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Size, Diversification and Risk: Preliminary Evidence from Commercial Banks in Pakistan

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Abstract

The aim of this paper is to provide some preliminary evidence on relation between size, diversification and risk in commercial banks of Pakistan. Using a panel of Pakistani banks, we investigated whether bigger banks are better diversified than smaller banks. The results suggested that larger banks were more diversified than their smaller counterparts mainly on account of their outreach and size of credit portfolio. On the risk side, based on accounting and market based risk measures, we explored if there is any impact of diversification on risk. We could not deduce significant result in favor of accounting risk measure of impaired lending signaling that banks find no incentive in diversification of credit books. The market based measures of VaR and Default indicator were significantly related to diversification signifying that market participants consider diversification as a relevant tool for risk mitigation. These findings have policy implications for regulators and risk management to ensure stability in financial system.

Keywords: Banking risks, Size, Diversification, Financial system.

1. Introduction

Diversification is perceived to play a vital role in risk management. The central bank imposes restrictions on exposure to a single sector to ensure diversification in credit portfolios[1]. This is based on the assumption that better diversification removes the systemic risk of a particular sector and reduces the probability of bank failure. In this context, banks with bigger size, in terms of total assets and branch network, are expected to be better diversified than smaller banks. The diversification capacity for larger banks is expected to emanate from the economies of scale and scope that they are likely to experience compared to smaller banks. However, there could be at least two reasons because of which banks may not diversify. First, they might have moral hazards which may increase concentration in their loan portfolio. This moral hazard is likely to emerge

[1] Regulation R 1, Prudential Regulations for Corporate and Commercial Banking, State Bank of Pakistan (2011), pp 14

from "*too big to fail*" doctrine where larger banks are presumed to be safer than smaller banks and therefore, they might continue to grow without diversifying their risks by investing in few profitable sectors.

Furthermore, if bank perceives a bailout package from Government or the sponsors, they would be encouraged to undertake riskier ventures for higher profits and they will find no incentive to diversify. In this particular case we might not observe a significant relation between size of credit portfolio and diversification. Second, if diversification does not reduce risk and constraints bank profitability, banks will not have any incentive to diversify. In absence of economic benefits either from risk mitigation or enhanced performance bank management will be reluctant in diversification over and above prudential limits. The firm diversification is not only critical for banks but an exhaustive literature exist in corporate finance that discusses impact of firms' diversification on their performance with mix empirical evidence. Based on these propositions if we establish that banks are diversified but diversification has no impact on risk then it can be concluded that banks are diversifying only as per statutory requirement. Therefore, role of diversification as a risk mitigating tool, as suggested by traditional financial economic theory, is absent.

There could be another reason that might lead to concentration in loan portfolios. Banks maintain a regulatory capital that is calculated using a standardized approach where banks allocate capital cushion against their exposures. This capital acts as a buffer against contingent losses. Banks might have the tendency to allocate capital and take risk assuming that this cushion is adequate to absorb all expected and unexpected losses and as a result banks with higher capital adequacy may not diversify. There is an inherent problem with estimation of capital adequacy using the standardized approach. The banks do not assess the repayment capacity of their borrowers for capital allocation and will follow risk weights suggested by the central bank. In case of unrated clients (which constitute the major portion of customers), they will allocate a 100% risk weight. Banks with good borrowers will have a higher capital charge, while banks with bad borrower quality will not have their risks adequately covered. Moreover, banks get no capital benefit for diversification in standardized approach. Therefore, banks might assume themselves to be risk remote by augmenting capital adequacy, simultaneously concentrating their portfolios in profitable sectors, which actually would result in hiding the credit risk under the rug and a single extreme event could burst the risk bubble resulting in contagion of bank failures.

In this article, we will study the relation of bank size, diversification and risk, using a panel of Pakistan's commercial banks from 2004 to 2009. The diversification to various sectors will be measured by the Herfindahl index; size will be proxy by the amount of total advances while bank risk would be estimated using asset quality measured by nonperforming loans ratio, the value at risk and the default likely indicator. The control variables for size and diversification are deposit ratio and equity to total assets while those for risk and diversification relationship would be non-interest expense to total assets, capital adequacy ratio and growth in GDP. Moreover, since NPLs are not likely to occur immediately after dispersion of the loan and only end of the year observations are available, we would introduce one lag of diversification (independent variable) to observe the impact of diversification on bank risks. We also contribute on methodological front and suggest robust measures for estimation of probability of default and value at risk.

