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## **General Linear Model on the Contribution of Changes to Minimum Wage in the Nigerian Economy**

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### ***Abstract***

*This paper discussed the contribution of changes in the minimum wage in the Nigerian Economy. The statistical technique adopted in this paper is the General Linear Regression Model. Some of the assumptions such as autocorrelation, multicollinearity, and homoscedasticity were tested, and they were all satisfied. Secondary data were collected from the CBN statistical bulletin from 1980 to 2012. The joint test hypotheses rejected the null hypothesis, which means that changes in minimum wage has significant contributions to the Nigerian economy between the years under study. Rejection of  $H_0$  in the joint hypothesis led to testing the parameters individually, which we found out that real gross domestic product, composite consumer price index and per capital income are significant while labour force, inflation rate and interest rate are insignificant. These results explained that real gross domestic product, composite consumer price index and per capital income have significant impact on the changes of minimum wage. The coefficient of determination ( $R^2$ ), which indicates the proportion in  $Y$  that is explained by  $X$ 's turned out with a high percentage of 90.3% showing that there is a strong relationship between the changes in minimum wage and RGDP, CCPI, PCI, LF, INFL, IR. This result entails that 90.3% (percent) variation on the minimum wage rate is explained by a change in the Nigerian Economy variables used in this paper.*

**Key words:** *Minimum wage, General Linear Model, Nigerian Economy, Labour Market*

### **1. Introduction**

One of the major environmental factors that business owners often contend with is the political environment (unclear economic law) which severally exerts legal responsibilities and burden on the business. One of such responsibility in Nigeria is the regular change in minimum wage laws which the businesses are expected to comply with. Government regulation is a powerful external force that creates difficult business environments. In Nigeria, the responsibility of determining the minimum wage falls on the federal government, hence, Minimum wage can be said to be a national economic policy which must be taken into cognizance when making business decisions by firms. Business owners must pay individuals the minimum wage according to federal or state guidelines. Although federal government guidelines set the standard of national minimum wage, states and private organizations at their own volition can go beyond the amount set by the federal government if they choose.

Fapohunda et al (2012) posits that Wage determination involves an evaluation of the contributions of employees in order to distribute fairly direct and indirect, monetary and non-monetary rewards within an organization's ability, pay and legal regulations. The minimum wage legislation is a very important criterion in the payment of wages. The fixing of minimum wage prevents the exploitation of weak, ill-informed or isolated groups of individuals. Minimum wage affords such people a more comprehensive protection than is available through existing voluntary bargaining machinery. Minimum wage is a universal practice. It is practiced in countries across the globe. According to International Labour Organization (2008), there is legislation or binding collective bargaining regarding minimum wage in more than 90% of the countries of the world. One argument is that the fixing of minimum wage affords workers a reasonable income to meet their basic needs and raise their standards of living. Another argument is that by the introduction of minimum wage employers are not only hindered from using unreasonably cheap labour; they are encouraged to use human resources more efficiently and therefore, raise productivity. The International Labour Organization ILO (2009) observes that ultimately, the impact and usefulness of a minimum wage policy depend on whether minimum wages are paid. This in turn depends on the effectiveness of the enforcement mechanisms. Penalties for violators, adequate compensation for workers whose rights have been violated and suitable resourcing of the enforcement

authority are all crucial factors. Fapohunda et al suggests that the active involvement of social partners in both the design and operation of minimum wage enforcement regimes is essential to enhance its impact. Income policy is usually used as a principal component of welfare boosting and poverty reduction macroeconomic policy framework in Nigeria and minimum wage legislation is a major income policy readily employed in this regard. Although, it has both negative and positive effects on the overall economy, policy makers, especially the politicians have used the fixing of minimum wage more often for political rather than socioeconomic reasons. Minimum wage legislations in the country have been preceded by high inflation rates that actually erode purchasing power and bring a reduction in welfare. As a result, minimum wage legislation, which normally leads to a rise in nominal wage, is justified as a means of adjusting wages and salaries to match the rise in cost of living. However, Ojo (1998) and Owoye (1994) opine that wage increases are always followed by threats of reduction in government and private workforce, and in some cases, such threats have resulted in massive lay-offs in the civil service. Besides, minimum wage increases in Nigeria do not match up with the rate of increases in prices, which resultantly leads to agitations from labour unions for persistent wages and salaries increase.

## 2. Research Objectives

The general purpose of this study is to conduct a general linear modeling of the contributions of changes in minimum wage to Nigerian economy. The following specific objectives shall be examined in this study:

- Investigate the contributions of minimum wage changes on the real gross domestic product of Nigeria.
- To examine the contributions of minimum wage changes on the composite consumer price index in Nigeria.
- To evaluate the contributions of minimum wage changes on per capita income in Nigeria.
- To examine the contributions of minimum wage changes on the labor force of Nigeria.
- To check the contributions of minimum wage changes on the inflation rate in Nigeria.
- To investigate the contributions of changes in minimum wage on interest rate in Nigeria.

## 3. The Concept of Minimum Wage

George (2012) in a succinct definition of the concept of minimum wage averred that minimum wage is the lowest wage an employer is allowed to pay.

Minimum wage can simply be defined as the smallest hourly wage that an employee may be paid as mandated by Federal Law. According to the Cain Labour Standard Act of 1938 in the USA minimum wage is the minimum hourly rate of compensation for labour as established by federal statute and refined by employers engaged in businesses that affect interstate commerce. It may also be defined as the rate of pay fixed either by a collective bargaining agreement or by governmental enactment as the lowest wage payable to specified categories of employees. The committee of experts in the ILO 1996 General Survey of Reports relating to Convention No. 131 on minimum wage fixing explains that minimum wage may be understood to mean the minimum sum payable to a worker for work performed or services rendered within a given period, whether calculated on the basis of time or output, which may not be reduced either by individual or collective agreement, which is guaranteed by law and which may be fixed in such a way as to cover the minimum need of the worker and his/her family, in the light of national economic and social conditions. Earlier in 1967, the ILO meeting of experts on minimum wage fixing and related problems had explained that the concept of the minimum wage contains three basic ideas. The first is that the minimum wage is the wage considered sufficient to satisfy the vital necessities of food, clothing, housing, education and recreation of the workers, taking into account the economic and cultural development of each country, this can alternatively be explained as living wage. The second is that minimum wage represents the lowest level of worker's compensation permissible by law. Third is that the minimum wage is the wage which each country has the force of law to uphold and which is enforceable under threat of penal or other appropriate sanctions. It further notes that minimum wage fixed by collective agreements made binding by public authorities is included in the above explanation. The establishment of a minimum wage system is a means of ensuring that workers (and in some cases, their families) will receive a basic minimum wage which will enable them to meet their needs; hence the frequent use of the term 'minimum living wage'. Efforts to implement such a concept imply an attitude or a policy which aims at improving the material situation of workers and guaranteeing them a basic minimum standard of living which is compatible with human dignity. Minimum wages constitute a level which may not be undercut, and whose application is guaranteed by law. It excludes certain bonuses or benefits and is payable, in cash or in kind, directly or indirectly by the employer to the worker for work performed by the latter. In addition, it often does not apply to certain types of workers (e.g. those working less than a certain number of hours) or to certain activities.

