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SCIENCE RESEARCH

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#### ESTIMATING BANK STAFF LAY-OFF IN NIGERIA USING THE ZERO – INFLATED NEGATIVE BINDMIAL REGRESSION

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#### Abstract

In this paper, Chi-square test for independence was performed to measure whether an association exists between the level of bank staff and fluctuations (increase or decrease) in bank staff strength in Nigeria. Since Chi-square test does not provide any inferences about causation, the Zero – Inflated Negative Binomial Regression was used to estimate the effect of level of staff on the number of bank staff laid off. Dataset used was obtained from the National Bureau of Statistics database which contains bank staff strength from the third quarter in 2017 till second quarter in 2020. The results obtained from the study revealed that there exists significant association between level of staff and fluctuations in number of bank staff. Furthermore, it was observed that chance of being laid off was highest for the contract staff although other levels of staff also had high risk of being laid off when compared with the executive staff. Suggestions were made on how to soften the effect of bank staff lay-off in Nigeria.

Keywords: lay-off, bank staff, chi-square test, zero-inflated negative binomial regression, count data.

# INTRODUCTION

Fluctuations exist in bank staff strength in Nigeria as evident in the report released by the National Bureau of Statistics in the second quarter of the year 2020. (<u>https://www.nigerianstat.gov.ng</u>.) These fluctuations were in the form of increase or decrease in number of bank staff from quarter to quarter. Where there was a decrease in staff strength, three scenarios come to mind namely compulsory retirement of staff, voluntary withdrawal from service or a lay-off. In this study, we assumed the third scenario.

The report released by the Central Bank of Nigeria (CBN) in April 2020 admonished that bank staff should not be retrenched amidst the Covid – 19 pandemic except when it becomes undeniably necessary but with the approval from CBN. Lay-off can be defined as an act of temporarily or permanently dismissing an employee. Words similar to lay-off are downsizing, retrenchment, redundancy and others.

Hamed, Bowra, Aleem and Hussain (2013) investigated the relationship between downsizing and financial performance of banks in Pakistan. The financial performance was measured on the basis of return on assets and equity, deposits and loan per employee, loan to asset ratio as well as non-performing loan to

FEDERAL POLYTECHNIC OKO, ANAMBRA STATE

Ioan ratio. T – test statistic was used to test if any significant

difference exists between pre - downsizing

and post – downsizing values of all variables considered. They concluded that no significant change exists in the banks' financial performance as a result of downsizing of staff.

Similar to Hamed et al. (2013), Nwakoby and Ananwude (2016) also investigated the nexus between financial performance and downsizing in commercial banks in Nigeria. They also made similar conclusion.

Wandera (2013) stated that it is only a carefully planned and managed retrenchment that can indeed serve as a reform strategy. He also observed that some retrenchment which were done haphazardly created feelings of uncertainty on the employees who were not laid-off. As a result, the self-confidence of those employees were lowered. More so, salary increment (if any) was not commensurate with the excess work load incurred.

Isa and Sharma (2016) investigated the reasons why retrenchment occurs in commercial banks. They include economic recession, underperformance of staff (which they defined as the inability of staff to meet the requirements expected of them), fraudulent activities of staff, persistent or long-term illness and many others. They also stated that staff retrenchment has some physical, psychological and social effects on retrenched staff. They recommended that staff retrenchment should only be a last resort when all other factors have been considered thoroughly and fairly and retrenchment seems inevitable.

With the alarming rate of retrenchment across organizations in Nigeria, Dibua, Idemobi and Okoli (2018) studied the influence of employee workload, pay cut, longer working hours, depression and anxiety on employees' service delivery in an electricity distribution company in Nigeria. They concluded that all variables considered made significant contributions to employees' service delivery except longer working hours. They suggested increase in survivors' pay as well as adjustments in work load of employees.

The Committee on Global Financial System released a report in 2018 titled "Structural changes in banking after the crisis". They stated that there exists a serious decline in bank profitability across the globe which was as a result of poor investor sentiment and weak earnings. They suggested a need for structural adjustments and cost cutting. However, Suchar and Gupta (2008) stated that when layoffs are wrongly done such as when organizations desire to cut cost within a very short time, the organization's goals are rarely accomplished coupled with some percentage decline in job performance.

FEDERAL POLYTECHNIC OKO, ANAMBRA STATE

Suchar and Gupta (2008) further examined the layoff which occurred in a manufacturing industry. Nokia in 2008. The impromptu massive layoff which raised agitation amongst the laid off employees had a ripple effect from damage of products by angry protesters to Union's shutdown of the company. This led to loss of huge resources. Having learnt the hard way, in 2011, Nokia decided to lay off staff again but in an equitable and fair way which benefitted the company as well as those laid off.

