check for updates

EVIDENCE OF NON-LINEAR RELATIONSHIP BETWEEN NON-INTEREST INCOME AND PROFITABILITY OF COMMERCIAL BANKS IN PAKISTAN

Check for updates

ID **Iraj Noor**[1+]
ID **Danish Ahmed Siddiqui**[2]

[1]Research Scholar Karachi University Business School, University of Karachi, Pakistan
Email: iraj.noor23@gmail.com Tel: +923323123375

[2]Associate Professor Karachi University Business School, University of Karachi, Pakistan
Email: daanish79@hotmail.com Tel: +923333485884

(+ Corresponding author)

ABSTRACT

Pakistan's commercial banks are lately facing hindrance in earning substantial profits due to low-interest rates and low-interest margins on Government Securities which is evidently reflected in the low Earning per Share and low share prices of commercial banks. To confronting this, the banks are forced to diversify their income. The past studies show the mixed inferences about the reliance on non-interest income can be profitable for commercial banks in Pakistan's case. This research fills the gap for the existence of a non-linear relationship between the non-interest income and profitability of banks in Pakistan. Threshold Regression Model is applied on a panel data of 13 commercial for the period 2007-2017. The results have shown that optimal diversification benefit can be attained by reaching to a certain level of non-interest income proportion. The findings of the study are: (1) there exist a single threshold, confirming the non-linear relationship between the Non-Interest Income ratio (NIR) and profitability (ROE). (2) The NIR impacts positively on profitability (ROE) when NIR (≤61.1%) and beyond this value i.e. NIR (>61.12%) the relationship is negative. The study can help the Pakistani banks in exploiting their maximum level of diversification and in earning large profits in unfavorable times.

Contribution/ Originality: This study investigates the non-linearity in the relationship between Non-Interest Income for banks in Pakistan and their profitability to exploit the optimal level of non-interest income ratio in order to diversify income profitably.

1. INTRODUCTION

1.1. Background to the Study

The banks in broader sense generate their revenues in the form of interest and non-interest income. Both of the sources are mainly altered by internal and external factors as suggested by the study of Gul *et al.* (2011) that both internal and external factors have significantly strong relations with the profitability of the banks in Pakistan.

Recently the low-interest rates along with low-interest margin on Government Securities imposed by the existing government made a dip in the interest income of the banks in Pakistan which impacted the profitability of the banks. This also reflected in the lowering earning per share and low share price of the banks in the few years. To coup up with it, banks are aiming for non-interest income more.

14

The financial globalization has developed so much that it is apparent for banks to benefit from the diversification of tradition business because of the competition they are confronting and to have some ground providing cushion for the credit risk. It also seems that non-interest income is more volatile and low risk-adjusted than interest income. But this doesn't mean that one cannot take benefit from it if not going too far and seeing it as complementing the core income source not supplementing it. The banks seem to depend on non-interest income more when their net interest margins are low and use non-interest income as an implement of marketing by reducing fees and service charges to attract customers and remain competitive in the market. So this makes sense that maybe if there is a negative correlation or weak correlation between interest and non-interest income and the banks can benefit from relying on non-interest income as generating higher profits. The non-interest income contains (1) proceeds generated as fees and commission against the financial services and consultation, by introducing new products and services. (2) Trading revenues and (3) improve income from gains or losses of exchange and profits or losses from changes of fair value and other business. It also seems that trading revenues are very volatile and it makes non-interest income more erratic than interest income. Besides all of the doubts, there are empirical evidence (Vithyea, 2014; Senyo et al., 2015) that are suggesting that banks profitability can be enhanced by reliance on non-interest income in a period of low-interest rates.

1.2. Problem Statement

Since banks tend to rely more on non-interest income, their profitability would also depend upon the fluctuations in non-interests income and the factors that affect those fluctuations. This is more pertinent in view that non-interest income is more volatile. Hence increases the riskiness of the banking sector. Banks during the times of low interest margin seeks more income from shifting their activities towards generating non-interest income. But the banks can't just earn the revenue without bearing the cost of it and it is said that the return generated from non-interest activities is more than offset by the cost of it. For this, banks should be careful when it comes to investing their resources in traditional activities, it should be efficient and effective. Banks should focus more on those areas of non-interest activities that contribute to less volatility. Furthermore, banks should consider their expertise when expanding their business plus center their endeavors to be more proficient in the areas in which they are not well skilled. In case of being more diversified, banks have to be vigilant about the increased risks as expanding businesses expands the array of risks, try not to be missed out on the investment opportunities. Because losing the non-interest income would ultimately make the banks to drop on total income especially in regimes of low-interest rates. Recently this has been observed in dropping earning per shares and share prices of commercial banks in Pakistan and reason reported is lower non-interest income along with low-interest income.