### 3.1. The Advantages of Minimum Wage

According to George (2012), the followings are the benefits minimum wage Helps Families. In an economy like Nigeria where unemployment rate is high, employers of labour will naturally explore this to pay employee's a wage rate that is below the cost of living, but with minimum wage legislation, business owners are constrained not to go below certain wage rate.

### 3.2. Reduces Tax Burden

A person making at least minimum wage is not using as many public services as someone on unemployment, according to economics expert Professor Brock Haussamen. An unemployed worker is given welfare, rent assistance and food stamps in many states. With minimum wage, the need for public assistance is lowered and this reduces the tax burden on the community and the state.

### 3.3. *Employment Incentive*

A minimum wage gives an unemployed person incentive to take a job because he knows what his minimum pay will be, according to economics website Economics Help. An unemployed person can compare the money he gets from public assistance and compare it to the minimum wage to determine the financial incentive to taking a job.

### 3.4. *Business Budgets*

Without a minimum wage, it can be difficult for small businesses to budget their money. With a minimum wage in place, a small business owner knows what he will be expected to pay per hour and he can create new jobs with his company based on this budgeting information.

### 3.5. *Common Reference*

The minimum wage makes the hiring process easier for young or unskilled workers and employers. The worker knows upfront what kind of wage she can expect, and the employer does not have to go through the process of negotiating a wage with a new employee.

## 4. **The Impact of Minimum Wage on the Economy**

Owen (2010) posits that Investor Words defines minimum wage as "the smallest hourly wage that an employee may be paid as mandated by federal law. Inflation and other factors necessitate periodic adjustments to the actual number." Demand side economists view the minimum wage as a tool to promote individuals out of poverty and supply side economists view the minimum wage as an undo expense for small businesses.

- **Employment**

Employment levels are measured in several fashions, but two are preferred by the state and federal governments, and by investment exchanges: the U-3 and the U-6. The U-3 is the most widely recognized as it is often cited in news reports and government reports. It contains employed and unemployed workers as well as those "marginally attached" meaning not fully employed. The U-6 is more comprehensive, containing employed, unemployed, under-employed, marginally attached and discouraged workers.

The minimum wage affects employment levels of both measures because small businesses are unable to absorb the higher cost of labor. As a result, small businesses reduce hours, downsize, or freeze hiring to maintain operating needs, such as inventory, fixtures, equipment, loan payments and other operating expenses.

- **Poverty Level**

Demand side economists argue increasing minimum wage levels will assist those earners in moving out of the poverty level. However, the bulk of minimum wage earners is young and/or unskilled. Jack Harrison, a business consultant, states of this phenomenon, "the young, the inexperienced, the uneducated, the unskilled workers, particularly in the already depressed segments of the country."

This same conclusion was reached by the Heritage Foundation in 2003, when it found that a raise in the federal minimum wage would positively impact a small percentage of minimum wage earners.

- **Labor Markets**

Labor, unlike inventory and supplies, is a commodity. Because it is subject to market forces, the cost of labor rises and falls. During times of economic expansion, labor becomes more costly--experienced and skilled workers must be paid more to retain. During economic downturns, labor becomes less costly as unemployment rises. Unskilled and inexperienced workers make up less of the employed labor pool as skilled and experienced workers take available positions. For small businesses, being able to have a skilled and experienced worker performing duties usually executed by unskilled and inexperienced workers is considered discount labor.

## 5. **Problems with Minimum Wage Increases**

In the view of Osmond (2010), the problem with minimum wage increases includes:

- **Employer Factors:** Minimum wage increases can have severe effects for businesses. Increases in payroll expense often require business owners to raise consumer prices on goods and services or reduce business costs. Payroll is often the highest expense for most businesses. An increase in minimum wage may result in businesses laying off employees. Employee layoffs are usually the first option as consumers may react negatively to an increase in product prices.
- **Employee Factors:** Minimum wage increases can also create negative situations for employees. Wage increases can push the employee's annual income into a higher tax bracket, of imposing a higher marginal tax rate on the individual. Minimum wage employees usually have lower wealth than other individuals in the economic marketplace. Tax liability increases can quickly erode the wealth of an individual living on minimum wage. Employees will also face higher payroll taxes, such as Social Security or Medicare, which can also reduce their immediate income.
- **Function:** Governments increasing minimum wage levels often create a distortion in free market economies. Free market economies are usually driven by the economic theory of supply and demand. Businesses have a demand for employees and attempt to fill this demand from the available supply of individuals in the economic marketplace. Each party agrees to specific wages for a certain level of service. Minimum wage laws can create higher wages than companies are willing to pay for specific employee services.

- **Effects:** Businesses may also face increasing wages across the board. Minimum wage increases often bring unskilled or lower-level employee wages closer to the pay for individuals with technical or expert abilities.

### 5.1. Warning

Significant minimum wage increases can drive companies into dangerous financial situations. Governments that continually increase minimum wage require businesses to pay more money for the same amount of employee service. If companies are unable to increase prices or reduce expenses, they may face liquidation or bankruptcy as a result of the wage increase.

Minimum wage policy is a government regulation that requires a company to pay a specific base wage to all workers. In most cases, minimum wage laws affect the hourly wage paid to workers; salaries are not included here.

## 6. Different Types of Minimum Wage

The different types of minimum wage policy a government can institute may be national, local, or based on free market principles. Many little tweaks and adjustments can occur here, depending on how governments determine minimum wages. These laws are often controversial as the effects are both seen and unseen and the consequences intended and unintended.

National minimum wage policy indicates all workers entering employment will earn a specific starting wage. Regardless of industry or job type, a new worker can have the expectations of this starting pay. The purpose of a national minimum wage is to ensure that all workers are able to achieve a specific standard of living. In some cases, these laws may come from the idea of fairness in terms of employee remuneration. For example, a worker entering an unskilled job should receive the same starting wage as an individual starting a semi-skilled job in a different industry.

Local minimum wage policy may occur when a national wage policy is absent from or insufficient for the market. Local policies may be in place due to the conditions of a state being different from another. For example, the cost of living in one state or local region can be significantly higher than another area. The result is a necessary increase in minimum wage policy in order to offset the standard of living costs between the two regions or locales.

Free market principles dictate no minimum wage policy from national or state governments. Each individual's wage bases itself on the current market rate for workers with similar knowledge, skills, and abilities. The wage can fluctuate frequently based on changes in the overall market or other economic changes. The result here is often a wage much lower than one set by a national or state minimum wage policy. More workers may receive employment, however, due to the lower wages per worker, allowing for more workers employed.