Since this study involves the use of Zero-Inflated Negative Binomial (ZINB) Regression, Verma, Swain, Singh and Khetan (2020) modeled the effects of certain factors on the number of spontaneous abortions among women in India using ZINB regression. He compared this model's fit to their dataset relative to other models like the Poisson model, Negative Binomial model and Zero Hurdle Negative Binomial Model and discovered that the Zero-Inflated Negative Binomial Model gave the best fit.

Zhang, Mallick and Yi (2016) applied ZINB regression in testing for differential abundance in microbiome studies. For further review on Zero-Inflated Negative Binomial models (Dyindamola, Onoja, Kehinde and Abass, 2018) and (Lewsey and Thomson, 2004).

# STATEMENT OF PROBLEM

Layoff, which is one of the most significant present – day issues throughout the globe; manifests across all sectors ranging from the banks to the manufacturing industries. Layoff does not occur necessarily due to misconduct from employee but due to structural issues like cutting down cost. However, in the banking sector, certain individuals are more prone to layoff. This paper therefore seeks to examine whether an association exists between the level of bank staff and fluctuations in bank staff strength in Nigeria. Also, the actual effect of level of staff on the number of bank staff laid off was estimated.

# **RESEARCH QUESTIONS**

1. Is there any significant association between level of bank staff and fluctuations in bank staff strength?

2. Does the level of bank staff predict the number of bank staff laid off? If yes, at what level of staff?

## HYPOTHESES

H<sub>OI</sub>: There is no association between variables Hu: There is an association between variables

α = 0.05

**Decision rule**: Reject Ho1 if p-value < 0.05 , otherwise accept Ho1.

H\_02: All regression coefficients are equal to zero. That is,  $\beta_0 = \beta_1 = \beta_2 = ... = \beta_j = 0$ 

FEDERAL POLYTECHNIC OKO, ANAMBRA STATE

H<sub>12</sub>: At least one coefficient is significantly different from zero. That is,  $\beta_i \neq 0$  for at least one j

α = 0.05

**Decision rule**: Reject  $H_{02}$  if p - value < 0.05 , otherwise accept  $H_{02}$ .

#### METHODOLOGY

#### 1 Chi-square test for independence

The chi-square test for independence or measure of association is used to check if two categorical variables are independent (not associated). It has the following assumptions:

The two variables must consist of two or more categorical independent groups. All expected frequencies must be greater than 5. The data used for this test is usually represented in a contingency table where values in each cell represents frequencies or counts. The chi-square test statistic is given by

$$\chi^{2} = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{(O_{ij} - E_{ij})^{2}}{E_{ij}}$$
(1)

Where  $O_{ij}$  represents the observed frequencies,  $E_{ij}$  represents the expected frequencies, r represents the rows and c represents the columns.

# 2 Zero - Inflated Negative Binomial Regression

Dur goal in this study is to predict the number of bank staff laid off (which is the dependent variable) given the level of bank staff. As a result, the dependent variable is count data. Count data are numbers bounded by zero. That is, their lowest value is zero. Consequently, they cannot obey the assumptions of a normal distribution. To model count data, the Poisson regression model comes to mind. However, its basic assumption which demands that the conditional mean and variance must be equal does not usually hold in real life situations. Instead, the variance usually appears greater than the mean. This situation is referred to as over – dispersion. When over – dispersion occurs, an alternative regression model called the Quasi – Poisson regression is used. If over – dispersion still occurs, the Negative Binomial regression is used. Now, if the dependent variable contains quite a good number of zeros, the Zero – Inflated Negative Binomial regression (ZINB) becomes perfect for modeling. The ZINB model has two parts which accounts for two different processes; a logit model which checks which of the two processes the zero outcome is associated with as well as a count model (which uses the negative binomial model) to model the count process. The Probability Mass Function of ZINB regression model is given by

$$P(y_i) = \begin{cases} p_i + (1 - p_i) (1 + \frac{\lambda}{\tau})^{-\tau} & , y_i = 0 \\ 1 & 3 \\ 1 & 1 \\$$

# INTERNATIONAL JOURNAL OF APPLIED

SCIENCE RESEARCH

FEDERAL POLYTECHNIC OKO, ANAMBRA STATE

$$(\mathsf{I}-p_i)\frac{\mathbf{r}(y_i+\tau)}{y_i!\,\mathbf{r}(\tau)}\,(1+\frac{\lambda}{\tau})^{-\tau}\,(1+\frac{\lambda}{\tau})^{-y_i} \qquad ,\,y_i=\mathsf{I},2...$$

Where y is the dependent variable,  $\tau$  is the over-dispersion parameter,  $p_i$  is the probability due to occurrence of true zeros (under a logistic model), (1–  $p_i$ ) is the probability due to false zero (under the Negative Binomial model) and  $\lambda$  is the mean.

