FIRMS’ SURVIVAL IN NIGERIA MANUFACTURING INDUSTRY: IS THERE EVIDENCE OF GIBRAT’S EFFECT?

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Erhijakpor O. E. Andrew²

Abstract

The Gibrat’s law of proportionality advocates that the growth rates of firms follow a random process, independent of its size at the earlier stage of the business. There is contradicting evidence that specific sectorial firms’ data, behaviour shows traces of the Gibrat’s effect. Consequently, to examine this law in a developing economy manufacturing industry, this study represents firms’ growth with two measures, profitability and performance. This study used a hybrid model that combines the autoregressive distributive lagged co-integration system with the panel data model to analyse the dynamic effect of firms’ growth, performance and size on firms’ survival. The short-run results unveiled that firms’ survival persists due to the strategic influence of previous survival levels, where firms’ performance remains predominant. Firms’ size was noticed to have a positive influence on firms’ survival, but the relationship was not statistically significant. Thus the law of proportional effect does not hold for firms’ in this industry. On the long-run firms’ survival is strongly dependent on firm’s performance though, firms’ growth and size remain paramount. Other findings have policy significance for firm survival in a developing manufacturing sector, efficiency in management decision implementation and government policies.

Keywords: ARDL, firm growth dynamics, firm survival, Gibrat’s law.

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Introduction

Analysing firms that have survived innovations, large and small firms, their births and deaths were not proportional due to their basic structural fundamentals and their growth rates were independent of their sizes as a result of industry-specific effects. Consequently, the law of proportional effect becomes pertinent (Tang, 2014; Gerosk, Lazarova, Urga & Walters, 2003; Wagner, 1992; Singh & Whittington, 1975; Samuel, 1965). These facts have been subjected to strenuous academic rigor in developed countries (Moreno & Casillas, 2007; Ganugi, Crossi & Gozzi, 2005; Wagner, 1992). It has been exposed to numerous sets of empirical cross-examinations, amidst controversies that have shaped management thinking, refined investors ideologies and redirected government policies associated with firms’ growth and survival. Thus, it is necessary to carry out a developing economy study to investigate the specified effect.

Subsequently, to explore the validity of the Gibrat’s law in this study, we first test the hypothesis that firms’ growth and size are not independent of firms’ survival in the short-run and secondly, in the long-run for large firms’. This conjecture is proposed to systematically investigate if firms converge to Gibrat’s-like behaviour through time. This is in accordance with the thoughts shared by Lotti, Santarelli and Vivarelli (2007), which states that the relationship between firms, due to the correlation between the exit of the less efficient firms and the convergence of the efficient ones, in the industry can generate a ‘steady state’. They proposed that this might be due to homogeneity in accordance with the Proportionate Effect Law. Subsequently, this paper attempts to analyse the role of discrete time in firms’ growth to understand firms’ survival, it does not consider unobserved heterogeneity and competing for risk. Also, it does not cover related firm and industry-specific covariates; because it is centered on firms in a homogeneous case, the manufacturing industry. It used the hybrid autoregressive distributed lagged (ARDL) model to examine dynamic firms behaviour in this sector. Thus, this study seeks to analyse if the Gibrat’s law can be confirmed or rejected in the sole population of surviving manufacturing firms, through their operating periods, in a developing economy.

Literature

Gibrat’s law of proportionate effect discloses that the proportional change in the size of a firm is independent of its absolute size. It implies that the large and small firms have a similar average proportionate rate of growth (Samuels, 1965). Samuels (1965) study considered firms that have survived through a specified time. He proposed that firm births and deaths in the periods covered by the study were not equal for large and small firms. Due to capital requirement adequacies and cases where a merger is treated as death, he suggested that firm growth was noticed to be independent of absolute size as an explanation of trends in the industry, though larger firms are found to
grow fastest as a result of the degree of concentration in the industry. Singh and Whittington (1975) used a stochastic model to iterate the Gibrat’s law. Insisting that firms size and growth in economic theory involves the conceptual measures of optimum size and its industrial equilibrium.

The Gibrat’s law of proportionate effect states that the growth rate of a given firm is independent of its size at the beginning of the production period (Lotti, Santarelli & Vivarelli 2003). Tang (2014) viewed it as a law that predicts firm’s growth as purely random and should be independent of its size. Wagner (1992) carried out a test on firms in the manufacturing industries, to validate the Gibrat’s Law of proportionate growth. He discovered that this law was valid for a selected group of firms in this sector within specified periods in their transformation history. He did not establish any concrete evidence to justify that some firms’ growth rates are faster due to their sizes. The study found that most firms grow faster because their previous records support increased growth. This was termed the ‘persistence of chance’.