A minimum wage policy may also extend a bit further if necessary. For example, the policy may have different pay scales for individuals, family size, and other statistics. Too much control through regulations, however, can greatly restrict a market and choke off the self-interest of individuals to achieve success.

## 7. Objectives of Minimum Wage Setting

The objective of minimum wage fixing, as set out in ILO Minimum Wage Fixing Convention, 1970 (No.131) and its accompanying Recommendation No. 135, is to give wage-earners the necessary social protection in terms of minimum permissible levels of wages. This objective was already implicitly or explicitly contained in previous ILO Convention No.26 and Recommendation No. 30 (applicable to trades) and Convention No. 99 and Recommendation No. 89 (applicable to agriculture), which stipulated that the minimum wage should not be fixed at a lower rate than one which would ensure the subsistence of the worker and his/her family. Minimum wages along with other measures of economic and social policy aim at reducing poverty and meeting basic needs. Minimum wage fixing alone cannot succeed without the satisfaction of the minimum needs of all workers. The objective of minimum wage fixing, as set out in ILO Minimum Wage Fixing Convention, 1970 (No.131) and its accompanying Recommendation No.135, is to give wage-earners the necessary social protection in terms of minimum permissible levels of wages. This objective was already implicitly or explicitly contained in previous ILO Convention No.26 and Recommendation No. 30 (applicable to trades) and Convention No. 99 and Recommendation No. 89 (applicable to agriculture), which stipulated that the minimum wage should not be fixed at a lower rate than one which would ensure the subsistence of the worker and his/her family. ILO (1988) observes that minimum wage fixing is often associated with one or more of the following four purposes. First is bringing the lowest wages up to the general level of wages paid for similar work. Second is exerting upward pressure to the general level of wages as a whole. Third is eliminating unfair competition fourth is serving as a policy tool aimed at promoting rapid growth and equitable distribution of the national income.

## 8. Criteria for Minimum Wage Determination

A number of criteria for fixing or determining wages and salaries have been identified in the literature. Among these are job evaluation (adjudged the most valuable way of fixing wages), government order (especially with regard to minimum wage), ability to pay (on the part of the employers), cost of living, collective bargaining and the effort of labour unions (which is dependent on the negotiation skills of the parties, the personality and the societal culture of the negotiators and the ideology and culture of the organization); the labour market situation (the interaction of supply and demand of labour in a relatively competitive labour market; the going rate (wages and salaries paid for comparable work by other institutions in the labour work or in the area or industry); and productivity (which has to do with measures of output per person). Modern sector wages and salaries are determined and regulated by administrative decisions of government, Wage Commissions, and Prices and Income Policies. Also, the traditional (mainly rural and informal) intermediate sector wages are influenced to a great extent by market forces and to a lesser extent by wage levels in government establishments. In 1977, the Federal Government had to establish a Productivity, Income and Wages Analysis Agency (to collect and analyze statistics on wages, income and price changes in both the public and

private sectors) as a permanent institution to substitute for the institutionalized culture of ad hoc wage commissions to resolve wage and salary problems. Nevertheless, wage review commissions/ committees still continue to feature in government wage determination process. The ILO Recommendation No. 135 identifies certain criteria, or factors, to be taken into account in determining the level of minimum wages. The criteria include: the needs of workers and their families; the general level of wages in the country; the cost of living and changes therein; social security benefits; the relative living standards of other social groups; and economic factors, including the requirements of economic development, levels of productivity and the level of employment. This criterion also includes the capacity to pay. The basic needs of workers and their families has to with measuring poverty levels and the basic needs of households (especially of wage- earner households) using data on average expenditures by low income households on various household goods and services. The statistics can be compiled from household income and expenditure surveys. However, in Nigeria, the recommended data is mostly not available. Next is the general level of wages in the country. The idea of comparable wages and incomes is an important, and sometimes the dominant, consideration in decision-making. Existing patterns of wages and incomes must be established before judgments can be made at the appropriate level of the minimum wage, taking into account other criteria such as ability to pay and the needs of workers. The pay of the Nigerian worker is one of the lowest in the world and it does not improve even in spite of changing market conditions. Workers in the public sector are particularly worse off. After a minimum wage has been fixed, it needs to be adjusted periodically. This is often done by reference to average wages, with a view to maintaining a particular ratio between the minimum wage and general wage levels. It is also necessary to know the number of workers earning at or near the minimum wage level, in order to assess the impact of a minimum wage increase on the wage bill. Again, the lack of adequate and reliable statistics is a major challenge in this area. Also, there is the cost of living factor. Measures of changes in the cost of living involve regular reports of the average prices of a selected range of household goods and services, and these prices may be useful inputs to the determination of minimum wages. Changes in price levels (as opposed to the absolute level of prices) are normally measured by a consumer price index. This may not only lead to a change the weighting system for a consumer price index for low-income households, but also lead to a re-assessment of the extent to which basic needs are being satisfied. The cost of living is hardly factored in minimum wage in Nigeria in that the huge cost of living requirements cities like Lagos is not the same as in Kebbi, Ebonyi, Edo and Ondo States and minimum wage is usually fixed at the same level for all states. Similarly pay in any progressive and egalitarian society should be commensurate with productivity and cost of living. This is even more so in a developing nation struggling to put in place certain regimes and improve human development and its living standards. Productivity is a criterion hardly ever used in fixing minimum wages in Nigeria. Another criterion is the relative living standards of other social groups which can be measured using average income and income distributions of different social groups; average expenditure, in total and on different groups of household goods and services, of different social groups; other measures of living standards (average number of rooms in dwelling, proportion of households renting accommodation, average number of household members per room, type of material of , proportion of household members with post-primary education, and so on). Added to these are economic factors. This includes the requirements of economic development, employers' capacity to pay, levels of productivity and the level of employment. Measures of economic development include: changes in gross domestic product (GDP) per capita at constant prices; while social measures of economic development might include: changes in the proportion of children attending school; changes in the literacy rate; changes in the number of schools/hospitals per capital; changes in the accessibility of selected community facilities (pipe water, markets, schools, hospitals, postal services, fire services, police services). In the area of economic activity changes in the unemployment rate; changes in the percentage of persons employed in agriculture, manufacturing and services sectors might be considered.