1.3. Gap Analysis

Smith et al. (2003); De Young and Rice (2004); Stiroh and Rumble (2006); Mndeme (2015); Trivedi (2015) explicitly stated that non-interest income can't be counted on as a reliable income source and can't replace the core-business income for commercial banks. But lately, there are many types of research claiming that non-interest income has a productive influence on the performance of banks and helps them in reducing their risk and the banks should consider generating more income from non-interest activities (Sanya and Wolfe, 2011; Govori, 2013; Saunders et al., 2016). There are studies (Govori, 2013; Vithyea, 2014; Senyo et al., 2015) claiming that especially in the times of depression banks can find buffer against credit risk and manage to increase their liquidity by increasing their non-interest income. In Pakistani context, Ismail et al. (2015); Aslam et al. (2015) empirically proved that non-interest income can expand the growth of business, profitability, and diversification for commercial banks while the study of Raza et al. (2013); Afzal and Mirza (2012) contradicts these claim. All of the mentioned literature has inferences using linear modeling that did not take into account the limited benefit of non-interest income. They seek whether the non-interest income is profitable or not. In order to take into account the feature of limited benefit, the

non-linear approach of modeling seems to be more appropriate than linear. For the sake of it, this paper moves forward a step further and is inferring the relation between the proposed variables using the non-linear approach of modeling. Hence, this paper explores the non-linearity in the relationship between non-interest income and the profitability of commercial banks in Pakistan which is hardly explored in this context so far. The Non-linear model is earlier adapted by Sun *et al.* (2017) on this subject. They took Hansen's Model of Panel Threshold Regression (briefly discussed in section.4) and split their data into three intervals; taking two thresholds. Then they observed the changing effect of NIR on ROE in those threshold intervals. They found the association between the two variables is found to be negative but the negative coefficients reduce after excelling each threshold. This means that the negative association weakens as the non-interest income ratio grows further. Their results still lack the evidence of limited benefit and fail to find the optimal point of benefit attained by diversifying into non-interest income. Moreover, no such endeavor was done on Pakistan. Being a developing country, Pakistan may offer new insights on this non-linearity phenomenon. This paper allowed for the turning points in the relationship between the two variables and determining the optimum level of income diversification since most of the researchers used linear model and concluded on the basis of their results which are contrary to each other and inferred mixed views about going for the income diversification.

1.4. Research Objectives and Significance

The objective of this research is to explore the presence of a non-linear relationship between Non-Interest Income and profitability of banks as to determine the optimal level, a commercial bank can reach in order to fully take advantage from diversifying their income. It is concluded by Ismail *et al.* (2015) that greater number of Pakistani commercial banks has not attained the position of utmost diversified income. Either the banks mostly focused on interest income or the non-interest income, they don't seek the balance that can get them the greater benefit in terms of profit from diversification in times of adversity. The examination of non-linearity between the two variables caters the assumption of changing the effect of Non-Interest Income proportion on the profitability of commercial banks. This paper helps the commercial banks in Pakistan to get an idea of maximum limit that they can reach to profitably diversify their income.

1.5. Research Question

Since the perception of greater the non-interest income, greater the profitability of banks is not right as discussed in the above sections. This leads to the query if there is a limited benefit that can be attained from diversifying into non-interest activities then what is the optimal limit for it? What is the maximum level for the non-interest income proportion that can be exploited as an income diversification benefit? The hypotheses of the paper are, (1) there exists non-linearity in the relationship between non-interest income ratio (NIR) and profitability of banks? If there exists then (2) what are the effects of structural change in NIR on the profitability of commercial banks in Pakistan?

1.6. Outline of the Study

In this paper Panel Threshold model is used to test non-linearity and to estimate threshold points (points of structural change) on the data of 13 commercial banks as panels over the period of 2007-2017. The data is collected from the financial reports of the banks provided on their websites. All of the empirical work is derived from Stata. Return on Equity (ROE) as profitability indicator is the response variable in the model and Non-Interest Income Ratio (NIR) as explanatory variable, other control variables are Capital Adequacy Ratio (CAR) and Non-performing Loan Ratio (NPLR). Generalized Least Square Regression represented as No-Threshold model is also calculated to compare with the Threshold Regression model and observe the behavior of all explanatory variables on the dependent variable (ROE) with no threshold effect. Section 2 discusses the literature of the studies that have been

established in the past in the same context. Section 3 constructs the theoretical framework of how non-interest income makes a difference in the profitability of banks. Section 4 discusses the methodologies in detail. Then the following section 5 discusses the result derived from the proposed models in the paper. Detailed discussion on results validating/contradicting past studies is presented in section 6 and then in the last conclusion and recommendations are given in section 7.

2. LITERATURE REVIEW

Past researches on this subject banks (Smith *et al.*, 2003; De Young and Rice, 2004; Stiroh, 2004; Stiroh and Rumble, 2006; Mndeme, 2015; Trivedi, 2015) explicitly stated that non-interest income can't be counted on as a reliable income source and can't replace the core-business income for commercial banks, either because of high correlation between non-interest income and interest income or presence of greater volatility than interest income. Non-interest income can be complementary used with interest income which happens to be the core business for the commercial. Mndeme (2015) reported his study that counting on non-interest income can severely affect the banks' profitability. Some agree with the idea that although non-interest income influences the profitability in a positive manner its impact is not essentially significant for risk-adjusted measures and hence considered fluctuating income source (Trivedi, De Young, and Rice). It is suggested that banks with good management tend to move slowly into non-interest income activities (De Young and Rice). But lately, there are many types of research claiming that non-interest income has a productive influence on the performance of banks and helps them in reducing their risk and the banks should consider generating more income from non-interest activities (Sanya and Wolfe, 2011; Govori, 2013; Saunders *et al.*, 2016). There are studies (Govori, 2013; Vithyea, 2014; Senyo *et al.*, 2015) claiming that especially in the times of depression banks can find buffer against credit risk and manage to increase their liquidity by increasing their non-interest income, found in case of Cambodia, Kosovo & Ghana respectively.