Besides, Afzal and Mirza (2011), this is the only study that has employed these measures on Pakistan's dataset. We report some interesting findings which have critical implications for banking industry. Our results suggest that larger banks are better diversified than smaller banks. This is possibly because of outreach and size of advances portfolio for bigger banks. However, we could not find any relation between risk and diversification which is alarming because if banks do not perceive any benefit from diversification, the risk will continue to concentrate in credit books. An encouraging finding is significant relation between market risk measures and diversification reflecting market perception towards risk indicating that market discipline can play a role in strengthening the financial system.

The rest of the paper is organized as follows. Section 2 will present a brief literature survey, section 3 will discuss research methodology, and empirical results are presented in section 4, while section 5 will conclude.

2. Literature Review

Berger et al (2010) studied the performance of 88 Chinese banks between 1996 and 2006. Their analysis was based on concentration versus diversified activities of banks in four areas. The economies of diversification to these banks was based on profit premiums and cost discounts. The profit premium and cost discounts were the difference between profits and costs of actual banks and a hypothetical concentrated firm. The diversification possibilities were classified according to geography, loans, deposits and assets. The measures of diversification were regressed on bank specific factors of cost efficiency, performance, risk, size, ownership, and conglomerate affiliation. The findings suggested a negative impact of diversification on bank performance in all activity areas. They observed a declining profit premiums and augmented cost factors for more diversified banks. The diseconomies of diversification were low in foreign bank and conglomerates suggesting that such banks were able to mitigate some of the negative impact of diversification. These findings were interesting for emerging markets in general and China in particular that have a constrained policy on foreign ownership in domestic financial institutions.

Elsas et al (2010) investigated the impact of earnings diversification on the shareholders' wealth. Their sample constituted of 380 banks from nine developed economies for the years between 1996 and 2008. The earning diversification was measured using Herfindahl Hirschman index based on various streams of revenues. The firm specific factors included performance measures of ROA, ROE, spread, market based measures of cost of equity, market to book, beta and bank growth measures of vertical integration, equity growth, mergers and acquisition growth and organic growth. The results suggested that earnings diversification had a positive relation with bank profitability emanating from non interest businesses and cost efficiency. For the market based factors, they suggested that better bank performance leads to high bank valuations showing an indirect positive relationship between shareholders' wealth and revenue diversification resulting in conglomerate premium in banking sector. They noted that their results are in contradiction with the previous findings for two main reasons. Primarily, the positive relation between diversification and shareholder value is attributed to different measures of diversification that were used previously. Moreover, the literature tends to ignore diversification as an indirect source of value creation which was reported significant by Elsas et al (2010).

Rossi et al (2009) analyzed the impact of diversification on firm specific characteristic of banking risks, costs, profit efficiency and capitalization on 96 Austrian commercial banks between 1997 and 2003. The study tested the relation of diversification with three basic hypotheses including classical diversification, bank monitoring and economic capital. They reported a positive relationship of diversification with firm profits and a negative relation between diversification and banking costs and risks. They also observed that increase in diversification lowers the economic capital requirements for banks. The study further provided some evidence, albeit weak, on management behavior and luck hypotheses. The results suggested that well managed banks are likely to achieve cost and profit efficiency through diversification and such firms are expected to warrant low provisions reducing overall realized risk of the bank. Lastly, the exogenous economic shocks, termed as bad luck hypothesis, are likely to lower bank performance even if they are otherwise diversified.

Lepetit et al (2008) studied the impact of non interest revenue on the risk structure of banks. They used a sample of 734 listed and non listed banks in 14 European countries from the period 1996 to 2002. To capture the level of earnings diversification, they employ an income statement approach by taking proportion of net non interest income to total operating income. The non interest income was then further classified on the basis of commission, fee and trading income. The risk variables used were based both on accounting and market data. The accounting measures comprised of standard deviation of ROA, ROE and loan loss provisions to net loans. The insolvency risk was proxy by Z score. The market risk measures included systematic risk, standard deviation of weekly stock returns, idiosyncratic risk and distance to default. Among income statement risk factors, they found out that banks with higher level of revenue diversification were prone to higher risks. These results remained robust for market based risk measures with risk being higher for banks where revenue diversification is driven by commission and fee income. Considering the banks size, they reported that small banks were less risky when they complement their operating income by trading activities, while larger banks were less exposed to risk if diversification is mainly in commission and fee based revenue. They concluded that counter to common intuition trading activities do not increase the risk profile of a bank, rather for banks with constrained balance sheets they could lower the risks to asset quality and default.