### **9. Challenges to Effective Minimum Wage Implementation in Nigeria**

There are several challenges to the management and implementation of the National Minimum Wage in Nigeria. One is the Labour Market Situation. Ojo (1998) notes that in a relatively competitive labour market, the interplay of supply and demand is the most important determinant of compensation. Arising from certain imperfections in the market caused by institutional, administrative, political and socio-cultural factors, the role of the price mechanism is minimal especially in a developing country like Nigeria nevertheless the interplay of supply and demand still exerts some influence. Consequently periods of unemployment do not generally favour high pays, as employers have the opportunity to attract high caliber employees without necessarily offering the legal minimum wage which may be considered excessive. Again periods of scarcity of skills in the labor market will expectedly witness high movements of wages, provided market forces are allowed to sufficiently allocate wages and employment. The labour market situation in Nigeria is such that there are too many people chasing too few jobs. The level of unemployment and poverty in Nigeria today is unprecedented. There are huge and unprecedented job losses occasioned by the global economic meltdown; the relocation of companies to other regions because of the security crises and the hydra headed power sector problems, the prevalent multiple taxation, security challenges, corruption, terrible conditions of basic infrastructure, the unacceptable high cost of doing business in Nigeria; reforms in the banking, petroleum, public sectors etc. worsened by the irrational and inhuman responses to these reforms by some employers of labour. In view of such circumstances the capacity of the Nigerian worker to demand the new minimum wage is greatly impaired. Fapohunda (2004), notes that, on a national basis, open unemployment was over 10%. Most of the unemployment is concentrated in the urban areas. The Federal Office of Statistics (2011) reports that as at September 2010, urban unemployment was over 20% in some states. The unemployment is not only of unskilled workers; it includes unemployment of highly skilled people including graduates of universities and of other institutions of higher learning. Fajana (1983) shows that there was strong and negative relationship between employment and wage changes in the Nigerian industrial sector. Specifically, the result showed that a 100 percent increase in average wages will lead to 23% fall in employment. Wages were found to have had some influence in

the Nigeria industrial employment growth. It was concluded that increase in federal minimum wage causes unemployment. Next is the Legal Framework. Payment of minimum wage is often not enforceable. Government must direct private sector employers to negotiate with their workers, with a view of implementing minimum wages. The enforcement capacity of the federal government agencies is a challenge. The Federal Government does not seem to have sufficient qualified personnel for the purpose of ensuring that the provisions of the labour laws including the National Minimum Wage are effectively and adequately observed by employers of labour including the various state and local governments. The International Labour Organisation (2008) observes that unfortunately in many countries, labour inspection services are understaffed and penalties for non-compliance with minimum wage regulations are too weak. A close examination of the number of officers working in the Federal Ministry of Labour and Productivity vis-à-vis the level of industrial activities tend to support this line of thinking. As a result, minimum wages too often remain a “paper tiger” rather than an effective policy. As observed by Squire and Suthiwart-Narueput (1997) compliance is a function of the probability of firms being visited by labour inspection services, and of the level of penalties in the case of non-compliance. There is therefore no gainsaying that supervision by the Ministry is very important so as to ensure that the Minimum Wage is actually implemented in practice.

Another challenge is lack of awareness. Many workers and indeed Nigerians seem ignorant of the minimum wage and the provisions of the Principal Act including the 2010 amendments they are therefore unable to demand for them. Adequate enlightenment campaign by government, the Organized Labour and other social partners and stakeholders to sensitize the Nigerian public and workers become necessary. Similarly there is the unfriendly posture of some state governors on minimum wage. The extent to which states comply with the minimum wage differs from one to the other. This might be due, to a very large extent, to the financial strength (of individual states), which has been recognized since 1991 as a critical factor in public sector employers’ compliance with any wage directive from the Federal Government in Nigeria, the Federal Government appears to play some sort of overriding role on labour matters. Some states are often unwilling to pay the new minimum wages. For instance, in 2000 many state governments refused to pay the Federal government recommended minimum wage leading to many industrial actions. The International Committee of the Fourth International (ICFI) on the strikes by labour and actions of State Governors in 2000 reports that the country was gripped by a strike wave over the level at which a new minimum wage should be set. The action began with a strike by civil servants in Lagos state, and quickly spread throughout the country. Forty-seven thousand public sector workers were on strike for two weeks in Lagos, with refuse dumps not cleared, water taps running dry and health services collapsing. Civil servants in at least 12 states also went on indefinite strikes. The story was not different in 2010 when the new minimum wage was recommended. This is very disturbing especially because in 2010 especially the state governments were consulted and represented in the Tripartite Committee on National Minimum Wage Committee. It is instructive to note here that any industrial actions further heat up the already overheated polity. In addition, there are those organisations with a culture of unfair labour practices and miserable wages. Sadly, some organisations have a culture of unfair labour practices and it would seem that they try to exploit every available opportunity to oppress, repress and enslave their workers. Such organisations do everything possible to evade the minimum wage. Some convert their employees to “contract or casual staff” such that none of these employers would have up to 50 employees since the minimum wage applies to companies with at least 50 employees. Moreover, in general, Nigeria does not have reliable or accurate statistics. There is no programme of establishment surveys covering industrial production and this is a very important criterion in fixing minimum wages. Similarly, there is the challenge of non-unionized workers, casualization and contract staff. Non-unionised workers are the greatest victims of unfair labour practices, including the denial of their rights as contained in the extant labour laws and the ILO conventions. The respect for workers’ right and dignity are more violated for non-unionised workers, casual workers and contract staff. This is quite understandable and that is why the constitution, extant labour laws, African Charter on Human and People Rights (Ratification and Enforcement Act) 1990 as well as various ILO conventions seeks to guarantee the right of workers to join a trade union for their protection. Economic factors also constitute challenge to employers’ capacity to pay a specified minimum wage. A quantitative assessment of this capacity may be difficult, but would include measuring the level of wage payments relative to: other payments, in particular other labour costs (such as non-wage costs related to the employment of labour) payments to other factors of production (profits, return on investment, etc.). Another challenge is that smaller and unregistered establishments, and especially those in the informal sector, tend to be excluded from minimum wage. Such establishments are more likely to employ casual workers and family members, and are less likely to be affected by minimum wage determinations. Casual workers, workers employed in small establishments or workers employed for less than the normal duration of work, are who more likely to be employed in household enterprises or in the informal sector, are precisely the type of workers whom might be affected by the absence of effective wage regulations (by collective agreement or otherwise). These workers should be protected from the risk of being paid unduly low wages and the minimum wage would act for them as a safety net. Equally important is the assessment of their employer’s capacity to pay a given minimum wage and the impact such a wage could have on the employment level and workers’ conditions of employment.

#### **10. Regression Analysis**

Regression analysis is a statistical technique that express mathematically the relationship between two or more quantitative variables such that one variable (the dependent variable) can be predicted from the other or others (independent variables). (Inyama; 1995). It is very useful in predicting or forecasting. It can also be used to examine the effects that some variables exert on others. It may be simple linear, multiple linear or non linear.

However, we shall concentrate on the multiple linear regression due to the nature of our data.

10.1. Multiple Linear Regression

If a regression model involves more than one independent variable, it is called a multiple regression model and is of the form

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k \dots (1)$$

Due to the nature of numerous explanatory variables, we shall use the general linear model that is working in matrix form.

11. The General Linear Regression Model

The general linear regression model expresses a linear relationship between the dependent variable Y, and K explanatory variables, where k can be 1, 2, 3, ... etc. In fact, when k is more than two as it is in this research work, estimation of the parameters of the model becomes extremely tedious. However, this difficulty can be greatly reduced by the use of matrix algebra. Matrix algebra provides a compact method of handling regression model.