Lotti, Santarelli and Vivarelli (2003) empirically applied the Gibrat’s law of proportionate effect through the quantile regression method to determine, if the law will hold for small Italian firms in the early stages of their life cycle. The results revealed that this was not true for some of the new small firms in their study. Relatively, they found it difficult to reject the potency of the law because they noticed that there were no large differences between new small and large firms in the industry in their early years of operation. To analyse Gibrare’s law in Italian mechanical companies, Ganugi, Grossi and Gozzi (2005) split their sample into regions. They notice that firm size, total assets follows approximately a log-normal distribution. This view was closely related to the Gibrat’s law. Relatively, further empirical results violated the Gibrat’s law because they noted that firm size influences the rates of growth negatively, and it does not aid the persistence of growth. Gerost, Lazarova, Urga and Walters (2003) deduced from previous empirical works that the firm size differences are transitory.

To establish this view, they examined firms’ long-run growth and disclosed that they are highly variable over time and that the differences in firms’ growth rates persist for long periods. They suggested that firms reach and maintain stable positions in a skewed size distribution. To evaluate the extent of growth in small, young, and innovating firms, Calvo (2006) used the least squares methods in accordance with Heckman’s Probit survival equation that correct for sample selection bias. Also, he used the Mil’s ratio and the maximum likelihood methods. The results of these tests reject the Gibrat’s law, but they supported the proposition that small firms grow larger and are more innovative than old firms that grow slowly.

Scholastic studies have provided empirical consequences that rejected the theoretical fundamentals of Gibrat’s law (Van Dijk, Hertog, & Mankveld, 1997; Hamilton, Shapiro & Vining, 2002; Moreno & Casillas, 2007). They asserted that small young firms grow faster because they are less risk averse,
have the greater capacity to innovate and they are flexible to policy change than larger firms. Hopenhayn (1992) consider this phenomenon true, emphasising that small firms grow faster than larger firms, due to a selection effect. Also, the power of a firm to restructure supply and the allocation of resources is likely to decrease with an increase in the size of the firm (Hamilton et al. 2002). Large companies’ growth slows, due to diversity; variability in policy structure that most likely decreased the total growth rate and productivity of these firms (Dune & Hughes, 1994). Almus (2000) studied Gibrat’s law on young technology-intensive (and non-technology intensive) firms in West Germany and noted that firms size follows approximately a log-normal distribution. He used Chesher (1979) approach to evaluate proportionate effect linking these firm’s size and growth and concluded that Gibrats law was not attainable.

Justifying the fact that companies size is approximately log-normal, under certain conditions as the limiting distribution of the product of positive random variates as the number of terms in the product tends to infinity. Tang (2014) employed a random-effects model to evaluate if Gibrat’s law holds for an individual firm from the energy sector. He disclosed that Gibrat’s law is more likely to be rejected ex-ante when an entire firm’s population is considered but more likely to be confirmed ex-post after market selection treatment was encapsulated in the proposed model. Consequently, the results show that Gibrat’s law is violated in the short term but holds in the long term when the firms have reached a steady state. Nassar, Almsafir and Al-Mahroug (2014) investigated Gibrat’s law in developing countries, in low technology-driven small young firms and noted that the law is not valid as smaller firms were empirically proven to grow faster than larger firms.

Methodology
The datasets used in this analysis are expressed in aggregate values as stated in the central bank of Nigeria Statistical Bulletin (CBN, 2010; 2015) and the stock market fact books (2008; 2010; 2015). The estimation process will assess firms’ survival (FS) as a measure of sales returns and its dependence on its first (FS-1) and second (FS-2) lag values. Firms’ performance (FP) is captured by the cost-of-goods-sold. Firms’ growth (FG) is represented by gross profit as a ratio of tax (profitability). Firms’ size (FZ) is obtained from the values of net assets to reveal the potential distortions in the firm’s financial strategy due to its ability to generate an adequate return on assets through robust sales. The control variable used in the model is the rates of inflation (INF), an important variable not included in the computation of the rates of return that is most desirable to analyse the survival of an investment project.