Mercieca et al (2006) investigated the impact of diversification (earnings and credit portfolio) and bank size on risk adjusted performance and solvency risk of small European credit institutions. They included data from 15 countries comprising 755 small banks for the period between 1997 and 2003. The small banks were classified on basis of turnover and number of employees with a maximum of 50 million Euros in revenues and staff strength of less than 250 people. Herfindahl Hirschman Index was used to measure diversification while bank size was estimated by balance sheet assets. The risk adjusted variables of performance were ROA and ROE scaled by their respective standard deviations. To employ solvency risk accounting based Z score was used. The results suggested that earning diversification within or across sectors has no impact on small banks profitability. A negative relation was observed between non-interest revenue and profitability discouraging small banks to diversify into non core activities. The size variable was relevant for the performance with a positive sign on the coefficient depicting better performance for relatively bigger banks within the sample. In loans diversification,

risk adjusted performance was inversely related to diversification implying that banks with high loan concentration were more profitable in the sample period. Similarly, banks with less diversification had low solvency risk. They attributed these results to relationship banking and low outreach of small banks where diversification does not add value to the performance.

3. Research Methodology

3.1 Sample Criteria

This study will use unbalanced panel data of Pakistan's listed commercial banks between 2004 and 2009 to analyze the impact of loans and revenue diversification on performance and risk profile. Our sample will be selected on the basis of following criteria

Firstly, the sample period constitutes of post financial reform period of 2004 to 2009. This sample period also represent the time span when commercial banks were adapting the disclosure requirements proposed in pillar 3 of Basel accord. These requirements include disclosure of sector wise distribution of loan portfolios of commercial banks that is vital for our estimations.

Second, only public listed banks would be included with data available on balance sheet, income statement and stock prices for estimation of probability of default and value at risk.

Thirdly, the banks that were delisted or merged will not be included.

Based on these criteria, we get an unbalanced panel with a minimum of 21 banks for 2004 and a maximum of 24 banks in 2009. Table 1 represents our sample size for the study period.

Table 1: Sample Distribution 2004 – 2009

Year	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
No of Banks	25	25	25	24	21	21

3.2 Dependent and Independent Variables

This paper analyses the relationship between diversification and risk for the sample banks. We investigate three dimensions of this relationship. Firstly, as per common intuition, we investigate if banks with larger loan portfolios have better advances diversification than relatively smaller banks. Next, we study the impact of sectoral diversification of loans on the risk profile of bank based on accounting and market based risk measures. Therefore, we will have following regressions. These are reported in following equations

$$HIL_{it} = \alpha_i + \beta_1 \log(Adv_{it}) + \beta_2 \left[\frac{D}{TA}\right]_{i,t} + \beta_3 CAR_{i,t} + \varepsilon_{i,t} \qquad (1).$$

$$(NPL/Adv)_{it} = \upsilon_i + \gamma_1 (HIL)_{i,t-1} + \gamma_2 \left[\frac{OH}{TA}\right]_{i,t} + \gamma_3 CAR_{i,t} + \gamma_4 \Delta GDP_{i,t} + \zeta_{i,t} \quad (2).$$

$$(DLI)_{it} = \tau_i + \mu_1 (HIL)_{i,t-1} + \mu_2 \left[\frac{OH}{TA} \right]_{i,t} + \mu_3 \Delta GDP_{i,t} + \mu_4 CAR_{i,t} + \phi_{i,t} \quad (3).$$

$$(VAR)_{it} = \psi_i + \chi_1 (HIL)_{i,t-1} + \chi_2 \left[\frac{OH}{TA} \right]_{i,t} + \chi_3 \Delta GDP_{i,t} + \chi_4 CAR_{i,t} + \varpi_{i,t} \quad (4).$$