Suppose we postulate that there is a linear relationship between the dependent variable, Y and k – 1 explanatory variables  $x_2, x_3, x_4, \dots, x_k$  for a population of size N observations on Y and the X's, we may write:

$$Y_i = b_1 + b_2 X_{2i} + b_3 X_{3i} + \dots + b_k X_{ki} + u_i, i = 1, 2, \dots, N \dots (2)$$

where  $b_1$  = the intercept on the Y-axis,  $b_2, b_3, \dots, b_k$  are the unknown population parameters.

$u$  = error (or stochastic disturbance) term.

Re-writing equation (2) as a set of N simultaneous equations, we obtain:

$$\left. \begin{aligned} Y_1 &= b_1 + b_2 X_{21} + b_3 X_{31} + \dots + b_k X_{k1} + U_1 \\ Y_2 &= b_1 + b_2 X_{22} + b_3 X_{32} + \dots + b_k X_{k2} + U_2 \\ Y_3 &= b_1 + b_2 X_{23} + b_3 X_{33} + \dots + b_k X_{k3} + U_3 \\ &\vdots \\ Y_N &= b_1 + b_2 X_{2N} + b_3 X_{3N} + \dots + b_k X_{kN} + U_N \end{aligned} \right\} \dots (3)$$

Equation (3) can be re-written more compactly in matrix form as:

$$Y = X\beta + U \dots (4)$$

where

$$Y = \begin{pmatrix} Y_1 \\ Y_2 \\ Y_3 \\ \vdots \\ Y_N \end{pmatrix}_{N \times 1}, \quad X = \begin{pmatrix} 1 & X_{21} & X_{31} & \dots & X_{k1} \\ 1 & X_{22} & X_{32} & \dots & X_{k2} \\ 1 & X_{23} & X_{33} & \dots & X_{k3} \\ \vdots & \vdots & \vdots & & \vdots \\ 1 & X_{2N} & X_{3N} & \dots & X_{kN} \end{pmatrix}_{N \times K}$$

$$\beta = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \\ \vdots \\ b_k \end{pmatrix}_{k \times 1}, \quad U = \begin{pmatrix} U_1 \\ U_2 \\ U_3 \\ \vdots \\ U_N \end{pmatrix}_{N \times 1}$$

12. Estimation of the Unknown Parameters

We can estimate the unknown population parameter,  $\beta$ , using the Ordinary Least Square (OLS) method. To do this, we take a random sample of n observation on Y and the explanatory variables, x, and fit a straight line through the n observations. Let this estimated line be given by

$$\hat{Y} = X\hat{\beta} \dots (5)$$

where  $\hat{\beta}$  is a year of estimates of  $\beta$ .

Let e be the difference between the true regression line Y and the estimated regression line  $\hat{Y}$  Then

$$e = Y - \hat{Y} \\ = Y - X\hat{\beta}$$

The OLS estimates are obtained by minimizing the error sum of squares,

$$\Sigma e_i^2 = e^T e \\ e^T e = (Y - X\hat{\beta})^T (Y - X\hat{\beta})$$

$$= (Y^T - \hat{\beta}^T X^T)(Y - X\hat{\beta})$$

$$= Y^T Y - Y^T X \hat{\beta} - \hat{\beta}^T X^T Y + \hat{\beta}^T X^T X \hat{\beta}$$

$$e^T e = Y^T Y - 2\hat{\beta}^T X^T Y + \hat{\beta}^T X^T X \hat{\beta} \quad \dots \quad (6)$$

Let  $e^T e = Q$ , so that equation (5) becomes

$$Q = Y^T Y - 2\hat{\beta}^T X^T Y + \hat{\beta}^T X^T X \hat{\beta}$$

$$\frac{\partial Q}{\partial \hat{\beta}} = -2X^T Y + 2X^T X \hat{\beta} = 0$$

$$2X^T X \hat{\beta} = 2X^T Y$$

$$\therefore \hat{\beta} = (X^T X)^{-1} X^T Y \quad \dots \quad (7)$$

Equation (7) provides us with a method for estimating the  $\hat{\beta}$  vector. The OLS estimates,  $\hat{\beta}$ , of the population parameter  $\beta$  is

- (a) a linear function of Y
- (b) an unbiased estimator of  $\beta$
- (c) the best amongst all unbiased linear estimators of  $\beta$ .

Proof of (a)

Since X are fixed numbers,  $(X^T X)^{-1}$  is therefore a matrix of fixed numbers. Hence, we write

$$\hat{\beta} = (X^T X)^{-1} X^T Y$$

$$= WY$$

where  $W = (X^T X)^{-1} X^T = \text{a constant}$

Hence  $\hat{\beta}$  is a linear function of Y.

Proof of (b)

$$\hat{\beta} = (X^T X)^{-1} X^T Y$$

$$= (X^T X)^{-1} X^T (X\beta + \mu)$$

$$= (X^T X)^{-1} X^T X \beta + (X^T X)^{-1} X^T U$$

$$\text{i.e. } \hat{\beta} = \beta + (X^T X)^{-1} X^T U \quad \dots \quad (8)$$

Taking expectation of both sides of equation (8), we have

$$E(\hat{\beta}) = E(\beta) + (X^T X)^{-1} X^T E(U)$$

$$\text{i.e. } E(\hat{\beta}) = \beta + 0 = \beta$$

Hence  $\hat{\beta}$  is an unbiased estimator of  $\beta$ .

Proof of (c):

Let  $\hat{\beta}^*$  denote any other linear unbiased estimator for  $\beta$ . This estimator can be expressed in the form

$$\hat{\beta}^* = [(X^T X)^{-1} X^T + B]Y$$

$$E(\hat{\beta}^*) = [(X^T X)^{-1} X^T + B]E(Y)$$

$$= [(X^T X)^{-1} X^T + B]X\beta$$

$$= [I + BX] \beta$$

where B is a  $(k + 1) \times n$  matrix of real numbers. Taking expectations,

Since  $\hat{\beta}^*$  is an unbiased estimator for  $\beta$ ,  $E(\hat{\beta}^*) = \beta$  and hence  $[I + BX]\beta = \beta$ . Thus  $I + BX$  is the identity matrix, which implies that  $BX = 0$ . By the rules of variance,

$$\text{Var}(\hat{\beta}^*) = \text{Var}[(X^T X)^{-1} X^T + B]Y$$

$$= [(X^T X)^{-1} X^T + B] \sigma^2 I [(X^T X)^{-1} X^T + B]^T$$



$$\begin{aligned}
 &= \sigma^2 [(X^T X)^{-1} X^T + B] [X(X^T X)^{-1} + B^T] \\
 &= \sigma^2 [(X^T X)^{-1} X^T X(X^T X)^{-1} + (X^T X)^{-1} X^T B^T + BX(X^T X)^{-1} + BB^T]
 \end{aligned}$$

