROA	0.000720	0.002610	0.275713	0.7832
SHARE	-0.422831	0.530543	-0.796977	0.4268
NPL	-0.264466	0.252285	-1.048281	0.2963
CRISIS	0.019329	0.024100	0.802041	0.4239
JDX	0.004144	0.026187	0.158266	0.8745
NDX	-0.061563*	0.031598	-1.948355	0.0534
R-squared	*0.307418*			
Adjusted R-squared	*0.252213*			
F-statistic	*5.568589*			
Prob(F-statistic)	*0.000000*			

Table 12: ***CAR & Interest Income Diversification***

Dependent Variable:	***CAR***			
Variable	***Coefficient***	***Standard Error***	***T-statistic***	***P-value***
C	0.081661	0.051524	1.584902	0.1153
HHI_INT	0.358949***	0.088959	4.035010	0.0001
GDP_GROWTH	0.022950	0.234185	0.098001	0.9221
RAROA	0.000678	0.002563	0.264607	0.7917
SHARE	-1.003122*	0.534187	-1.877848	0.0625
NPL	-0.239955	0.248134	-0.967038	0.3352
CRISIS	0.024998	0.023823	1.049362	0.2958
JDX	-0.003890	0.025886	-0.150284	0.8808
NDX	-0.061546	0.031051	-1.982111	0.0495
R-squared	*0.331117*			
Adjusted R-squared	*0.277800*			
F-statistic	*6.210375*			
Prob(F-statistic)	*0.000000*			

Table 13: ***CAR & Non-Interest Income Diversification***

Dependent Variable:	***CAR***			
Variable	***Coefficient***	***Standard Error***	***T-statistic***	***P-value***
C	0.270306***	0.042342	6.383930	0.0000
HHI_NON	-0.038312	0.059571	-0.643134	0.5212
GDP_GROWTH	0.021730	0.247262	0.087885	0.9301
RAROA	0.000382	0.002730	0.139820	0.8890
SHARE	-0.550700	0.551700	-0.998187	0.3199
NPL	-0.316350	0.265784	-1.190251	0.2360
CRISIS	0.007524	0.024771	0.303724	0.7618
JDX	0.007939	0.027152	0.292404	0.7704
NDX	-0.062704*	0.032798	-1.911826	0.0580
R-squared	*0.254437*			
Adjusted R-squared	*0.195008*			
F-statistic	*4.281356*			
Prob(F-statistic)	*0.000018*			

SUR EQUATIONS (LARGE BANKS):

Table 14: ***SUR Results***

		Revenue Diversification	***Loan Diversification***	***Int. Income Diversification***	***Non_int. Income***
	Dependent Variable: NPL	Coefficient	Coefficient	Coefficient	Coefficient
Equation 1	***HHI*** ++	**-0.1536***** (1.543)	**-0.1260***** (-3.657)	**-0.0835***** (-4.239)	**-0.0455***** (-3.789)
	GDP_Growth(-1)	**-0.1416**** (-2.184)	**-0.1232*** (-1.813)	**-0.1802**** (-2.634)	**-0.1200*** (-1.788)
	GDP_Growth(-2)	**-0.1124**** (-2.656)	**-0.0851*** (-1.930)	**-0.1289**** (-2.881)	**-0.0949**** (-2.185)
	GDP_Growth(-3)	**-0.235406***** (-3.637)	**-0.2034**** (-3.011)	**-0.2812***** (-4.052)	**-0.2175**** (-3.259)
	CAR	**0.149868**** (2.156)	**0.1826**** (2.521)	**0.0860** (1.067)	**0.1979**** (2.866)
	Unemp(-1)	**0.5868***** (7.314)	**0.5223***** (6.274)	**0.7889***** (7.501)	**0.4939***** (6.097)
	INT(-1)	**0.6493***** (5.144)	**0.5760***** (4.338)	**0.6218***** (4.761)	**0.5573***** (4.294)
	CRISIS	**0.003** (0.794)	**0.0049** (1.141)	**0.0059** (1.397)	**0.0029** (0.698)
	JDX	**-0.0084*** (-1.867)	**-0.0112**** (-2.380)	**-0.0075** (-1.596)	**-0.0071** (-1.501)
	NDX	**-0.0028** (-0.504)	**-0.0014** (-0.250)	**-0.0011** (-0.184)	**-0.0019** (-0.329)