This estimation technique interweaves the traditional ARDL co-integration approach, which treats all the variables in the model as endogenous in the light of their lagged values, with the panel data system
which permits unobserved individual heterogeneity of the uniqueness of the firms. This hybrid model systematically combines the statistical nature of traditional cross-sectional data estimation technique with ARDL time series schemes (Kao & Chiang, 1999). The functional form of the proposed ARDL model is:

\[
FS = f(FS-1, FS-2, FP, FG, FZ, INF) - \quad \quad \quad \quad \text{equation (1)}
\]

The related linear equation function will be,

\[
FS = b_0 + b_1FS-1 + b_2FS-2 + b_3FP + b_4FG + b_5FZ + b_6INF + U_t \quad \quad \quad \quad \text{equation (2)}
\]

Where:
- \(U_t\) represents the stochastic error term.
- The presumptive (a-priori) signs are \(b_1>0, b_2 <0, b_3>0, b_4>0, b_5>0, \) and \(b_6<0\).

To effectively estimate this model and arrive at a robust result, it is necessary to examine the variables in the model for the presence of unit root in the observed series. The Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) unit root test were used to detect the order of each series (Gujarati, 2005; Greene, 2008). Consequently, the critical \(t\)-values of the test were estimated and the null hypothesis of non-stationarity is rejected if the \(t\)-statistic is less than the critical \(t\)-value (Hylleberg & Mizon, 1989, Engle & Granger, 1987; 1991).

The proposed error correction model (ECM) of firms’ survival in Nigeria which is the anticipated short-run model is expressed as:

\[
ddFS = b_0 + b_1(L)ddFS+ b_2FP + b_3FG + b_4FZ + b_5INF – b_6ecm_{t-1} + U_t \quad \quad \quad \quad \text{equation (3)}
\]

Here, \(L\) is the general lag operator; ECM represents the time series of the residuals that form the co-integrating vector. The ECM negative coefficient suggests the existence of co-integration and it defines the feedback mechanism among the co-integrating variables.

**Discussion of findings**

This section discusses the outcome of the estimation process and interpreted the results of the unit root test, the error correction mechanism (ECM) and the long-run coefficient of the auto-regression distributive \((3, 0, 0, 0)\) model (ARDL).
The first difference solution was for an intercept without a trend is for the DF and ADF test with an intercept and a trend values for the DF and ADF test. Thus, we obtain stationarity for all the variables in the model. The calculated critical values for the DF and ADF test for an intercept without a trend are -2.9400 and the DF and ADF test with an intercept and a trend is -3.5313. Hence we reject the null hypothesis of non-stationarity and the alternative hypothesis that the variables in the model are stationary. Thus, the first difference solution was used to estimate the model developed in section three.

Table 1: Coefficients of the DF and ADF unit root test

<table>
<thead>
<tr>
<th>Variable</th>
<th>Test</th>
<th>Intercept and no trend</th>
<th>Intercept and trend</th>
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</thead>
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<tr>
<td></td>
<td></td>
<td>Levels</td>
<td>1st Diff.</td>
</tr>
<tr>
<td>INF</td>
<td>DF</td>
<td>-5.9056*</td>
<td>-8.6305*</td>
</tr>
<tr>
<td></td>
<td>ADF</td>
<td>-4.8056*</td>
<td>-7.1047*</td>
</tr>
<tr>
<td>INTR</td>
<td>DF</td>
<td>-4.1282*</td>
<td>-11.0771*</td>
</tr>
<tr>
<td></td>
<td>ADF</td>
<td>-3.5358*</td>
<td>-7.2282*</td>
</tr>
<tr>
<td>FP</td>
<td>DF</td>
<td>-2.4645</td>
<td>-15.9280*</td>
</tr>
<tr>
<td></td>
<td>ADF</td>
<td>-2.5968</td>
<td>-5.7541*</td>
</tr>
<tr>
<td>FG</td>
<td>DF</td>
<td>-6.1629*</td>
<td>-13.4063*</td>
</tr>
<tr>
<td></td>
<td>ADF</td>
<td>-4.3578*</td>
<td>-9.3523*</td>
</tr>
<tr>
<td>INDX</td>
<td>DF</td>
<td>-2.8783</td>
<td>-11.6840*</td>
</tr>
<tr>
<td></td>
<td>ADF</td>
<td>-3.0962*</td>
<td>-7.8349*</td>
</tr>
<tr>
<td>FS</td>
<td>DF</td>
<td>-2.4523</td>
<td>-12.6386*</td>
</tr>
<tr>
<td></td>
<td>ADF</td>
<td>-2.7551</td>
<td>-5.2117*</td>
</tr>
</tbody>
</table>

Critical Value
-2.9400  -2.9400  -3.5313*  -3.5313*

Source: Authors estimation, with data from fact-books. *Represents statistical significance at one percent.