Since  $BX = 0$ ,  $X^T B^T = 0$ , and  $\text{Var}(\hat{\beta}^*)$  can be written as

$$\begin{aligned}
 \text{Var}(\hat{\beta}^*) &= \sigma^2 [(X^T X)^{-1} + BB^T] \\
 &= (X^T X)^{-1} \sigma^2 + BB^T \sigma^2 \\
 &= \text{Var}(\hat{\beta}) + BB^T \sigma^2
 \end{aligned}$$

The  $i$ th entry of the main diagonal of  $BB^T$  is

$$\sum_{j=1}^n \hat{\beta}_{ij} \geq 0 \quad i = 1, 2, 3, \dots, n$$

Therefore, the entries on the main diagonal are minimized when  $B = 0$ . From this, it is easy to see that  $\text{Var}(\hat{\beta}_0)$ ,  $\text{Var}(\hat{\beta}_1)$ , ...,  $\text{Var}(\hat{\beta}_k)$  are minimized by letting  $B = 0$ . In this case,  $\hat{\beta}^* = \hat{\beta}$  as claimed.

**13. Estimation of the Variance of the Ols Estimators**

$$\text{Var}(\hat{\beta}) = E \left[ (\hat{\beta} - \beta)(\hat{\beta} - \beta)^T \right] \quad \dots \quad (9)$$

From equation (8),

$$\hat{\beta} - \beta = (X^T X)^{-1} X^T U \quad \dots \quad (10)$$

substitute (10) into (9) to get

$$\text{Var}(\hat{\beta}) = [(X^T X)^{-1} X^T U] [(X^T X)^{-1} X^T U]^T \quad \dots \quad (11)$$

$$= E[(X^T X)^{-1} X^T U U^T X(X^T X)^{-1}] \quad \dots \quad (12)$$

$$= E[(X^T X)^{-1} X^T E(UU^T) X(X^T X)^{-1}]$$

$$= (X^T X)^{-1} X^T \sigma^2 X(X^T X)^{-1}$$

$$= \sigma^2 (X^T X)^{-1} X^T X(X^T X)^{-1}$$

$$= \sigma^2 (X^T X)^{-1} \quad \dots \quad (13)$$

**14. Estimation of the Error Mean Square**

The sample disturbance term,  $e$  can be written as

$$\begin{aligned}
 e &= Y - X\hat{\beta} \\
 &= Y - X(X^T X)^{-1} X^T Y \\
 &= (I_n - X(X^T X)^{-1} X^T) Y \\
 &= wY \quad \dots \quad (14)
 \end{aligned}$$

where

$w$  is a matrix of fixed numbers, and

$W$  is a symmetric idempotent matrix

Thus  $e$  is a linear function of  $Y$

Also,  $e = WY = W(X\beta + U)$

$$= wX\beta + wU$$

$$= [I_n - X(X^T X)^{-1} X^T] X\beta + wU$$

$$= [X - X(X^T X)^{-1} X^T X] \beta + wU$$

$$= (X - X) \beta + wU = 0 + wU$$

$$\therefore e = wU \quad \dots \quad (15)$$

i.e.  $e$  is also a linear function of  $U$ .

Then, the error sum of squares becomes  $e^T e$ , where

$$\begin{aligned}
 e^T e &= (wU)^T wU \text{ from (15)} \\
 &= U^T w^T wU
 \end{aligned}$$

$$\begin{aligned}
 &= U^T W U \text{ since } W \text{ is symmetric idempotent} \\
 E(e^T e) &= E[\text{tr}(U^T W U)] \\
 &= E(\text{tr}(W U U^T)) \\
 &= [\text{tr}\{W E(U U^T)\}] \\
 &= \text{tr}[W \sigma^2 I_n] \\
 &= \sigma^2 \text{tr}[I_n - X(X^T X)^{-1} X^T] \\
 &= \sigma^2 [\text{tr}(I_n) - \text{tr}\{X(X^T X)^{-1} X^T\}] \\
 &= \sigma^2 [\text{tr}(I_n) - \text{tr}\{X(X^T X)^{-1} (X^T X)\}] \\
 &= \sigma^2 [\text{tr}(I_n) - \text{tr}(I_k)] \text{ since } (X^T X)^{-1} (X^T X)
 \end{aligned}$$

is a  $k \times k$  matrix

$$\begin{aligned}
 &= \sigma^2(n - k) \\
 \therefore E(e^T e) &= \sigma^2(n - k) \\
 \Rightarrow \sigma^2 &= \frac{E(e^T e)}{n - k} \quad \dots \quad (16)
 \end{aligned}$$

Thus, an unbiased estimator of  $\sigma^2$  is given by

$$\hat{\sigma}_u^2 = S^2 = \frac{e^T e}{n - k}$$

Source of variation	Df	SS	MS
Regression	$K - 1$	$\sum \hat{y}_t^2$	$\frac{\sum \hat{y}_t^2}{k - 1}$
Error	$n - k$	$\sum y_t^2 - \sum \hat{y}_t^2$	$\sum y_t^2 - \frac{\sum \hat{y}_t^2}{n - k}$
Total	$n - 1$	$\sum y_t^2$	

Table 1: ANOVA Table

$$F_{\text{calculated}} = \frac{\frac{\sum \hat{y}_t^2}{k - 1}}{\frac{\sum y_t^2 - \sum \hat{y}_t^2}{n - k}} = \frac{\text{RMS}}{\text{EMS}}$$

The decision rule is to reject  $H_0$  is  $F_{\text{cal}} \geq F_{k-1, n-k; \alpha}$  otherwise accept  $H_0$ .

**15. Coefficient of Determination**

The (multiple) coefficient of determination is given by

$$R^2 = \frac{\sum \hat{y}_t^2}{\sum y_t^2} \quad \dots \quad (17)$$

where  $x_1, x_2, y$  are in deviation form. The adjusted  $R^2$  written as  $\bar{R}^2$  is defined by

$$\bar{R}^2 = 1 - (1 - R^2) \frac{n - 1}{n - k} \quad \dots \quad (18)$$

**16. Test of Hypotheses**

Our model  $Y = \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2 + U$  involves two explanatory variables. Hence we can conduct two types of tests about the parameters of the model, namely; individual tests and joint tests.

16.1. Individual Test

Individual test involves testing whether an explanatory variable has any influence on the dependent variable when the other explanatory variable is held constant.

The null and alternative hypotheses may be stated as follows:

- $H_0 : \beta_i = 0, i = 1, 2, \dots, 19$  (i.e. there is no linear relationship between  $x_i$  and  $y$ , the other  $x$  held constant).
- $H_1 : \beta_i \neq 0$  (i.e. a relationship exists between  $x_i$  and  $y$ ).