Table 14: *SUR Results*

		Revenue Diversification	***Loan Diversification***	***Int. Income Diversification***	***Non_int. Income***
	Dependent Variable: RAROA	Coefficient	Coefficient	Coefficient	Coefficient
Equation 2	***HHI*$^{++}$**	**-48.3876**** (-2.639)	**-73.1760***** (-3.751)	**-13.4204** (-1.593)	**-14.2424**** (-1.986)
	GDP_Growth(-1)	**8.7271** (0.223)	**11.4480** (0.308)	**8.3336** (0.205)	**19.0582** (0.484)
	GDP_Growth(-2)	**27.7491** (1.115)	**34.4221** (1.455)	**30.4110** (1.187)	**32.6516** (1.298)
	GDP_Growth(-3)	**29.5871** (0.744)	**33.3029** (0.879)	**30.6789** (0.744)	**33.3117** (0.824)
	CAR	**-10.9042** (-0.311)	**-8.341** -0.259)	**-6.2294** (-0.142)	**-1.0336** (-0.031)
	INT	**104.7607** (1.229)	**100.974** (1.239)	**76.0338** (0.878)	**83.4798** (0.974)
	SHARE	**-12.6180** (-0.409)	**14.4952** (0.466)	**-25.9194** (-0.826)	**-19.2881** (-0.610)
	NPL(-1)	**-13.7984** (-0.273)	**-24.8652** (-0.513)	**18.9520** (0.371)	**-31.9412** (-0.617)
	CRISIS	**-1.4201** (-0.632)	**-0.3378** (-0.159)	**-0.9643** (0.417)	**-1.0623** (-0.469)
	JDX	**-5.7418**** (-2.113)	**-7.0276**** (-2.675)	**-5.3780*** (-1.091)	**-5.1249*** (-1.839)
	NDX	**-2.7545** (-0.863)	**-2.1276** (-0.693)	**-2.3876** (-0.722)	**-3.0807** (-0.949)
	Dependent Variable: RAROE	Coefficient	Coefficient	Coefficient	Coefficient
Equation 3	***HHI*$^{++}$**	**-48.8291**** (-2.704)	**-78.5032***** (-4.144)	**-15.5526*** (-1.888)	**-12.6028*** (-1.768)
	GDP_Growth(-1)	**-5.3432** (-0.138)	**-1.9850** (-0.055)	**-7.6145** (-0.190)	**6.1501** (0.157)
	GDP_Growth(-2)	**21.9798** (0.894)	**28.7820** (1.251)	**23.7147** (0.939)	**27.6067** (1.103)
	GDP_Growth(-3)	**21.143** (0.538)	**25.4662** (0.691)	**20.5781** (0.507)	**26.7141** (0.664)
	CAR	**-13.8025** (-0.408)	**-14.1780** (-0.460)	**-15.9114** (0.976)	**-3.8224** (-0.118)
	INT	**7.9920** (0.095)	**5.9847** (0.076)	**-19.1005** (0.224)	**-14.1468** (-0.166)
	SHARE	**-30.8100** (-1.014)	**-0.5454** (-0.018)	**-45.1568** (-1.467)	**-40.0607** (-1.274)
	NPL(-1)	**-47.6904** (-0.957)	**-53.1932** (-1.133)	**-13.9548** (-0.278)	**-61.9348** (-1.200)
	CRISIS	**-3.1159** (-1.403)	**-1.9157** (-0.928)	**-2.7675** (-1.215)	**-2.6738** (-1.186)
	JDX	**-5.2624*** (-1.963)	**-6.5483**** (-2.565)	**-4.7929*** (-1.723)	**-4.6845*** (-1.692)
	NDX	**-2.4631** (-0.782)	**-1.8421** (-0.617)	**-1.9879** (-0.609)	**-2.8839** (-0.895)
	Dependent Variable: Z-SCORE	Coefficient	Coefficient	Coefficient	Coefficient