In Pakistani context, Ismail *et al.* (2015) and Aslam *et al.* (2015) empirically proved that non-interest income can expand the growth of business for commercial banks while the study of Raza *et al.* (2013) contradicts these claim and said that non-interest income has a significantly negative impact on profitability. Afzal and Mirza (2012) claimed that non-interest income can't be associated with risk reduction. There has to be a balance between interest and non-interest income in order to have profitably diversified income (Ismail *et al.*, 2015) signifying the limited benefit of income diversification. All of the above discussion establishing the sense of limited advantage from non-interest income, as sticking to core business (lending money) guarantees more stable and reliable income and assures profitability for banks and in order to seek more income sources one should be very vigilant about moving into non-traditional activities, taking it as complimentary & not counterbalancing.

This section discusses the conclusion of past studies establishing the association between Non-Interest Income Ratio (NIR) and profitability (ROE) of banks for Pakistan's case and for globally. There are mixed views about the effect of non-interest income on profitability and considering it a reliable and stable source to go for income diversification. Some literature is reported below.

Stiroh (2004) studied the linkage between on non-traditional operating income of U.S. banks and their performances at both aggregate and individual bank level and suggested prudence from increasingly relying on the non-interest income because it is more volatile and correlated with the interest income, signifying little diversification benefits from shifting towards non-traditional business activities. Davis and Tuori (2000) stated that the relation of profitability and non-interest income inclines to be positive for less restricted financial systems. Smith *et al.* (2003) supported the idea that income produced by non-interest activities does stabilize profits for most European countries' banks in the years 1994 to 1998 but not for all types of banks. It is negatively correlated with interest income however more volatile and does not fully counterbalance the decrease in interest income. Furthermore, De Young and Rice (2004) took data from 1989 to 2001 of U.S. commercial banks and concluded that banks with good management move slowly into non-interest income activities because although there is an

association of a marginal increase in non-interest income and higher performance there is a poor trade-off of risk and return. Mndeme (2015) wrote in his paper that greater reliance on non-interest income unfavorably affected the performance of all the categories of banks in Tanzania. Trivedi (2015) in his article inferred that enhanced non-interest income share has an essential positive effect on profitability but not on a risk-adjusted one hence does not assure the stability of returns.

However, on the other side, the investigation of Saunders *et al.* (2016) deduced with larger sample of U.S. banks, data from 2002-2013, that higher non-interest income ratio is linked with high profitability and lower risk. Sanya and Wolfe (2011) provided evidence that shifting towards non-interest income improved not only profitability but also reduced liquidity risk. Alpera and Anbarb (2011) empirically supported that non-interest income has a positive and notable impact on the profitability of banks in Turkey. Govori (2013) wrote in his paper that rates of return of Kosovo's commercial banks are directly and significantly impacted by non-interest revenues and banks of Kosovo should go for a stream of diversified income to provide some cushion for the credit risk. Vithyea (2014) investigated the contribution of non-interest income in profitability of Cambodian banks and stated that in the period of depression, for higher profit banks should focus on non-traditional activities more because taking more weight on traditional activities might make banks to suffer from default loan by more exposure of credit risk. But it is also suggested that off-balance sheet activities and fees charged against services should also be carefully observed because some banks might encounter low transaction concentration in a period of less growth. Misra (2015) paper also go with the same statement that non-interest income has a significant impact on the return on assets (ROA) and return on equity (ROE) depicting the profitability of the banks in India. Sun *et al.* (2017) took panel data of 16 commercial banks of China for the period 2007-2013 and found that the relation between non-interest income and profitability of banks has structural change. Their paper stated that crossing the two threshold values, the negative relation between non-interest income and profitability weakens and the coefficients tend to be zero and might even be positive as rising the non-interest income ratio. This supports the idea of non-interest income benefiting profitability. Gichure (2015) stated that there is an insignificant and negative relationship between non-interest income and profitability for banks of Kenya rejecting the idea of non-interest income as profitable income diversification. Ozek (2017) confirmed the positive relation of non-interest income with high profitability for commercial banks in Turkey. Chinese researchers (Sheng and Wang, 2008) believe that the increase of the non-interest income proportion can productively enhance the performance of the business for banks. Senyo *et al.* (2015) stated in their article that non-interest income has an additive role in the periods of low-interest income, in the context of Ghana.

There are some studies conducted prior, establishing the relation of the two variables for Pakistan's case. Like (Ismail *et al.*, 2015) reported that non-interest income can profitably diversify the income for banks of Pakistan. Aslam et.al also provided evidence supporting the positive relation of non-interest income and growth of the business. On the contrary, Raza *et al.* (2013) stated that non-traditional business activities have a significantly negative association with the profitability of banks in Pakistan. Afzal and Mirza (2012) deduced that banks cannot benefit from the income diversification as it has no essential relationship with the risk reduction.