Under the assumption that each  $U_i$  is  $N(0, \delta^2)$ , the test statistic will be given by

$$t_{cal} = \frac{\hat{\beta}_i}{SE(\hat{\beta}_i)} \quad \dots \quad (19)$$

The decision rule is to reject  $H_0$  at the  $\alpha$  level of significance if  $t_{cal} > t_{tab}$  (and hence conclude that a relationship exists between  $y$  and  $x_i$ ) and to accept  $H_0$  otherwise.

16.2. Joint Test

This involves testing whether  $X_i, i=1, 2, \dots, 19$  are jointly related to  $Y$ . This is equivalent to testing whether

$$\beta_1 = \beta_2 = \dots = \beta_k = 0$$

Thus, the null and alternative hypotheses are:

- $H_0 : \beta_1 = \beta_2 = \dots = \beta_k = 0$  (i.e.  $x_1, x_2, \dots, x_k$  are not jointly related to  $y$ )
- $H_1 : \beta_i \neq 0$  for at least one  $i$  i.e.  $x_1, x_2, \dots, x_{18}$  and  $x_{19}$  are jointly related to  $y$ .

Thus, a joint test can be conducted using the Analysis of variance techniques as follows:

$$TSS = \sum y_t^2$$

$$RSS = \sum \hat{y}_i^2 = \hat{\beta}_1 \sum x_1 y + \hat{\beta}_2 \sum x_2 y$$

$$ESS = TSS - RSS = \sum y_t^2 - \sum \hat{y}_t^2$$

17. Tests for Multicollinearity Using Condition Index

This is perhaps the best available multicollinearity diagnostic. It involves calculating the eigenvalues of the matrix of observations on the independent variables  $X_i$ . The eigenvalues can also be derived from computer estimation of the regression model as we shall experience in this research work. Using the eigenvalues, we derive the condition number and the condition index CI defined respectively as:

$$K = \frac{\text{max imum eigenvalue}}{\text{min imum eigenvalue}}, \quad \dots \quad (20)$$

and

$$CI = \sqrt{K} \quad \dots \quad (21)$$

If  $10 \leq CI \leq 30$ , there is moderate to strong multicollinearity.

If  $CI > 30$ , there is severe multicollinearity.

If  $CI < 10$ , there is no significant multicollinearity.

18. Test for Autocorrelation

An autocorrelation is a correlation between members of series of observations ordered in time (as in time series data) or space (as in cross-sectional data) (Damodar and Dawn; 2009). In the regression context, the classical linear regression model assumes that such autocorrelation does not exist in the disturbances  $U_i$ . Symbolically,

$$COV(U_i, U_j / x_i, x_j) = E(U_i U_j) = 0 \quad i \neq j$$

The Durbin-Watson test shall be used to test for the presence of autocorrelation which is given by

$$D = \frac{\sum_{t=2}^n (e_t - e_{t-1})^2}{\sum_{t=1}^n e_t^2} \quad \dots \quad (22)$$

where  $e_t$  is the OLS residual

*18.1.Hypotheses*

$H_0 : \rho = 0$  (no autocorrelation)

$H_1 : \rho \neq 0$  (autocorrelation exist)

The decision rule is to

Reject  $H_0$  if  $D > 4 - D_L$

Accept  $H_0$  if  $D < 4 - D_u$ , and it is inconclusive if  $D$  falls between  $4 - D_u$  and  $4 - D_L$

**19. Test for Heteroscedasticity Using the White Test**

To a data, we can check for the presence of heteroscedasticity in the data as follows:

- Obtain the estimated error term  $e_i$  from the regression.
- Regress the error term squared on the original explanatory variables (X), their squared values and their cross products.
- Then reject  $H_0$  that there is no heteroscedasticity of  $\chi^2_{cal} = nR^2 > \chi^2_{tab} \dots$  (23)
- and accept  $H_0$  otherwise, where the degree of freedom is equal to the number of regressors.
- It is not advisable to apply the test to a model with several independent variables as this will consume degrees of freedom.

**20. Data Analysis**

We shall analyse the data in this paper work using the general linear model discussed in the previous section. We shall also carry out a joint test to know if relationship exists between the dependent variable and the independent variable. If the null hypothesis is rejected in the joint test, we shall proceed to individual test. However, the data collected for this research work is thus presented in Table 2.

YEAR	RGDP	MW	CCPI	PCI	LF	INF	IR
1980	90884.5	200	0.9	1.48	9094.5	10	6.0
1981	95874.5	200	1.0	1.05	10841.2	21.4	6.0
1982	70155	200	1.1	1.02	12215	7.2	8.0
1983	70025.1	200	1.5	0.93	10922	23.2	8.0
1984	65719.7	200	1.9	0.85	8135	40.7	10.0
1985	62253.7	200	1.9	0.90	5417	4.7	10.0
1986	67992.9	750	2.1	0.91	5573	5.4	10.0
1987	70520	750	2.4	0.88	7323	10.2	12.75
1988	70871.8	750	3.8	0.93	10661.1	56	12.75
1989	77397.7	750	5.5	0.97	12383.7	50.5	18.5
1990	92238.5	750	5.7	1.02	18414.1	7.5	18.5
1991	94235.5	1200	7.0	1.01	30626.8	12.9	14.5
1992	97019.9	1200	10.4	0.82	35423.9	44.5	17.5
1993	99604.2	1200	16.8	1.01	58640.3	57.3	26.0
1994	100936.7	1200	29.7	0.99	80948.1	57.0	13.5
1995	103078.6	1200	45.0	0.98	85021.9	73.1	13.5
1996	106600.6	1200	51.5	0.99	114476.3	29.1	13.5
1997	109972.5	1200	56.7	0.99	172105.7	8.5	13.5
1998	113509	5500	63.5	0.99	205553.2	10.0	19.25
2009	116655.5	5500	63.6	0.99	192984.4	6.6	19.93
2000	121207.81	5500	72.9	1.00	175735.8	6.9	16.25
2001	126323.8	5500	84.9	1.02	268894.5	18.9	18.75
2002	131489.8	7500	95.2	1.04	371897.9	12.9	19.0
2003	136460.0	7500	117.9	1.05	438114.9	14	14.0
2004	145380.0	7500	129.7	1.09	429230	15	14.0
2005	561.93	7500	144.7	0.00	456970	11.6	14.0
2006	593.57	7500	157.1	0.42	499.68	20.3	14.0
2007	634656.6	7500	167.4	0.63	868.19	8.5	14.0
2008	672202.7	18000	192.6	1.1	1389.68	15.5	17.5
2009	716949.7	18000	102.2	1.2	1780.04	13.9	17.5
2010	775000.4	18000	114.2	1.4	2272.76	11.8	18.0
2011	273.042	18000.0	178.93	2.7	52160.0	10.8	10.32
2012	455.5	18000.0	117.04	2.8	53830.0	6.11	12.1

Table 2: Data on Minimum Wage and selected variables of for measuring Minimum wage  
Source: Central Bank of Nigeria Statistical Bulletin

- RGDP-Real Gross Domestic Product
- MW-Minimum wage
- CCPI-Composite consumer price index
- PCI-Per Capital Income
- LF-Labour Force
- INFL-Inflation Rate
- IR-Interest Rate

### 20.1. Joint Test

#### 20.1.1. Hypotheses

- $H_0$  : Changes in minimum wage has no significant contributions on the Nigerian economy.
- $H_1$  : Changes in minimum wage has significant contributions on the Nigerian economy.