Table 14: *SUR Results*

		Revenue Diversification	***Loan Diversification***	***Int. Income Diversification***	***Non_int. Income***
Equation 4	***HHI*** $^{++}$	**-64.0040**** (-2.975)	**-95.6692**** (-3.248)	**-20.8209**** (-2.871)	**-15.0071**** (-2.114)
	GDP_Growth(-1)	**44.1556** (1.232)	**52.2445** (1.494)	**34.0655** (0.922)	**59.0691** (1.639)
	GDP_Growth(-2)	**48.2988*** (2.090)	**59.6059**** (2.657)	**49.4467**** (2.129)	**56.6418**** (2.440)
	GDP_Growth(-3)	**56.3303** (1.529)	**65.3980*** (1.833)	5**2.0865** (1.388)	**68.3020*** (1.843)
	D/TA	**5.5593** (0.448)	**16.6185** (0.999)	**2.5145** (0.215)	**-5.4385** (-0.516)
	INT	**86.74110** (0.998)	**75.7635** (0.874)	**80.1818** (0.930)	**100.1906** (1.161)
	MGMT	**-1.5794** (-0.232)	**3.2361** (0.532)	**3.0026** (0.486)	**4.1462** (0.639)
	SHARE	**34.2051** (0.989)	**48.0143** (1.399)	**29.3519** (0.850)	**47.9629** (1.425)
	NPL	**68.2882** (1.267)	**78.3813** (1.400)	**88.0137** (1.595)	**40.1212** (0.758)
	CRISIS	**-3.5400** (-1.646)	**-1.5458** (-0.744)	**-2.9396** (-1.387)	**-2.5335** (-1.187)
	JDX	**-4.6740*** (-1.904)	**-6.1646**** (-2.515)	**-4.4419*** (-1.798)	**-3.9307** (-1.563)
	NDX	**-6.9338**** (-2.362)	**-6.9145**** (-2.404)	**-6.1833**** (-2.058)	**-7.9460**** (-2.687)
	Dependent Variable: VaR	Coefficient	Coefficient	Coefficient	Coefficient
Equation 5	***HHI*** $^{++}$	**-0.0108*** (-1.733)		**-0.0072**** (-2.186)	**-0.0001** (-0.051)
	GDP_Growth(-1)	**0.0158** (1.290)		**0.0159** (1.328)	**0.0158** (1.257)
	GDP_Growth(-2)	**-0.0072** (-0.881)		**-0.0056** (-0.684)	**-0.0065** (-0.763)
	GDP_Growth(-3)	**0.0161** (1.302)		**0.0170** (1.408)	**0.0170** (0.183)
	CAR	**0.0582**** (3.083)		**0.0357** (1.485)	**0.0709***** (4.221)
	MGMT	**-0.0023** (-0.905)		**-0.0012** (-0.571)	**-0.0012** (-0.537)
	XRATE	**0.0007***** (6.273)		**0.0007***** (5.532)	**0.0007***** (6.302)
	CRISIS	**0.0036***** (4.053)		**0.0031***** (3.339)	**0.0039***** (4.476)
	JDX	**0.0003** (0.405)		**0.0006** (0.704)	**0.0002** (0.223)
	NDX	**-0.0002** (-0.205)		**-0.0002** (-0.172)	**-0.0002** (-0.212
	Determinant Residual Covariance	**8.50E-07**	**0.373485**	**8.94E-07**	**1.05E-06**

SUR EQUATIONS (SMALL BANKS):