All of the above literature inferred using linear modeling. This paper moves forward a step further and is inferring the relation between the proposed variables using the non-linear approach of modeling. The idea is to find the existence of non-linear association by introducing threshold points and determining their significance then observes the impact in those changing structural points. For this, a panel of 13 banks is constructed for the period of 2007-2017. Panel Threshold Regression Model is applied and the results are compared with the Generalized Least Square Regression's result as the comparison of the threshold model with no-threshold model.

3. THEORETICAL FRAMEWORK

Following are the ways Non-Interest Income Effects on the Profitability of Commercial banks.

18

3.1. Increased Stream of Revenues and Expenses with the Inclusion of Non-Interest Income

The obvious two streams of earning revenues for banks are interest income generating activities and non-interest income generating activities. When the banks confront limitation from perceived competition and the regulatory restrictions, the banks pursue non-interest income as an augmented source. Non-interest income earns income by (1) proceeds generated as fees and commission against the financial services and investment consultation, by introducing new products and services. (2) Trading revenues and (3) from gains/losses of exchange, changes in fair value of assets and other business. It also comes with the expenses like salary for labor, marketing and administration cost. The banks need to employ teams to market new services and attract clients. All of this cost is more than what comes with the core business of the banks which is lending loans. Plus changes in market factors affect the returns from investment in bonds and in stocks. This ultimately affects the overall income for the bank. Banks then need the expertise to manage the possible risk and be prudent about market changes.

3.2. Increased Volatility of Returns of Non-Interest Business

There is evidence of higher volatility induced in the non-interest income. It is said that non-interest income business has a poor trade-off between risk and return and provides low risk-adjusted returns than the interest income. All of these conclusions made ground for doubt about stabilize income. The reasons why non-interest income is volatile are illustrated by some researchers: 1) Non-interest income business does not pledge fixed assets as security and hold regulatory capital in case of loss. So this increases the risk associated with the return on non-interest activities. 2) Switching cost is much lower than that of a cost bearing with interest income as these activities do not base on the relationship. 3) The cost for generating non-interest products is mostly either fixed or quasi-fixed; that increases with no of labors increased rather than variable so this makes the non-interest income to bear more operating leverage than the interest income. All of these aspects are accounted for the increased volatility of the non-interest income.

3.3. Increased Operating Risk with Non-Interest Income Business

Non-interest income business expansion requires investing in labor and facility which constitutes its expense, most fixed. This makes high operating leverage induced than the interest income business. When the profit for industry drops, this severely influences the profitability in an adverse direction, increasing the operating risk for non-interest income business.

Developing innovative and new products and services also contribute to the cost of non-interest income business. The new product and services should also be able to be changed along with customer needs and more types of businesses make it complex for the banks to manage properly also increased the management cost for it. Non-interest Income can move in the direction of increasing total income in the beginning but with the expansion of it, it's per unit cost also increases rather than it's per unit income so the increased operating cost leads to lower net income. It is found that banks with a relatively higher or lower ratio of interest income can perform more efficiently. Another view also holds that increased commission income to overall income can adversely affect the profitability of banks.

4. RESEARCH METHODOLOGY

4.1. Panel Threshold Model

To take into account the possible structural change in the relationship between non-interest income and the performance of the commercial banks, the threshold points are introduced to form a specific model. This will help in capturing the effect of threshold which is the state in which the proposed variables are associated with each other in a way and after crossing that value (threshold point) the association changes into another. In this case, the

association of profitability (ROE) of banks and non-interest income ratio (NIR) is to be found when *NIR (≤ γ)* and *NIR (> γ)*. The data used in this paper has multiple individuals (banks) observed over multiple years so the model applied is Panel Threshold Model. The model is proposed by Hansen (1999). Hansen developed a technique that is more appropriate for threshold regression applicable on panel data. He applied his technique to investigate the changing effect of cash flows on investment for firms differing in extent of financial constraint. His theory implies that firms which are debt-constrained have cash flows positively related to their investment as they finance their investment out of their cash flow otherwise the cash flows are irrelevant to the investments because the firms then can easily borrow from the market of external financing. Also, banks are not willing to finance firms having large debts. This theory is contrary to the classical models of the firms supposing the presence of perfect financial markets which provide the needed sources for the investment projects. This problem was earlier addressed by Fazzari et al. (1988) he divided the firms into groups according to the hypothetical level of dividend to income ratio and observed whether the effect of cash flows on investments of each group of firms differs or not. They proposed that firms that pay a low dividend are retaining their earnings more because they are facing limitations from the external financial market, hence are financially constrained. Hansen (1999) pointed out two problems with Fazzari et al. (1988) model 1) assuming dividend to income ratio as an exogenous variable while it was actually an endogenous variable treated as threshold variable and might have biased the results. He used debt level instead as a threshold variable which is exogenous in nature showing the debt-constrained firms. 2) Fazzari et al. used a hypothetical value of dividend to income ratio for each group of firms rather than estimating it from the sample. Hansen estimated the values of the threshold variable through boot strapping technique. The model of Hansen (1999) has two benefits in comparison with the earlier Threshold Effect Regression Model. First, the endogenous variables and exogenous variables are not needed to be separated in this threshold regression model, so the dependency of threshold and estimated parameters only lies on endogeneity. Second, asymptotic distribution theory is proposed by this model to find the confidence interval of parameters along with the statistical significance of the threshold points, estimated by the model.