## ANALYSIS AND RESULTS

Codes were written in R environment with supplementary packages pscl and MASS. They are all available in R software.

#### Figure 1:



Figure 1 shows that the dependent variable had excess zeros (zero-inflated). That is why the zero-inflated negative binomial regression was used to model its effect with the level of staff.

Table 1: Cross tabulation of number of bank staff laid off (decrease) or added to the workforce (increase) from third quarter (2017) to second quarter (2020) versus the level of staff.

SCIENCE RESEARCH

# FEDERAL POLYTECHNIC OKO, ANAMBRA STATE

	Level of Staff			
	Executive S	Senior Jur	nior Contract	
Decrease	72	4914	4844	9837
	35	2113	7386	21747
Increase				

The first row shows the total number of each level of staff that were laid off (decrease) while the second row shows the total number of each level of staff that were added to the workforce (increase).

The output below shows the value of calculated  $\chi^2$  with its degree of freedom (df) and p-value.

# Output

Pearson's Chi-square test

X-squared = 3693.2, df = 3, p-value < 2.2e-16

## Interpretation

Since the p-value (< 2.2e-16) is less than the  $\alpha$ -value of 0.05, we reject the null hypothesis and therefore conclude that there exists a significant association between the level of staff and fluctuations in bank staff strength. That is, the increase or decrease in number of bank staff has a significant relationship with the level of staff.

Table 2: Estimates of the ZINB regression coefficients with their standard errors, exponentiated coefficients and p-value

(a) Count model coefficients (negative binomial with log link):

	Estimate	Exp(Coefficient)	Standard error	P-value
Intercept	2.423	11.2939	0.3410	1.17e-12
Executive Staff *				
Senior Staff	4.4658	86.9946	0.5302	< 2e-16

### FEDERAL POLYTECHNIC OKO, ANAMBRA STATE

Junior Staff	4.1149	61.2446	0.4838	< 2e-16
Contract Staff	5.3833	217.7312	0.5676	< 2e-16

The executive staff were used as reference group

# (b) Zero-inflation model coefficients (binomial with logit link):

	Estimate	Exp(Coeff)	Standard error	P-value
Intercept	-1.2239	0.2940823	0.8323	0.141
Executive Staff *				
Senior Staff	1.4057	4.0782690	1.0292	0.172
Junior Staff	0.6631	1.9407078	1.0419	0.525
Contract Staff	1.7834	5.9498093	1.0419	0.087

The executive staff were used as reference group

## Interpretation

From Table 2(a), the p-values of all levels of staff were less than 0.05, we therefore reject the null hypothesis and conclude that all levels of staff were significant. From the values on the third column, the exponentiated coefficient (also known as the Incidence Rate Ratio (IRR)), the risk of being laid off was high for the junior staff (IRR=61.24) compared to the Executive staff. The risk was higher for the senior staff with IRR=86.99 and the risk of being laid off was highest for the contract staff with IRR=217.73.

From Table 2(b), the p-values for all levels of staff were greater than 0.05, we do not reject the null hypothesis and conclude that all levels of staff made no significant contribution to the odds of not being laid off.

# CONCLUSION

There exists significant association between level of staff and fluctuations in bank staff strength in Nigeria. Furthermore, it was observed that chance of being laid off was highest for the contract staff although other levels of staff also had high risk of being laid off when compared with the executive staff.



FEDERAL POLYTECHNIC OKO, ANAMBRA STATE

#### POLICY IMPLICATIONS

- Having seen that the contract staff are the most severely affected bank staff when lay-off occurs, we suggest they seek employment elsewhere while still serving in their workplace. This will enable them scale through life post layoff.
- Those in authority to lay off staff should give pre information as well as establish handsome palliatives to staff laid off. This will
  go a long way in softening their transition to another phase of life.
- Staff retrenchment should only be a last resort when all other factors have been considered thoroughly and fairly and retrenchment seems inevitable.

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7

INTERNATIONAL JOURNAL APPLIED SCIENCE RESEARCH, INJASR. VOL. 1, JUNE 2021

FEDERAL POLYTECHNIC OKO, ANAMBRA STATE

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