Table 15: ***SUR Results***

		Revenue Diversification	***Loan Diversification***	***Int. Income Diversification***	***Non_int. Income***
	Dependent Variable: NPL	Coefficient	Coefficient	Coefficient	Coefficient
Equation 1	***HHI*** $^{++}$	**0.0548**	**-0.0501****	**0.0536****	**0.0535****
		(1.543)	(-2.104)	(2.233)	(3.161)
	GDP_Growth(-1)	**-0.2625***	**-0.2432***	**-0.2548***	**-0.3013****
		(-1.844)	(-1.710)	(-1.807)	(-2.155)
	GDP_Growth(-2)	**-0.1159**	**-0.0939**	**-0.1003**	**-0.0987**
		(-1.248)	(-1.011)	(-1.095)	(-1.094)
	GDP_Growth(-3)	**-0.2929****	**-0.2651***	**-0.2620**	**-0.3094****
		(-2.065)	(-1.882)	(-1.871)	(-2.234)
	CAR	**-0.0099**	**-0.0182**	**-0.0358**	**0.0178**
		(-0.359)	(-0.658)	(-1.261)	(0.625)
	Unemp(-1)	**0.4162****	**0.3398****	**0.2359**	**0.4903****
		(2.534)	(2.103)	(1.444)	(3.036)
	INT(-1)	**0.8818****	**0.7904****	**0.9337*****	**0.7992****
		(3.207)	(2.916)	(3.402)	(3.036)
	CRISIS	**-0.0043**	**-0.0081**	**-0.0060**	**-0.0054**
		(-0.460)	(-0.868)	(-0.661)	(-0.598)
	JDX	**0.0152***	**0.0164***	**0.0147**	**0.0152***
		(1.679)	(1.819)	(1.642)	(1.730)
	NDX	**0.0023**	**4.18E-05**	**0.0015**	**-0.0010**
		(0.194)	(0.004)	(0.131)	(-0.086)
	Dependent Variable: RAROA	Coefficient	Coefficient	Coefficient	Coefficient
Equation 2	***HHI*** $^{++}$	**-6.0239***	**-9.2522*****	**3.8522**	**-1.7624**
		(-1.752)	(-3.766)	(1.244)	(-1.060)
	GDP_Growth(-1)	**19.8648**	**20.0402**	**18.2073**	**19.2779**
		(1.4001)	(1.467)	(1.276)	(1.337)
	GDP_Growth(-2)	**11.8014**	**11.1123**	**10.3861**	**9.7597**
		(1.272)	(1.249)	(0.117)	(1.050)
	GDP_Growth(-3)	**3.2578**	**1.9337**	**2.1964**	**2.2181**
		(0.227)	(0.144)	(0.152)	(0.153)
	CAR	**0.9178**	**0.7221**	**0.9899**	**1.1585**
		(0.391)	(0.309)	(0.400)	(0.475)
	INT	**-43.6534**	**-43.6447**	**-28.7490**	**-34.5882**
		(-1.417)	(-1.505)	(-0.946)	(-1.150)
	SHARE	**-19.2850***	**-34.0862****	**-32.5016****	**-18.5752**
		(-1.649)	(-2.781)	(-2.161)	(-1.578)
	NPL(-1)	**-20.1696****	**-20.3412****	**-20.9959****	**-20.2056****
		(-2.403)	(-2.527)	(-2.497)	(-2.379)
	CRISIS	**1.3537**	**1.1962**	**1.7189***	**1.5596***
		(1.570)	(1.436)	(1.948)	(1.798)
	JDX	**-0.1338**	**-0.1285**	**-0.4908**	**-0.2669**
		(-0.146)	(-0.146)	(-0.526)	(-0.291)
	NDX	**-2.4934****	**-2.2607****	**-2.1483***	**-2.0943***
		(-2.222)	(-2.123)	(-1.929)	(-1.882)