Table 2: ARDL (3, 0, 0, 0), ECM and Long-run with firms’ survival (FS) on the regressors

<table>
<thead>
<tr>
<th>Regressors</th>
<th>ARDL Schwarz Bayesian criterion.</th>
<th>Error correction representation (ECM) of the ARDL</th>
<th>Estimated long-run coefficient of the ARDL.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>t-ratio</td>
<td>p-value</td>
</tr>
<tr>
<td>DDFS(-1)</td>
<td>.023666</td>
<td>-.48337</td>
<td>.633</td>
</tr>
<tr>
<td>DDFS(-2)</td>
<td>.11370</td>
<td>-.23529</td>
<td>.027</td>
</tr>
<tr>
<td>DDFS(-3)</td>
<td>-.13442*</td>
<td>-.31392</td>
<td>.004</td>
</tr>
<tr>
<td>DDINFL</td>
<td>195.8086</td>
<td>2.6855</td>
<td>.012</td>
</tr>
<tr>
<td>SIZE</td>
<td>1862.6</td>
<td>1.5330</td>
<td>.137</td>
</tr>
<tr>
<td>INTP</td>
<td>1118.2</td>
<td>1.1924</td>
<td>.243</td>
</tr>
<tr>
<td>DDFP</td>
<td>1.1811*</td>
<td>22.4182</td>
<td>.000</td>
</tr>
<tr>
<td>ECM(-1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>.97169</td>
<td>.99133</td>
<td></td>
</tr>
<tr>
<td>R-Bar-Squared</td>
<td>.96461</td>
<td>.98916</td>
<td></td>
</tr>
<tr>
<td>F-test</td>
<td>F(7, 28) 137.2685*</td>
<td>.000</td>
<td>F(7, 28) 457.4052*</td>
</tr>
<tr>
<td>D.W. Stat.</td>
<td>1.8413</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Authors estimation, with data from fact-books. *Represents statistical significance at one percent.
Table 2 depicts the estimates of the short-run and long-run equations of parsimonious firms’ survival model. The long-run position of firms’ survival is strongly dependent on firms’ performance, inflation rate, size and firm growth which are 0.93, 153.96, 1464.6 and 0.25 respectively. Subsequently, only the firms’ performance variable is statistically significant at one percent on the long-run. This means that over time, for firms to survive competition in the manufacturing industry, their levels of performance is a major attribute to survival rather than firm growth, firm’s size and the distortions of the rates of inflation. Thus, dynamic relationships exist between the variables in the model and firm survival will adjust to its suggested long-run growth path in the light of its performance, with time following a disturbance.

Further, the results of the equilibrium error indicate that the short-run changes in firms’ performance have a significant effect on firms’ survival. Also, the first and second lag values of firms’ survival, contributed adequately to the present levels of firms’ survival. Consequently, about 1.2 of the discrepancy is due to firms’ performance and .12 and .25 of the discrepancies are due to previous values of firms’ survival between the actual and short-run values of firms’ survival which are partially eliminated as the firms struggled to survive.

The error correction representation of the ARDL, the short-run outcome, shows that the first and second period lag values of firms’ survival (DDFS (-1) and DDFS (-2)) have a positive influence on the present levels of firms’ survival. This suggests that in the short-run, the adequacy of previous market share potentially influences the firms’ present domestic value added and their abilities to survive. A unit increase in the first lag value of firms’ survival will generate a .248 unit increase in the present levels of firms’ survival. Similarly, a unit increase in the second lag value of firms’ survival will generate a .134 unit increase in the present levels of firms’ survival. These variables were statistically significant at the one and five percent levels respectively. This suggests that previous levels of firms’ survival that foster the present levels of firms’ survival in the manufacturing sector are absolutely necessary for firms’ to endure uncertainties in the short-run.