The model of this research is based on Hansen's Panel threshold model to determine the association of non-interest income and profitability of banks. The specific single threshold model is written as follows:

$$y_{it} = u_{it} + x'_{it}\beta_1 + e_{it}, \ q_{it} \leq \gamma \qquad (4.1.1)$$

$$y_{it} = u_{it} + x'_{it}\beta_2 + e_{it}, \ q_{it} > \gamma \qquad (4.1.2)$$

In the above equations, the letter *i* indicates banks, *t* indicates years, y_{it} indicates dependent variable, x'_{it} is an independent variable vector of order $p \times 1$. q_{it} is the threshold variable which is, in this case, non-interest income ratio (NIR). Besides NIR the other explanatory variables are CAR (Capital Adequacy Ratio) and NPLR (Non-Performing Loan Ratio). The response variable used in this paper is ROE (Return on Equity) as the measure of profitability.

Since we are taking NIR as a threshold variable so it plays its role as a regime dependent variable and segregates the data into groups where the regime changing effect can be observed. Particularly for single threshold model, the different regimes are indicated by two states where the threshold variable is lower than the specific value and where the threshold variable is greater than the specific value.

Di (γ) is defined as a dummy variable which equals to ($q_i \leq γ$) or and (·) is indicator function. This indicator function divides the data into 0 and 1. It indicates 0 when ($q_i \leq γ$) and indicates 1 when ($q_i > γ$).

This makes the above equation expressed as follows:

$$y_{it} = u_{it} + x'_{it}\beta + x'_{it}d_{it}(\gamma)\theta + e_{it}, \ e_{it} \sim iid \ (0, \sigma^2) \qquad (4.1.3)$$

In this, β = β₂; θ = β₁ − β₂. With any estimated threshold value, we can get the model fit and find the residual sum of squares (RSS). Following Hansen, the value that minimizes the RSS we take that value as the optimal threshold. The model for this research is proposed as follows,

20

$$ROE_{it} = u_{it} + \beta_1 \, CAR_{it} + \beta_2 \, NPLR_{it} + \beta_3 \, NIR \, (q_{it} \le \gamma) + \beta_4 \, NIR \, (q_{it} > \gamma) + e_{it} \; , \; e_{it} \sim iid \, (\, 0, \sigma^2) \qquad (4.1.4)$$

4.2. Test for the Threshold Effect

In this test, it is considered that there is no threshold, one threshold, two thresholds or triple thresholds. The F_1 statistics is used to check first for no threshold against one threshold. Since the threshold value is not known so bootstrapping is used to approximate the asymptotic distribution and then the p-value is found. If F_1 is rejected in favor of one threshold then one threshold is further tested against two thresholds and so on.

$$F_1 = \frac{S0 - S1 \, (\gamma)}{\sigma 2 \, cap} \qquad (4.2.1)$$

Here, S_0 is RSS derived under the null hypothesis. Under the second null hypothesis the maximum likelihood ratio statistics are.

$$LR_1 \, (\gamma) = \frac{S \, (\gamma) - S(\gamma)}{\sigma 2} \qquad (4.2.2)$$

Hansen provided a simple formula to calculate a rejection region. If $LR_1 \, (\gamma) \le c \, (\alpha)$ the null hypothesis cannot be rejected where $c \, (\alpha) = -2 \ln (1 - \sqrt{1 - \alpha}\,)$ where α is the significance level.

4.3. Hausman Test of Endogeneity

Hausman Test of endogeneity (Hausman, 1978) also illustrated as the Hausman test for specification, is used to choose between the model of fixed effect and the random effect model. This selection is grounded on the information about the presence of endogeneity in the independent variables i.e. correlation between the error term and the explanatory variables in the panel data model. The estimators of these two models (i.e. fixed effect model and random effect model) depict specific properties which are; random effect estimator is efficient, consistent and unbiased if there is no endogeneity in the explanatory variables in the panel data model (means $Cov(e, x_i = 0)$) and fixed effect estimator is efficient, consistent and unbiased if there is endogeneity in the explanatory variables (means $Cov(e, x_i \ne 0)$). The formula for Hausman statistics is $(B_{fe}-B_{re})'[(V\_B_{fe}-V\_B_{re})^{\wedge}(-1)](B_{fe}-B_{re})$. This statistics is Chi-square distributed and is critically valued against $\chi^2 \, (k)$, where k is the degree of freedom equal to the number of factors. The null hypothesis under this test is H_0 = There is no systematic difference between the estimators of the Fixed Effect Model and Random Effect Model i.e. random effect model is preferred. While the alternate hypothesis is H_1 = There is a systematic difference between the estimators of the Fixed Effect Model and Random Effect Model i.e. fixed effect model is preferred. The test statistics is chi-square χ^2. The decision is made on the basis of corresponding p-value; if the p-value is greater than 0.05 we accept the null hypothesis concluding there is no endogeneity.