$F_{cal} = 40.450$  (See Appendix)

The decision rule is to reject  $H_0$  if  $F_{cal} \geq F_{tab}$

where  $F_{tab} = F_{6, 26, 0.05} = 2.46$

Since  $F_{cal} = 40.450 > F_{tab} = 2.46$ , we reject  $H_0$  and accept  $H_1$ . Because we have rejected the null hypothesis, it becomes imperative to carry out an individual test to justify our hypotheses.

### 20.2. Individual Test

From the output of the SPSS software,

The necessary hypotheses are as follows:

$H_0 : \hat{\beta}_i = 0, \forall i, i = 1, 2, \dots, 5$  (Changes in minimum wage have no significant contributions on each of the indicators in Nigerian economy).

$H_1 : \hat{\beta}_i \neq 0$  (Changes in minimum wage have significant contributions on each of the indicators in Nigerian economy)

Comparing the P-values of the independent variables with 5% level of significance, we can conclude that RGDP, CCPI and PCI are significant, while LF, INFL and IR are insignificant.

### 21. Test for Multicollinearity Using Condition Index (CI)

$$CI = \sqrt{K}$$

$$\text{where } K = \frac{\text{max imum eigen value}}{\text{min imum eigen value}} = \frac{0.780}{0.032} = 24.375$$

$$\therefore CI = \sqrt{24.375} = 4.937$$

Since  $CI < 10$ , there is no significant multicollinearity.

### 22. Test For Autocorrelation

- Hypotheses for the male pupils

$H_0 : \rho = 0$  (no autocorrelation)

$H_1 : \rho \neq 0$  (autocorrelation exists)

From the SPSS results in the appendix, Durbin Watson Statistic (D) = 1.762.

From the statistical table,  $d_l = 0.936$ , and  $d_u = 1.594$ .  $4 - d_l = 4 - 0.936 = 3.064$ , and  $4 - d_u = 4 - 1.594 = 2.406$ . Since D is less than 2.406, we reject  $H_0$

### 23. Test for Heteroscedasticity

- Hypotheses for male Pupils

$H_0$  : There is no presence of heteroscedasticity.

$H_1$  : there is presence of heteroscedasticity.

$$\chi_{cal}^2 = nR^2 \text{ where } R^2 = 0.903$$

$$\therefore \chi_{cal}^2 = 33(0.903) = 29.799$$

The decision rule is to reject  $H_0$  if

$$\chi_{cal}^2 > \chi_{tab}^2 \text{ where}$$

$$\chi_{tab}^2 = \chi_{4,0.05}^2 = 9.488$$

Since  $\chi_{cal}^2 = 29.799 > \chi_{tab}^2 = 9.488$ , we reject  $H_0$ .

#### 24. Conclusion

This research centers on the application of general linear model on the contribution of changes in minimum wage in the Nigerian economy. Since the calculated value is greater than the tabulated value in the joint test hypotheses, we reject the null hypothesis, which means that changes in minimum wage has significant contributions on the Nigerian economy between the years under study. Rejection of  $H_0$  in the joint hypothesis leads to testing the parameters individually which we found out that real gross domestic product, composite consumer price index and per capital income are significant while labour force, inflation rate and interest rate are insignificant.

There is no multicollinearity in the data since CI is less than ten. There is no presence of autocorrelation since the Durbin Watson Statistic is less than the lower tabulated value. Heteroscedasticity exists in the data, which means constant variance.

The coefficient of determination ( $R^2$ ), which indicates the proportion in Y that is explained by X's turned out with a high percentage of 90.3% showing that there is a strong relationship between the changes in minimum wage and RGDP, CCPI, PCI, LF, INFL, IR. This result entails that 90.3% (percent) variation on the minimum wage rate is explained by a change in the Nigerian Economy variables used in this paper.

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## 26. Appendix

Descriptive Statistics			
	Mean	Std. Deviation	N
MW	5.1621E3	6154.93997	33
RGDP	1.5870E5	2.08373E5	33
CCPI	62.0233	61.91929	33
PCI	1.0655	.50054	33
LF	1.0122E5	1.41077E5	33
INF	21.2730	18.70112	33
IR	14.2758	4.40036	33

Table 3

Model Summary <sup>b</sup>					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.950 <sup>a</sup>	.903	.881	2124.04115	1.762

a. Predictors: (Constant), IR, PCI, INF, RGDP, LF, CCPI  
b. Dependent Variable: MW

Table 4

ANOVA <sup>b</sup>						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1.095E9	6	1.825E8	40.450	.000 <sup>a</sup>
	Residual	1.173E8	26	4511550.797		
	Total	1.212E9	32			

a. Predictors: (Constant), IR, PCI, INF, RGDP, LF, CCPI  
b. Dependent Variable: MW

Table 5

Coefficients <sup>a</sup>								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-6526.750	1672.621		-3.902	.001		
	RGDP	.008	.002	.287	3.473	.002	.546	1.830
	CCPI	58.338	8.533	.587	6.836	.000	.505	1.980
	PCI	5024.355	834.684	.409	6.019	.000	.808	1.238
	LF	.000	.004	-.015	-.184	.855	.546	1.831
	INF	-22.133	22.630	-.067	-.978	.337	.787	1.270
	IR	133.910	99.235	.096	1.349	.189	.739	1.352

a. Dependent Variable: MW

Table 6

Collinearity Diagnostics <sup>a</sup>										
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions						
				(Constant)	RGDP	CCPI	PCI	LF	INF	IR
1	1	4.853	1.000	.00	.01	.01	.00	.01	.01	.00
	2	.780	2.495	.00	.00	.05	.00	.23	.12	.00
	3	.762	2.523	.00	.25	.03	.00	.08	.07	.00
	4	.317	3.912	.00	.18	.01	.22	.10	.23	.00
	5	.182	5.169	.02	.15	.73	.00	.11	.33	.03
	6	.074	8.096	.05	.41	.15	.50	.48	.24	.32
	7	.032	12.320	.92	.00	.01	.27	.00	.00	.65

a. Dependent Variable: MW

Table 7

Residuals Statistics <sup>a</sup>					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-1.1559E3	1.8588E4	5.1621E3	5849.58554	33
Residual	-5.96411E3	4.43029E3	.00000	1914.58482	33
Std. Predicted Value	-1.080	2.295	.000	1.000	33
Std. Residual	-2.808	2.086	.000	.901	33

Table 8