3.3 Loan Diversification and Size

To observe the impact of size of loan portfolio on diversification, we will regress Herfindahl index with log of advances (proxy for loan size) after controlling for direct and indirect sources of financing. The Herfindahl index (HIL) is calculated as under

$$HIL = \sum_{j=1}^{m} L_j^2 \ ,$$

where m represents the number of sectors to which banks would lend, L_j is the proportion of loan to sector j to total loans. In Pakistan, for reporting purposes, commercial banks have 34 sector categories so m will be 34 for each bank in our sample. The value of *HIL* will be between 0 and 1 with lower value representing higher diversification. Since, financing sources can impact the diversification decision we control for financing through deposits measured as proportion of deposits to total assets and capital by including capital adequacy ratio (CAR). Based on portfolio theory we expect a positive relation between loan size and diversification implying that bigger banks with larger loan portfolios should be better diversified owing to economies of scale and scope.

3.4 Risk Measures of Banking Firms

We employ both accounting (financial statements) and market based measures to explain the relation between risk and diversification. The independent variable will comprise of HHI to proxy diversification as explained earlier. The control variables will comprise of overhead to total asset and GDP growth rate, while for market based risk measures we will further control for capital adequacy. One point worth mentioning is use of lagged HHI for diversification. For accounting based risk factor we will use one lag of HHI because the non performing loans are recognized after some lag. In Pakistan, Prudential regulations require a loan to be classified as substandard when mark up/principal is overdue by 90 days, doubtful when overdue by 180 days and a loss must be recognized if advances are overdue for a year. Therefore, non performing loans will appear on financial statements after their aging. The accounting based dependent variable of risk will be proportion of nonperforming loans to total loans. This ratio is a book measure of credit risk for the bank which impact both income and financial strength of the firm. The market based risk estimates will comprise of distance to default indicators as suggested by Merton (1974), Black and Scholes (1973) and value at risk (VAR). The distance to default will be estimated using the iterative process of Vassalou and Xing (2004), while the value at risk will be estimated using a simulation based stochastic geometric

Brownian motion approach as used by Afzal and Mirza (2011). VAR is referred to as the maximum loss that is expected in a given investment horizon. The ex post volatility ignores the direction of the investment movement. The observed volatility can be high because historical prices might have witnessed an abnormal increase which is not an indication of distress. VAR is considered a more appropriate measure of risk because unlike standard deviation or volatility it only considers the left tail of returns. Therefore, we prefer VAR over beta to include idiosyncratic risk which is more relevant in this case.

The traditional risk theory suggests a positive relation between HHI and risk. A high value of HHI reflects low diversification and this could lead to high non performing loans and hence credit risk. Similarly, market participants should perceive a well diversified bank to be of low risk and market based risk measures should reflect this perception. The expected signs are reported in Table 2.

Table 2: Expected Signs of Coefficients

	Variables (Regressor)	**Expected Signs**
HH Index (Loans)	Size of Loan Portfolio Log(Total Advances)	-
	Deposits to Total Assets	-
	Capital Adequacy	+
Risks (NPL/Advances), DLI and VAR	Lagged Value of HHI	+
	Overheads to Total Assets	+
	Capital Adequacy	-

4. Empirical Results and Analysis

The descriptive statistics of our dependent and independent variables from 2004 to 2009 are presented in Table 3.

Table 3: Banks Descriptive Statistics

	VAR	Total Assets (Mlns)	Overheads / TA	NPLs / Advances	CAR
2004					
Average	6.73%	121138.4	2.22%	10.55%	17.41%
Median	6.51%	67890.5	1.99%	8.32%	12.89%
Min	5.42%	3686.8	1.29%	22.09%	8.16%
Max	8.21%	549740.8	3.45%	48.22%	71.01%
2005					
Average	6.65%	161982.5	2.46%	8.81%	11.98%
Median	6.22%	91502.4	2.14%	4.00%	11.18%
Min	5.27%	9618.4	1.40%	0.01%	3.47%
Max	8.81%	577719.1	4.88%	38.89%	21.91%
2006					
Average	9.86%	172556.5	2.55%	10.43%	13.52%
Median	6.56%	113773.4	2.29%	4.39%	11.66%
Min	3.12%	8178.7	1.44%	0.01%	3.61%
Max	29.68%	635132.7	7.27%	63.00%	29.68%
2007					
Average	6.35%	204357.0	2.72%	7.13%	16.73%
Median	5.66%	141277.4	2.50%	5.22%	11.46%
Min	3.82%	14447.5	1.21%	0.03%	0.00%
Max	19.27%	762551.8	6.19%	33.93%	65.43%
2008					
Average	10.27%	212027.0	2.99%	12.61%	13.50%
Median	7.84%	157782.5	2.70%	7.84%	10.62%
Min	5.30%	16487.3	0.07%	0.85%	0.36%
Max	27.63%	817758.0	7.87%	33.64%	55.13%
2009					
Average	9.45%	251784.4	3.12%	16.74%	15.41%
Median	8.54%	180865.4	2.79%	11.68%	13.25%
Min	4.83%	23734.1	0.65%	1.95%	0.56%
Max	18.75%	944232.8	6.14%	44.06%	57.04%