5. RESULTS

Stationarity of every variable is required when panel threshold regression model is opted to use. This is because panel data has time series element besides having cross-sectional. Since there is a time series component (of longer period) it is necessary to test for stationarity (means no trend, no seasonal fluctuations and constant variance over time) in order to get consistent results. For this Levin-Lin-Chu test of unit, root is used. The null hypothesis is there is unit root in the panel and the alternate hypothesis is there is no unit root in the panel. All the variables are stationary at a level as p-value of all variables is less than $\alpha = 0.05$ level of significance. This rejects the null hypothesis in favor of alternate, which is that the panels are stationary.

Table-5.1. Unit Root Test for Stationarity of Variables (ROE, NIR, CAR, NPLR).

Levin-Lin-Chu unit-root test for all variables		
Ho: Panels contain unit roots	Number of panels = 13	Panel means: Included
Ha: Panels are stationary	Number of periods = 11	Time trend: Not included
AR parameter: Common	Asymptotics: N/T -> 0	ADF regressions: 1 lag
LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)		
ROE	**Statistic**	**p-value**
Unadjusted t	-7.5543	
Adjusted t*	-3.6839	0.0001
		α= 0.05
NIR	**Statistic**	**p-value**
Unadjusted t	-6.9305	
Adjusted t*	-2.7249	0.0032
		α= 0.05
CAR	**Statistic**	**p-value**
Unadjusted t	-7.9226	
Adjusted t*	-5.5652	0
		α= 0.05
NPLR	**Statistic**	**p-value**
Unadjusted t	-9.3706	
Adjusted t*	-4.2239	0
		α= 0.05

Table-5.2. Hausman Test for Endogeneity of Explanatory Variables (NIR, CAR, NPLR).

	---- Coefficients ----			
	(b)	**(B)**	**(b-B)**	**sqrt(diag(V_b-V_B))**
	Fixed effect	**Random effect**	**Difference**	**S.E.**
NIR	0.1842984	0.1433904	0.040908	0.0213556
CAR	1.701292	1.256267	0.4450248	0.4948553
NPLR	–1.506597	–1.777582	0.2709854	0.3102926

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 5.39
Prob.>chi2 = 0.1457.

In order to avoid the bias estimates of the model, it is needed to check for endogenous variables in the model which means if there is any predictor variable whose value is determined by the other regressor in the model i.e. if the explanatory variables are correlated with the error term or not. For this, Hausman test for endogeneity is used; the null hypothesis is there is no systematic difference in the coefficients of fixed effect and the random effect and the alternate hypothesis is there is systematic difference in coefficients of fixed effect and random effect. The above results show that the p-value 0.1457 is greater than 0.05 accepting the null hypothesis that there exists no endogeneity.

Table-5.3. Test for existence of Threshold Points.

Threshold effect test (bootstrap = 1000 1000 1000):							
Threshold	**RSS**	**MSE**	**Fstat**	**Prob**	**Crit10**	**Crit5**	**Crit1**
Single	5.7395	0.0435	60.99	0.0000***	9.4299	13.1695	21.4899
Double	5.6380	0.0427	2.38	0.9100	21.4010	25.2091	31.9711
Triple	5.5812	0.0423	1.34	0.9710	22.5134	36.5679	208.3800
Single threshold exist							

This test determines the existence of threshold points for NIR in the model if there does any. The estimated threshold points will be the change in structure points in the model. And the relationship of the performance of the bank and non-interest income is required to be found at those structural points to determine the diversification benefit. For this we have to consider that there might be 3 turning points, defining the number of thresholds in

order to specify our model. The bootstrapping of 1000 replicates is conducted and the model estimated the threshold effects for single double and triple along with their significance presented by p-value and F-statistics. It can be seen that the existence of a single threshold point is significant up to 1% indicated by (***). While double and triple thresholds are not significant even at 10% level of significance (p-value is greater than α= 0.01*** or 0.05** or 0.1*).

The estimated single threshold is 0.6112 that is the structural change is observed in the relationship between the non-interest income and performance of bank when the NIR is lower than 61.12% or greater than 61.12%.

Table-5.4. Threshold Regression estimates.

Explanatory variables	Coef.	Std. Err.	t	P>|t|
CAR	1.55535	0.5778898	2.69	0.008***
NPLR	-0.1727	0.4136686	0.42	0.0677*
NIR (≤61.12%)	0.68598	0.1013131	6.77	0.000***
NIR (>61.12%)	-0.561	0.1250735	-4.49	0.000***

The above result shows the different relationships of non-interest income ratio with the profitability of banks, lower and greater the threshold point. The impact of NIR is positive on the profitability of the bank until the ratio goes up to 61.12%. Above this value the relationship is negative; it means Pakistani commercial banks can strive to increase their profitability by increasing their NIR up to 61% and maintain to that bar in order to get diversification benefit from non-interest income. Increasing the proportion of non-interest income to the total income more than 61.12% can negatively impact the profitability. All the variables, except for NPLR, are highly significant at α= 1%, while NPLR is significant at 10% level of significance. CAR has a positive impact while NPLR has a negative impact on the profitability of banks indicated by ROE.

