SCITECH
RESEARCH ORGANISATION|

Volume 6, Issue 1
October, 2017|

Journal of Marketing and HR
www.scitecresearch.com

RELATIONSHIP BETWEEN GROSS MARGIN AND SOME SOCIO-ECONOMIC VARIABLES IN SOME SELECTED DATE PALM MARKETS OF JIGAWA STATE NIGERIA

Musa, S.[1], Umar, A.[2] and Wudil, A. H.[3]

[1]bappa.girei@gmail.com
Department of Agricultural Economics and Extension, Federal University
Dutse PMB 7156, Dutse, Jigawa State, Nigeria.

[2]aminu_umaru2007@yahoo.com
Department of Economics, Modibbo Adama University of Technology PMB 2076 Yola Nigeria.

[3]azeezhud4real@gmail.com
Department of Agricultural Economics and Extension, Federal University
Dutse PMB 7156, Dutse, Jigawa State, Nigeria.

Abstract

The study examined the relationship between gross margin and some socio-economic variables in some selected date palm markets of Jigawa State, Nigeria. The specific objectives were to; determine the influence of some socio-economic variables on gross margin and examine the causations between socio-economic variables and gross margin. Analytical tool employed for the analysis were multiple regression and gross margin analysis. Purposive and simple random sampling techniques were employed in selecting 122 respondents from a sampling frame of 305. The result revealed that the coefficients of age (584.88), selling price (3.97) and quantity sold (3076.22) were positive and statistically significant while cost of transportation (-20.48), marketing experience (-533.81) and cost of the product were negative and statistically significant. The R^2 value of 0.79 indicates that about 79% of the variation in gross margin was explained by variables included in the model while the remaining 21% is due to error term. The F-statistics of 51.79 indicates that all the variables in the model were jointly and statistically affecting gross margin. There is no autocorrelation as indicated by the F-value of 0.3149 and no heteroscedasticity as indicated by the F-value of 0.4057. The Granger causality test indicates that there is no causation between gross margin and age, household size and marketing experience while there is unidirectional relationship between gross margin and years of formal education, selling price, cost of the produce and quantity sold and the is a bi-directional relationship between gross margin and cost of transportation. It was concluded that there is positive and significant relationship between gross margin and age, selling price and quantity sold while there is statistical and negative relationship between gross margin and cost of transportation, marketing experience and cost of the produce. No causation between gross margin and age, household size and marketing experience, while Years of formal education, selling price cost of and cost of transportation also causes gross margin.

Keywords Relationship; Gross Margin; Markets; and Date Palm

1. Introduction

Date palm (*Phoenix dactylifera* L.) is one of the most important fruit crops in arid zones of Arabian Peninsula, Middle East and North America for a very long time and a source of income and food and plays a significant role in the economy, environment and society of countries where they are cultivated [1]. The date palm has much importance by providing concerted energy which could be stored and carried along on long journeys especially in the desert and has provided a more conducive environment for human beings in the desert [2]. Because of the high tolerance to harsh weather condition, the tree provides timber, shelter, and food human beings [3].

Agricultural marketing involves the moving of produce from the farm to the consumer through different interconnected activities [4]. Through agricultural marketing has aided in providing income, provides support to producers and increase in production through adopting improved technologies. It will also aid in generating income for government and supports amenities like infrastructure, roads and water which will result in improving efficiency in marketing [5].

Agricultural supply can be characterized by seasonality in production which is associated with price variation with general fall in prices during the production season and rises up before the start of next season, except for stored commodities where prices fall before the next season because traders want to sell their produce before arrival of new produce [6]. This could lead to either exploiting the consumer by charging high prices or marketers by getting lower prices for their commodities. The distribution and marketing agricultural system could be characterized with lower efficiency and high marketing margins which has increased prices and reduced the availability of the produce which has resulted in malnutrition in children and various diseases among adults and nursing mothers [7].