Table 3(Cont.): Banks Descriptive Statistics

	HIL	Deposits/TA	Advances (Mlns)	Advances / TA	DLI
2004					
Average	0.197	81.74%	66708.3	55.07%	2.36%
Median	0.174	80.61%	40599.3	59.80%	0.07%
Min	0.073	56.23%	4016.6	35.23%	0.00%
Max	0.299	86.23%	277919.1	62.74%	15.23%
2005					
Average	0.195	76.98%	92147.5	55.51%	5.10%
Median	0.199	77.77%	55526.0	56.41%	0.31%
Min	0.063	57.89%	3723.7	38.71%	0.00%
Max	0.342	89.61%	299422.8	64.73%	19.74%
2006					
Average	0.191	74.89%	100177.5	54.81%	5.66%
Median	0.174	75.11%	71991.5	57.66%	3.46%
Min	0.113	58.53%	2395.0	29.28%	0.00%
Max	0.372	86.88%	348370.5	63.38%	17.03%
2007					
Average	0.194	74.63%	111434.5	50.00%	5.22%
Median	0.155	75.74%	86623.4	53.41%	1.35%
Min	0.086	61.22%	3992.2	22.63%	0.00%
Max	0.476	83.06%	380751.2	63.70%	20.35%
2008					
Average	0.159	74.07%	128744.7	58.76%	3.97%
Median	0.139	74.40%	95790.4	60.76%	0.74%
Min	0.069	58.46%	6163.0	35.03%	0.00%
Max	0.336	88.25%	460244.7	82.42%	17.50%
2009					
Average	0.182	73.00%	124758.0	46.59%	3.78%
Median	0.155	75.77%	84021.4	48.47%	0.00%
Min	0.071	45.13%	9723.4	30.50%	0.00%
Max	0.423	84.79%	475243.4	62.26%	16.50%

The cumulative total assets of our sample banks have increased by 100% from 121bln in 2004 to over 251bln in 2009. Similarly, total credit portfolio of sample banks increased by 87%, from 66bln to 124bln during the sample period. The credit quality has deteriorated with average non performing loans to gross advances ratio of 16.74% in 2009 compared to 10.55% in 2004. This signifies that despite of increasing loan exposure, banks might not have realized proportionately high profits from credit books owing to increasing level of classified loans. The increasing loan exposure could be alarming if the credit quality is compromised as a result of adverse selection or low diversification. The overall risk profile of the sample banks increased with average value at risk of 6.7% in 2004 to 9.4% in 2009. The default likely indicator increased from 2.3% to 3.8% from 2004 to 2009. Since, value at risk and default likely indicators are computed from market based information, the investor risk perception about banking firms have increased. The risk absorption capacity has reduced with a capital adequacy ratio of 17.4% in 2004 to 15.4% in 2009. The reduction in CAR coupled with augmented NPLs is indication of deteriorating risk absorption for the sample banks.

These variables could have a large variation depending on the bank size. In Pakistan top six banks account for 56% of banking assets. Table 4 presents average statistics for our sample period on basis of bank size (top six vs. rest of the banks).