Table-5.5. No Threshold Regression estimates.

ROE	Coef.	Std. Err.	z	P>|z|
NIR	0.14339	0.089	1.610	0.100*
CAR	1.256	0.484	2.590	0.009***
NPLR	-1.778	0.279	-6.370	0.000***

For comparison purpose the no threshold model is also estimated and the result is shown in the Table 5.5 NIR and CAR are positively related with the ROE, While NPLR is negatively associated with the ROE. All the variables are significant at α= 1% and 10%, separated by *** and *.

6. DISCUSSION

This research is first ever effort in Pakistan to probe the differing effect of Non-interest income on profitability. Panel data of 13 listed commercial banks for the period of 2007-2017 is used. First, the Hausman test of endogeneity is applied to find a correlation between the explanatory variables and the error terms. Results signify no presence of endogeneity which is going with the results of Sun *et al.* (2017) using the same variables. Next Table 5.3 shows the significant number of thresholds. An only single threshold is appeared to be significant in the test. In Table 5.4, the results of Panel Threshold Regression are shown, considering the significance of only a single threshold model; two intervals are introduced in the model which are NIR≤61.12 and NIR>61.12. The differing coefficients in each interval indicate the changing effect of NIR on ROE. In the first interval (NIR≤61.12%), the coefficient is 0.6859 indicating the positive significant influence on the ROE. While in the second interval (NIR>61.12%) the coefficient is   -0.561 showing the negative significant association of NIR and ROE. The presence of threshold is validated with the results of Sun *et al.* (2017). However the effect of threshold is quite different, the value of threshold indicates that banks can profitably diversify their income if they seek to increase

their non-income proportion up to 61%. Surpassing that value would not help the banks in escalating their income. The relation of non-interest income in the No Threshold model on profitability is negative as shown in the results of Raza *et al.* (2013); Mndeme (2015).

Other than NIR, the effect of other variables like Non-performing Loan Ratio *(NPLR)* and Capital Adequacy Ratio *(CAR)* is observed on profitability. The effect of NPLR is appeared to be negative on the profitability in both the models (i.e. linear and non-linear for comparison purposes) which is also agreed by the study of Sun *et al.* (2017); Alpera and Anbarb (2011); Saunders *et al.* (2018). This is expected because NPLR is asset quality indicator and it shows the proportion of defaulted loans in the total loan portfolio. Greater of that ratio increases the credit risk for the banks and hence declines the performance of the banks. The positive effect of CAR on profitability (ROE) is validated by Alpera and Anbarb (2011); Saunders *et al.* (2018). CAR shows the capitals strength of the banks; the capability of absorbing the adverse conditions in terms of losses and managing the risk exposure. Hence the higher ratio shows the greater performance of the banks.

7. CONCLUSION AND RECOMMENDATIONS

The aim of this study is to find the existence of a non-linear relationship between non-interest income ratio and profitability of commercial banks of Pakistan in order to achieve optimal diversification benefit from non-interest income; so called the non-traditional source of income. For this, the data of 13 listed commercial banks are taken for the period of 2007 to 2017. The Panel Threshold Regression model is applied to find the significant no. of threshold points (change in structural points) and then the change in the relationship between **NIR (Non-Interest Income Ratio)** and profitability indicated by **ROE (Return on Equity)** is observed at those points.

It appears that single threshold exists, confirming the hypothesis of the presence of a non-linear relationship between non-interest income and profitability in case of Pakistan's commercial banks. The model estimated the threshold value of 0.6112 and the threshold effect is analyzed at two intervals i.e. lower than 61.12% and higher than 61.12%. It is found that the impact of NIR (<61.12%) on ROE is significantly positive and it changes to negative as the non-interest ratio goes up the 61.12% i.e. NIR (>61.21%). This means that optimal diversification benefit from non-interest income can be attained if the ratio of non-interest income to total income is escalated up to and maintained at the estimated percentage of around 61%. Above this value, the banks can impair the profitability as it would be too much deviation from the traditional operations of banks, resulting in volatility of returns and increased chances of default.

For comparison sake, the no-threshold model is also estimated using Generalized Least Square Regression (GLS). ROE has a significant and positive association with NIR and CAR which also competes with the past studies; establishing the relation between non-interest income ratio and profitability for Pakistan's case. The negative association is observed between ROE and NPLR as it is also expected that defaulted loans result in ceased interest payments which decrease interest income and ultimately affect the overall profitability of banks. The research suggests that banks can get maximum benefit from a non-traditional source of income if they strive to take the proportion of their non-interest income up to a certain level especially in regimes of low-interest income when the low-interest margins can substantially affect the profitability. The banks should come up with more innovative ways in terms of financial products and services to generate non-interest income and place their resources efficiently taking in consideration their proficiency and vigilantly supervise to reduce the risk induced with it.