1.1 Objectives of the Study

The main objective of the study was to determine the relationship between gross margin and some socio-economic variables in some selected date palm markets of Jigawa State, Nigeria. The specific objectives were to;

i) determine the influence of some socio-economic variables on gross margin; and
ii) examine the causations between the socio-economic variables and gross margin.

2. Methodology

The study was conducted in Jigawa State, Nigeria. Purposive and simple random sampling techniques were used in selecting marketers through the administration of questionnaire. Eight markets namely; Maigatari, Shuwari (Kiyawa), Babaldu (Birnin Kudu), Gwaram, Gujungu (Taura), Gumel, Kazaure and Hadejia markets were purposively selected due to high number of date palm marketers. Respondents were selected in proportion to the sizes of the markets such that 27 were selected from a sampling frame of 67 from Shuwarin market, 24 were selected a sampling frame of 60 in Babaldu market, while 16 were selected from a sampling frame of 40 in Gujungu market, 15 were selected from a sampling frame of 38, and 14 were selected from a sampling frame of 35 in Gumel market. Moreover, 12 were selected from a sampling frame of 30 in Hadejia market while 10 were selected from a sampling frame of 25 in Kazaure market and 4 were

selected from a sampling frame 10 in Gwaram market, making a total sampling from of 305 and a total sample size of 122 using the sampling percentage of 40%.

3. Multiple Regression Model

This study adopted regression model used by [8] and made adjustments by replacing the dependent variable i.e. marketing efficiency with gross margin and made modifications on the explanatory variables by replacing some of independent variables with variables that fits the research for the analysis. The gross margin (GM) was regressed on numerous variables affecting the level of profit (using E views 7.1 software).

Functional forms of multiple regression models were considered and the best (linear function) was chosen using criteria for selection. The implicit form of the regression can be specified as follows:-

$$GM = f\left(X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8\right)$$

Where
$GM = \pi$= Gross margin
X_1= Age (Years)
X_2 = Household size (Numeric),
X_3 = Years of formal education (Years),
X_4 = Transportation cost (Naira),
X_5 = Marketing experience (Years),
X_6 = Selling price (Naira),
X_7 = Cost of the produce (Naira),
X_8 = Quantity sold (Bags),
u_i= Error term
β_0= Intercept
β_1 - β_8 = Parameters
f = Functional form notation
Four functional forms of the regression were expressed as follows:

Linear

$$GM = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \ldots\ldots\ldots\ldots\ldots + \beta_8 X_8 + \mu_i$$

Cobb Douglas

$$GM = \beta_0 + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_4 LnX_4 + \beta_5 LnX_5 + \ldots\ldots\ldots\ldots + \beta_8 LnX_8 + \mu_i$$

Exponential

$$GM = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \ldots\ldots\ldots\ldots\ldots + \beta_8 X_8 + \mu_i$$

Semi log

$$GM = \beta_0 + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_4 LnX_4 + \beta_5 LnX_5 + \ldots\ldots\ldots\ldots + \beta_8 LnX_8 + \mu_i$$

Gross margin (GM) by definition is simply the difference between the total revenue (TR) and the total variable cost (TVC) [9] and is expressed as:

$$GM = TR - TVC$$

Where:
GM= Gross margin in naira of date palm per marketer per month
TR= Total revenue in naira

TVC= Total variable cost

An enterprise is considered profitable if the gross margin is positive. This implies that the total revenue (TR) is greater than the total variable cost (TVC). If the gross margin (GM) is negative the enterprise is not economically profitable. The higher the gross margin, the higher the level of profitability of an enterprise and vice versa.

$$GM = f\left(X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8\right)$$

While we adopted the causality model of [10] and was calculated using E-views 7.1 software.