Table 4: Descriptive Statistics - Top Six vs. Rest of the Banks (2004 - 2009)

		Total Assets (Mlns)	Overhead to Total Assets	NPLs to Gross Loans	HIL	VAR	CAR	DLI
Top Six Banks	Average	446534.9	2.5%	8.3%	0.12	6.8%	13.2%	10.0%
	Median	408324.7	2.5%	9.1%	0.12	6.4%	12.3%	9.8%
	Min	267639.7	2.0%	3.6%	0.09	4.3%	9.4%	2.2%
	Max	701108.8	2.9%	12.3%	0.17	21.9%	17.8%	20.6%
Rest of the Banks	Average	74702.1	3.0%	11.1%	0.21	9.3%	17.0%	2.3%
	Median	53987.2	2.8%	7.1%	0.18	7.9%	11.5%	0.2%
	Min	13742.3	1.5%	0.8%	0.11	3.1%	4.2%	0.0%
	Max	195078.2	5.8%	38.5%	0.48	29.6%	42.6%	11.3%

Concentration index (HHI) for bigger banks is 0.12 as compared to 0.21 for smaller banks. This signifies that banks with larger advances are better diversified than smaller banks. The capital adequacy ratio based on standardized approach (as applicable in Pakistan) is 13.8% for larger banks while it is 17.0% for remaining banks. It is likely that relatively smaller banks with high concentration of their advances portfolios are trying to mitigate their concentration risk with an approximation cushion of CAR. The risk based indicators of NPLs to total loans and value at risk are low for the top six banks implying low risk as compared to rest of the banks. The larger banks depicted marginally better

efficiency with overheads to total assets of 2.5% as compared to remaining banks that have an average ratio of 3%.

Given the large numbers of variables it is least likely that, despite being a random variable, α is uncorrelated with any of the independent variables. Therefore, assumption of random effect would be too stringent and appropriate regression would be using fixed effects. The fixed effect regression results for loan diversification are reported in Table 5.

Table 5: Hirschman Herfindahl Index (Loans)

Variables	Coefficient	Std. Error	t ratio	p value	
Log (Advances)	-0.021	0.007	-3.113	0.002	***
Deposits to Total Assets	-0.141	0.062	-2.285	0.025	**
Capital Adequacy	0.002	0.000	3.766	0.000	***
Constant	0.134	0.123	1.091	0.280	
Adj R - Squared	0.393				
F Stats	2.718				
P Value (F)	0.000				

We observe negative coefficient for size of loan portfolio and deposit to total assets while a positive coefficient for capital adequacy. The negative relation between size of credit portfolio and concentration index implies that banks with higher advances portfolio are better diversified (low HHI value) as compared to banks with moderate or low exposure to advances. The larger banks have higher economies of scope and they can tap diversified sectors with higher outreach as compared to banks that are constrained with size. Moreover, such banks on basis of revenue volumes can afford to earn relatively low profits from certain sectors if the economic value of diversification is high. The coefficient on deposits to total assets is interesting to interpret. The banks with more reliance on deposits as source of funds are better diversified with low value of HHI. Therefore, banks practice prudent asset liability management by investing core sources of funds in diversified credit portfolio. The capital adequacy provides an approximate cushion against credit, market and operational risks and it is not surprising that banks with high cushion, albeit approximate, have a low tendency to diversify. All coefficients are statistically significant at 95%.

The regression results for non performing loans as measure of accounting based risk are reported in Table 6.

Table 6: Non Performing Loans to Gross Loans

Variables	Coefficient	Std. Error	t ratio	p value	
HHI Loans	0.042	0.047	0.906	0.367	
Overheads to Total Assets	0.100	0.028	3.558	0.001	***
Capital Adequacy	0.000	0.000	-5.294	0.000	***
GDP growth	-0.115	0.055	-2.101	0.036	**
Constant	0.022	0.042	0.523	0.601	
Adj R - Squared	0.249				
F Stats	7.309				
P Value (F)	0.000				

The regression results did not give a significant coefficient for diversification variable, while overhead to total assets and capital adequacy were significant. The coefficient on capital adequacy is negative representing that banks with higher capital adequacy are experiencing low loan losses. The insignificant relation between non performing loans and diversification reflects that banks find no benefit from diversification. These two results are alarming for the risk taking behavior in commercial banks. If banks find no benefit from diversification they will be tempted to extend credit to selected profitable sectors building up credit risk in their portfolios. Secondly, the significant coefficient on CAR represents that banks are assuming risk on the basis of regulatory capital. In Pakistan, banks are following a standardized approach for allocation of risk weights and based on this "one size fits all" approach, 100% risk weights are assigned to all unrated corporate sector clients. This will understate the risk of exposures that have constrained repayment capacity while at the same time would require an overstated capital charge for good borrowers. Moreover, CAR is capital allocation not only for credit risk but also against other risks including market and operational. This will result in a moral hazard for the banks, if they assume CAR as a cushion against loan losses, banks can walk away from diversification by maintaining higher regulatory capital. This will result in piling up credit risk in advances portfolios of the commercial banks.