The firms’ growth variable, which was represented by profitability (DDFG), has a positive influence on the levels of firms’ survival to approximately .319 units. Relatively, a unit increase in firms’ growth linked to profitability, will lead to a .319 unit increase in firms’ survival. This variable was not statistically significant at the one, five and ten percent; its positive influence matter to sustain firms’ survival in the industry. The second variables used to represent firms’ growth, the levels of firm’s performance (DDFP), has a positive influence of approximately 1.18 units on the level of firms’ survival. A unit increase in firms’ performance linked to growth will generate a 1.18 unit increase in firms’ survival. It was noticed that this
variable was statistically significant at the one percent level, confirming that firms’ performance relates significantly to their levels of survival.

Firms’ size has a positive influence on firm survival. A unit increase in firm size will lead to 1862.6 units increase in firms’ survival in the short-run. This variable is not statistically significant at the one, five and ten percent levels but its positive influence has implication for firms’ survival in the short-run. These illustrate that the Gibrat’s law of proportional effect does not hold in this industry considering the sample analysed. This suggests that firms’ growth rate, an indication of a change in size, dependents on its size to drive innovations that lead firms’ survival in the early stages of growth in the manufacturing sector in Nigeria. Therefore, we accept $H_0$ that changes in firms’ size (growth and performance) is not independent of firms’ absolute size for survival in the short-run and long-run.

The rate of inflation which was used as the control variable has a positive influence on firms’ survival, indicating that an increase in the rates of inflation positively influences firms’ survival by 195.81 units in the short-run. This variable is not statistically significant at the one, five or ten percent levels but it is essential for the analyst, management and policy makers to note that inflation enhances firm survival in the short-run.

The ECM coefficient of -1.27 has the expected negative sign and it's statistically significant at the one percent level. This suggests that it may take approximately 1.3 units of related lag time of discrepancies between the actual and the short-run levels necessary for firms’ survival in the industry to recover. This implies that firms’ survival may revert back to its equilibrium growth path quickly in moderate time.

The summary statistics show that the model has a perfect fit. The $R^2$ value of .99 indicates that over 99 percent systematic variation of firms’ survival can be explained by the model, omitting less than 1 percent which is attended by the error term. The F (7, 28) statistics value of 457.41, pass the test of individual statistical significance at the 1 percent level, suggest that all the slope coefficients are simultaneously significantly different from zero. The Durbin-Watson (D.W.) statistics value of 1.84, which is approximately 2.0, indicates that the estimated model is free from the presence of first-order serial correlation. These show that the results of the estimated model are proficient and the implication of the study in line with policies proposed from this outcome is practicable.

**Conclusion**

This study probed firms’ survival and growth in accordance with the Gibrat’s law of proportional effect. It focused on analysing how the changes in the size of the growth rate of firms are independent of its absolute size to influence survival in the short-run and the long-run in the course of business in the Nigeria manufacturing sector. It used the hybrid ARDL co-integration test to analyse the significance of the influence of the variables in the model...
on firm survival. The variables in the model were stationary after the first difference process. The long-run and error correction mechanism (short-run) results were evaluated and the variables pass the test of statistical significance at different levels.

It was revealed that in the short-run, previous firms’ survival levels strengthen firms’ present levels of survival to endure uncertainties in the industry. These variables were statistically significant at 1 percent. Profitability, a measure of firms’ growth, indicated positive influences that sustain firms’ survival. The control variable, the rates of inflation, has an adequate positive influence on firms’ survival. Also, firms’ size is fundamental to firms’ survival. These variables were not statistically significant, thus the Gibrat’s law of proportional effect does not hold in this industry considering the sample analysed. In contrast, firms’ performance, the second measure of growth, is essential for firms’ survival in the short-run and it was statistically significant at the 1 percent level.

On the long-run, firms’ survival was strongly influenced by the levels of firms’ performance, the rates of inflation, firms’ size and profitability. This suggests that in the long-run, for firms to survive competition in the manufacturing industry, their levels of performance are essential for survival rather than firm growth, firm size and the rates of inflation.

References


Firms’ Survival in Nigeria Manufacturing Industry: Is there Evidence of Gibrat’s Effect?