4. Results and Discussions

4.1 Multiple Regression Analysis

Table 1 represents regression results showing the relationship between gross margin (Y), and the specified variables$(X_1 - X_8)$. The result reveals that linear regression function is the best functional form based on criteria for selection which involves value of the coefficient multiple determinations, standard error, mean of the estimated parameters and significance of the explanatory variables as indicated in (Appendix 1). Based on the linear results one year increase in the age of the marketers will lead to increase in the gross margin by about 585 naira, similarly, one unit increase in the size of the household will increase gross margin by about 210 naira, also one year increase in formal education will increase gross margin by about 578 naira, one naira increase in the cost of transportation will reduce gross margin by about 21 naira, one year increase in marketing experience will reduce gross margin by about 534 naira, one naira increase in selling price will increase gross margin by about 4 naira, one naira increase in costs of the product will reduce gross margin by about 3 naira and lastly, one unit increase in quantity sold will increase gross margin by about 3076 naira. This results show that gross margin is highly related to the quantity sold than all the remaining variables as indicated by the coefficients of the variables. The coefficients of all the variables in this study were found to be consistent with the theoretical a-priori expectations of the study. The results further revealed that the coefficient of age of the marketers is positive and statistically significant at 5% level, the coefficients cost of transportation and costs of the product are found negative and statistically significant at 1% level, the coefficient of selling price is found positive and statistically significant at 1% level, the coefficient of quantity sold is found positive and statistically significant at 1% level, while marketing experience is found negative and statistically significant at 10% level. The coefficients of household size and the years of formal education are found positive and statistically insignificant as indicated by the t-statistics values in Table 15 below.

The R-Square value of 0.7857 (Table 1) shows that 78.57% of total variations in gross margin (Y) was explained by the variables included in the model. Coincidently, the R-Square adjusted (0.7706) is found to be high after adjusting for the degree of freedom, implying that the model of this study is fit and reliable. The F-Statistic value of 51.79 which measures the joint significance of the parameters was found statistically significant at 1% level, this implies that all the variables of the model are jointly and statistically affecting gross margin. The Durbin-Watson statistics value of 1.89 is found to be greater than R-Square value of 0.7857 implying that the model of this study not is spurious; therefore it can be used for policy purpose. The Durbin-Watson statistics value of 1.89 reveals that there is presence of autocorrelation even though is negligible. This provides the basis for conducting serial correlation, Heteroscedasticity and unit root test.

The results of the Breusch-Godfrey serial correlation LM test revealed that there is no serial correlation between the error terms. The null hypothesis of no serial correlation is accepted as indicated by the F- value of 0.3149 at 1% probability level (Appendix I). This further confirmed the reliability of the model of this study. The results of the Breusch-Pagan-Godfrey heteroscedasticity test revealed that there is no heteroscedasticity in the model, meaning that the variance is constant. The null hypothesis of no heteroscedasticity is accepted as indicated by the F- value of 0.4057 at 1% probability level.

Table 1: Regression Analysis (Linear Function)

Variables	Coefficient	Standard error	t. statistics
C (Constant term)	-47624.67	12999.97	-3.68***
X_1(Age)	584.88	256.97	2.28**
X_2 (Household size)	209.57	399.72	0.52^{NS}
X_3 (Years of formal education)	578.02	498.38	1.16^{NS}
X_4 (Cost of transport)	-20.48	3.57	-5.74***
X_5 (Marketing experience)	-533.81	279.17	-1.91*
X_6 (Selling price)	3.97	0.99	4.01***
X_7(Cost of produce)	-3.22	1.14	-2.82***
X_8 (Quantity sold)	3076.22	241.70	12.73***
R. Squared 0.79			
R^2 Adjusted0.77			
F-Statistic 51.79***			
Durbin-Watson Stat. 1.89			

Source: Field Survey, 2015
*, **, *** = Indicates significance at 10%, 5% and 1% probability level respectively.
N S = Not significant