Table 15: *SUR Results*

		Revenue Diversification	***Loan Diversification***	***Int. Income Diversification***	***Non_int. Income***
	Dependent Variable: RAROE	Coefficient	Coefficient	Coefficient	Coefficient
Equation 3	***HHI*$^{++}$**	**-6.0890***	**-9.4342*****	**3.6653**	**-2.0788**
		(-1.715)	(-3.714)	(1.146)	(-1.212)
	GDP_Growth(-1)	**20.6781**	**20.8991**	**18.9492**	**20.3764**
		(1.412)	(1.479)	(1.286)	(1.370)
	GDP_Growth(-2)	**12.1021**	**11.4248**	**10.6493**	**10.0333**
		(1.263)	(1.243)	(1.110)	(1.046)
	GDP_Growth(-3)	**5.0544**	**3.7370**	**3.9082**	**4.1606**
		(0.341)	(0.262)	(0.262)	(0.278)
	CAR	**0.7960**	**0.5727**	**0.9697**	**0.9546**
		(0.330)	(0.239)	(0.382)	(0.380)
	INT	**-43.7724**	**-43.8716**	**-29.2183**	**-34.9365**
		(-1.375)	(-1.464)	(-0.930)	(-1.126)
	SHARE	**-19.4176**	**-34.5204****	**-32.0379****	**-18.7431**
		(-1.608)	(-2.723)	(-2.062)	(-1.543)
	NPL(-1)	**-21.8847****	**-22.0441****	**-22.5305****	**-21.8565****
		(-2.525)	(-2.648)	(-2.594)	(-2.494)
	CRISIS	**1.6580***	**1.4961***	**2.0159****	**1.8752****
		(1.862)	(1.738)	(2.212)	(2.095)
	JDX	**-0.1165**	**-0.1096**	**-0.4650**	**-0.2474**
		(-0.123)	(-0.121)	(-0.483)	(-0.261)
	NDX	**-2.4959****	**-2.2637****	**-2.1404***	**-2.0948***
		(-2.154)	(-2.057)	(-1.862)	(-1.825)
	Dependent Variable: Z-SCORE	Coefficient	Coefficient	Coefficient	Coefficient
Equation 4	***HHI*$^{++}$**	**-36.2069*****	**-41.5225*****	**32.5224*****	**-17.0342*****
		(-3.510)	(-5.825)	(3.684)	(-3.567)
	GDP_Growth(-1)	**-25.3524**	**-30.1228**	**-38.7060**	**-21.3864**
		(-0.609)	(-0.778)	(-0.925)	(-0.514)
	GDP_Growth(-2)	**-3.9098**	**-11.9147**	**-11.4487**	**-16.2868**
		(0.141)	(-0.464)	(-0.413)	(-0.593)
	GDP_Growth(-3)	**-34.0062**	**-45.5106**	**-39.7005**	**-35.7016**
		(-0.801)	(-1.151)	(0.928)	(-0.842)
	D/TA	**15.7808***	**20.5700****	**26.4982****	**15.4224**
		(1.715)	(2.354)	(2.952)	(1.701)
	INT	**-39.6622**	**-35.3361**	**67.7215**	**12.8331**
		(-0.427)	(-0.415)	(0.743)	(0.143)
	MGMT	**0.2104**	**0.4774**	**-0.0400**	**0.2440**
		(0.505)	(1.188)	(-0.097)	(0.595)
	SHARE	**-94.6605****	**-169.570*****	**-209.831*****	**-86.0548****
		(-2.684)	(-4.710)	(-4.739)	(-2.446)
	NPL	**-39.2094**	**-42.6686***	**-50.327****	**-34.7686**
		(-1.533)	(-1.791)	(-1.971)	(-1.359)
	CRISIS	**1.4343**	**1.0599**	**4.5739***	**2.9738**
		(0.547)	(0.434)	(1.710)	(1.143)
	JDX	**-1.6329**	**-1.7062**	**-4.1311**	**-2.3914**
		(-0.598)	(-0.671)	(-1.483)	(-0.881)
	NDX	**-2.1685**	**-0.7646**	**-0.4867**	**0.2165**
		(-0.653)	(-0.250)	(-0.487)	(0.066)

Table 15: *SUR Results*

		Revenue Diversification	***Loan Diversification***	***Int. Income Diversification***	***Non_int. Income***
	Dependent Variable: VaR	Coefficient	Coefficient	Coefficient	Coefficient
Equation 5	***HHI*** $^{++}$	**-0.0062**** (-2.566)		**0.0001** (0.060)	**-0.0017** (-1.432)
	GDP_Growth(-1)	**-0.0014** (-0.134)		**-0.0009** (-0.080)	**0.0007** (0.068)
	GDP_Growth(-2)	**-0.0019** (-0.258)		**-0.0015** (-0.202)	**-0.0018** (-0.248)
	GDP_Growth(-3)	**-0.0016** (-0.151)		**-0.0013** (0.120)	**-3.36E-05** (-0.003)
	CAR	**-0.0023** (-0.797)		**-0.0023** (-0.732)	**-0.0027** (-0.922)
	MGMT	**-0.0003**** (-2.737)		**-0.0003**** (-2.588)	**-0.0003**** (-2.594)
	XRATE	**0.0002*** (1.853)		**0.0002*** (1.768)	**0.0002*** (1.962)
	CRISIS	**0.0002** (0.316)		**0.0002** (0.271)	**0.0002** (0.312)
	JDX	**0.0022***** (3.581)		**0.0021**** (3.254)	**0.0021***** (3.322)
	NDX	**-0.0006** (-0.777)		**-0.0003** (0.6605)	**-0.0004** (-0.473)
	Determinant Residual Covariance	**7.12E-07**	**0.17779**	**7.19E-07**	**6.95E-07**