REFERENCES

Afzal, A. and N. Mirza, 2012. Size, diversification and risk: preliminary evidence from commercial banks in Pakistan. Pakistan Journal of Commerce and Social Sciences, 6(2): 282-296.

Alpera, D. and A. Anbarb, 2011. Bank specific and macroeconomic determinants of commercial bank profitability: Empirical evidence from Turkey. Business and Economics Research Journal, 2(2): 139-152.

Aslam, F., B. Mehmood and S. Ali, 2015. Diversification in banking: Is noninterest income the answer for Pakistan's case?. Science International (Lahore), 27(3): 2791-2794.

Davis, E.P. and K. Tuori, 2000. The changing structure of banks' income: An empirical investigation. Economics and Finance, Working Paper No. 11, Brunel University, West London.

De Young, R. and T. Rice, 2004. Noninterest income and financial performance at US commercial banks. Financial Review, 39(1): 101-127.Available at: https://doi.org/10.1111/j.0732-8516.2004.00069.x.

Fazzari, S.M., R.G. Hubbard and B.C. Petersen, 1988. Financing constraints and corporate investment. Brookings Papers on Economic Activity, 1988(1): 141-195.

Gichure, K.S., 2015. The relationship between non-interest income and financial performance of commercial banks in Kenya. International Journal of Finance and Accounting, 1(2): 35-47.

Govori, F., 2013. The performance of commercial banks and the determinants of profitability: Evidence from Kosovo, MPRA, Paper No. 46824.

Gul, S., F. Irshad and K. Zaman, 2011. Factors affecting bank profitability in Pakistan. Romanian Economic Journal, 14(39): 61-87.

Hansen, B.E., 1999. Threshold effects in non-dynamic panels: Estimation, testing, and inference. Journal of Econometrics, 93(2): 345-368.Available at: https://doi.org/10.1016/s0304-4076(99)00025-1.

Hausman, J., 1978. Specification tests in econometrics. Econometrica, 46: 1251–1271.Available at: https://doi.org/10.2307/1913827.

Ismail, A., R. Hanif, S. Choudhary and A. Nisar, 2015. Income-diversification in banking sector of Pakistan: A'blessing'or'curse'?. The Journal of Commerce, 7(1): 11-22.

Misra, S.D., 2015. Determinants of bank profitability in India. International Journal of Indian Culture and Business Management, 10(2): 193-211.Available at: https://doi.org/10.1504/IJICBM.2015.068170.

Mndeme, R., 2015. Impact of non-interest income on banking performance in Tanzania. International Journal of Economics, Commerce and Management, 3(5): 75-92.

Ozek, P., 2017. Non-traditional activities and funding structure: An analysis of commercial banks in Turkey. UİİİD-İJEAS, 18: 53-70.

Raza, S.A., S.T. Jawaid and J. Shafqat, 2013. Profitability of the banking sector of Pakistan: Panel evidence from bank-specific, Industry-specific and macroeconomic determinants, MPRA, Paper No. 48485.

Sanya, S. and S. Wolfe, 2011. Can banks in emerging economies benefit from revenue diversification? Journal of Financial Services Research, 40(1-2): 79-101.Available at: https://doi.org/10.1007/s10693-010-0098-z.

Saunders, A., M. Schmid and I. Walter, 2016. Non-Interest income and bank performance: Does ring-fencing reduce bank risk? (No. 1417). University of St. Gallen, School of Finance.

Saunders, A., M. Schmid and I. Walter, 2018. Non-core banking, performance, and risk (2018). University of St.Gallen, School of Finance Research Paper No. 2014/17. Available from https://ssrn.com/abstract=2504675 or http://dx.doi.org/10.2139/ssrn.2504675.

Senyo, D.B., A.-T. Olivia, A. Musah and E. Nuhu, 2015. Income diversification and financial stability of banks in Ghana. International Journal of Business and Social Science, 6(6): 177-184.

Sheng, H. and B. Wang, 2008. Impact of non-interest income on performance of Chinese listed commercial banks. Finance Forum, 6: 8–11.

Smith, R., C. Staikouras and G. Wood, 2003. Non-interest income and total income stability, bank of England, Working Paper No. 198.

Stiroh, K.J., 2004. Diversification in banking: Is noninterest income the answer? Journal of Money, Credit, and Banking, 36(5): 853-882.Available at: https://doi.org/10.1353/mcb.2004.0076.

Stiroh, K.J. and A. Rumble, 2006. The dark side of diversification: The case of US financial holding companies. Journal of Banking & Finance, 30(8): 2131-2161.Available at: https://doi.org/10.1016/j.jbankfin.2005.04.030.

Sun, L., S. Wu, Z. Zhu and A. Stephenson, 2017. Noninterest income and performance of commercial banking in China. Scientific Programming, 2017: 1-8.Available at: https://doi.org/10.1155/2017/4803840.

Trivedi, S.R., 2015. Banking innovations and new income streams: Impact on banks' performance. Vikalpa, 40(1): 28-41.Available at: https://doi.org/10.1177/0256090915573616.

Vithyea, Y., 2014. The linkage between bank net interest margins and non-interest income: The case of the Cambodian banking industry, MPRA, Paper No. 582230.