Appendix

**Appendix A1: Autoregressive Distributed Lag Estimates, ARDL (3, 0, 0, 0)**

<table>
<thead>
<tr>
<th>Regressor</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio[Prch]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDGSales(-1)</td>
<td>-.023666</td>
<td>.048960</td>
<td>-</td>
</tr>
<tr>
<td>48337[.633]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDGSales(-2)</td>
<td>-.11370</td>
<td>.048886</td>
<td>-</td>
</tr>
<tr>
<td>2.3259[.027]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDGSales(-3)</td>
<td>-.13442</td>
<td>.042819</td>
<td>-</td>
</tr>
<tr>
<td>3.1392[.004]</td>
<td>.3194E-3</td>
<td>.3676E-3</td>
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<tr>
<td>DGGBTXTAX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.86868[.392]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDINFL</td>
<td>195.8086</td>
<td>72.9143</td>
<td></td>
</tr>
<tr>
<td>2.6855[.012]</td>
<td></td>
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SIZE: 1862.6
INTP: -1182.6
1.1924[.243]
DDOGS: 1.1811
22.4182[.000]

R-Squared: .97169
S.E. of Regression: 3422.7
F-stat.: F( 7, 28) 137.2685[.000]
Mean of Dependent Variable: 33.3871
S.D. of Dependent Variable: 18193.2
Residual Sum of Squares: 3.28E+08
Equation Log-likelihood: -339.5331
Akaike Info. Criterion: -347.5331
Schwarz Bayesian Criterion: -353.8672
DW-statistic: 1.8413

Diagnostic Tests

A: Lagrange multiplier test of residual serial correlation
B: Ramsey's RESET test using the square of the fitted values
C: Based on a test of skewness and kurtosis of residuals
D: Based on the regression of squared residuals on squared fitted values
Figure 1

Estimated Long Run Coefficients using the ARDL Approach
ARDL(3,0,0,0) selected based on Schwarz Bayesian Criterion

Dependent variable is DDSALES
36 observations used for estimation from 5 to 40

<table>
<thead>
<tr>
<th>Regressor</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio(Prob)</th>
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<tbody>
<tr>
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<td>SIZE</td>
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<td>952.6401</td>
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Appendix C: Error correction representation of ARDL (3, 0, 0, 0)

Error Correction Representation for the Selected ARDL Model
ARDL(3,0,0,0) selected based on Schwarz Bayesian Criterion

Dependent variable is dDDSALES
36 observations used for estimation from 5 to 40

<table>
<thead>
<tr>
<th>Regressor</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio[Prob]</th>
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<tbody>
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<td>dDDGPBTAX</td>
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<td>dDDINFL</td>
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<td>991.7524</td>
<td>-1.1924[.243]</td>
</tr>
<tr>
<td>dDDCOGS</td>
<td>1.1811</td>
<td>.052685</td>
<td>22.4182[.000]</td>
</tr>
<tr>
<td>ecm(-1)</td>
<td>-1.2718</td>
<td>.10645</td>
<td>-11.9475[.000]</td>
</tr>
</tbody>
</table>

List of additional temporary variables created:
- DDSALES = DDDSALES - DDSALES(-1)
- DDSALES1 = DDSALES(-1) - DDSALES(-2)
- DDSALES2 = DDSALES(-2) - DDSALES(-3)
- DDGPBTAX = DDGPBTAX - DDGPBTAX(-1)
- DDINFL = DDINFL - DDINFL(-1)
- dSIZE = SIZE - SIZE(-1)
- dINTP = INTP - INTP(-1)
- dDDCOGS = DDCOGS - DDCOGS(-1)
- dINTP = INTP - INTP(-1)
- dDDCOGS = DDCOGS - DDCOGS(-1)
- ecm = DDSALES - .2511E-3*DDGPBTAX - 153.9634*DDINFL - 1464.6*SIZE + 929.8775*I

R-Squared                      .99133   R-Bar-Squared .98916
S.E. of Regression             3422.7   F-stat.     F( 7, 28) 457.4052[.000]
Mean of Dependent Variable    -183.8292  S.D. of Dependent Variable 32879.8
Firms' Survival in Nigeria Manufacturing Industry: Is there Evidence of Gibrat’s Effect?

Residual Sum of Squares     3.28E+08   Equation Log-likelihood -339.5331
Akaike Info. Criterion      -347.5331   Schwarz Bayesian Criterion -353.8672
DW-statistic               1.8413

R-Squared and R-Bar-Squared measures refer to the dependent variable dDDSALES and in cases where the error correction model is highly restricted, these measures could become negative.

Figure 3

Figure 4