The insignificance of diversification benefits for banks has a policy implication for central bank. This entails that State Bank of Pakistan should encourage banks to move to an internal rating based approach, as proposed by Basle II, that provides banks with better risk coverage of their clients. The internal rating based approach also provide implicit diversification benefits in calculating regulatory capital by considering correlation within assets and explicit benefits against liquidity risk through advanced measurement approach. Adapting these internal risk modeling approaches will encourage banks to diversify their credit portfolios. The regression results for market based risk variables are reported in Table 7 and 8.

Table 7: Default Likelihood Indicator

Variables	Coefficient	Std. Error	t ratio	p value	
HHI Loans	0.002	0.000	11.353	0.000	***
Overheads to Total Assets	0.106	0.044	2.412	0.016	**
Capital Adequacy	0.000	0.000	-2.670	0.008	***
GDP growth	-0.073	0.264	-0.276	0.783	
Constant	0.082	0.139	0.587	0.558	
Adj R - Squared	0.177				
F Stats	5.228				
P Value (F)	0.000				

Table 8: Value at Risk

Variables	Coefficient	Std. Error	t ratio	p value	
HHI Loans	0.132	0.045	2.896	0.005	***
Overheads to Total Assets	0.152	0.013	11.326	0.000	***
Capital Adequacy	-0.076	0.027	-2.791	0.005	***
GDP growth	-0.069	0.057	-1.202	0.229	
Constant	0.154	0.123	1.249	0.215	
Adj R - Squared	0.182				
F Stats	8.251				
P Value (F)	0.000				

Since market based risk measures are based on market perceptions it is not surprising that we find a significant relation between diversification variable and value at risk and profitability of default. The market places a higher risk for banks which are concentrated in their credit positions while they place a low risk for banks which are better diversified. The control variables of overhead to total assets and capital adequacy are also significant implying relevance of capital adequacy as overall risk absorption cushion and operational inefficiencies as a factor that contributes towards risk. All factor loadings are significant at 95%.

5. Conclusion

The aim of this article was to analyze two propositions about risk and diversification. Primarily, we examined if larger banks are better diversified than smaller banks. Secondly, we investigated if banks find any benefit in diversification. We analyzed this proposition by observing if diversification results in risk reduction. The risks that were

considered consisted of both accounting and market based risks, while we used Hirschman Herfindahl Index to capture sectoral diversification.

The result on bank size and diversification were not surprising and we observed significant relation between larger banks and diversification index. Larger banks were better diversified than smaller banks and this is understandable because of their outreach coupled with strong capacity to mobilize funds. However, the results were surprising for the impact of diversification on risk. We could not deduce a significant relation between diversification and non performing loans suggesting that banks will find no economic benefit by diversifying their advances portfolio and this will bring a moral hazard. Banks will not diversify and concentrate on prime borrowers to maximize profits ignoring the risk. Moreover, we observe significant coefficient on capital adequacy ratio signaling that banks at large are relying on capital adequacy as the cushion and continue to pile up risk in their portfolios. The credit portfolio will become riskier and riskier and one extreme event could trigger a systemic failure. The market based risk measures showed a positive relation with diversification reflecting investors' concerns about diversification vis-à-vis banking credit risk. There is a strong policy implication for risk management that should be considered by the central bank. In Pakistan, the central bank is not aggressively pursuing the implementation of Basel II. Initially, major propositions were scheduled to be adapted by 2008 but due to lack of technical expertise and inconsistent preparation on account of commercial banks, SBP relaxed this deadline and now banks are allowed a transition to Basel II at the pace of their convenience. However, at minimum, SBP should seriously consider a transition of one size fits all standardized approach to internal rating based approach which provides diversification benefits in calculating regulatory capital. If banks get economic benefits from diversification they will attempt to diversify their portfolios that will lower the risk profile of credit portfolios enhancing the strength of financial system.

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