4.2 Granger Causality Test

The Granger causality results in Table 2 revealed that there is no causation between gross margin and age of the marketers, between gross margin and household size, and between gross margin and marketing experience (Appendix II). The result also shows that there is a unidirectional causation between gross margin and years of formal education at 5% probability level, selling price ($p< 0.01$), cost of the product ($p< 0.05$) and quantity sold ($p< 0.01$), but the causation runs from years of formal education, selling price, cost of the product and quantity sold to gross margin. This means that gross margin does not cause years of formal education, selling price, cost of the product and quantity sold but these variables cause gross margin. There is also a bi-directional causation between costs of transportation and gross margin ($p< 0.05$), meaning that costs of transportation causes gross margin and gross margin causes costs of transportation. Furthermore, the result revealed that there is no causation between age and household size, cost of transportation, marketing experience, selling price, cost of the produce and quantity sold but there exist a bi-directional causation between age and years of formal education at 5% probability level, meaning age of marketers causes years of formal education and also years of formal education causes age of marketers. There exist a bi-directional causation between household sizes and years of formal education at 1% probability level, meaning the household size causes years of formal education and years of formal education causes the household size. Similarly, there also exists a unidirectional causation between household sizes and cost of transportation ($p<0.05$) meaning that cost of transportation causes household sizes of the sampled marketers. There is no causation between household sizes and marketing experience, selling price, and cost of the

product but there exist a unidirectional causation between household sizes and quantity sold ($p<0.05$) meaning the quantity sold causes the household sizes.

The result revealed that there is unidirectional causation between years of formal education and cost of transportation ($p<0.05$), marketing experience ($p<0.05$), cost of the product ($p<0.05$), and quantity sold ($p<0.01$) meaning that years of formal education causes cost of transportation, marketing experience, cost of the product, and quantity sold. However, there is no causation between years of formal education and selling price. There exists a unidirectional causation between costs of transportation and marketing experience ($p<0.01$), and quantity sold($p<0.01$) meaning years of experience causes cost of transportation and also quantity sold causes cost of transportation, moreover, there is no causation between cost of transportation and selling price and also no causation between cost of transportation and cost of the produce. Marketing experience had no causation with selling price, cost of the product and quantity sold. There is no causation between marketing experiences and selling price, cost of the product and quantity sold. Similarly, there is no causation between selling price and cost of the product, and no causation between selling price and quantity sold. Nevertheless, there is no causation between cost of the product and quantity sold (Appendix II).

Table 2: Results of Causations between Variables

Variables	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
y	NO	NO	UNI** $x_3 \rightarrow y$	BI*** $x_4 \leftrightarrow y$	NO	UNI*** $x_6 \rightarrow y$	UNI*** $x_7 \rightarrow y$	UNI** $x_8 \rightarrow y$
X_1		NO	BI*** $x_1 \leftrightarrow x_3$	NO	NO	NO	NO	NO
X_2			BI*** $x_2 \leftrightarrow x_3$	UNI*** $x_4 \rightarrow x_2$	NO	NO	NO	UNI** $x_8 \rightarrow x_2$
X_3				UNI** $x_4 \rightarrow x_3$	UNI** $x_3 \rightarrow x_5$	NO	UNI** $x_3 \rightarrow x_7$	UNI*** $x_3 \rightarrow x_8$
X_4					UNI*** $x_5 \rightarrow x_4$	NO	NO	UNI*** $x_8 \rightarrow x_4$
X_5						NO	NO	NO
X_6							NO	NO
X_7								NO
X_8								

Source: Field Survey, 2015

NO = No causations UNI= Unidirectional causations BI= Bidirectional causations
, * Indicates the rejection of the null hypothesis of no causation at 5% and 1% significance level respectively
↔, → = Directions of causation

5. Conclusion

Based on the findings, it is concluded that there is a positive and significant relationship between gross margin and age, selling price and quantity sold while there is statistical and negative relationship between gross margin and cost of transportation, marketing experience and cost of the produce. Gross margin does not cause age, household size, and marketing experience and age, household and marketing experience does not cause gross margin. Years of formal

education, selling price cost of the produce and quantity sold causes gross margin. It is also concluded that gross margin causes cost of transportation and cost of transportation also causes gross margin.

6. References

[1] Chao, CT, & Krueger, RR. (2007). The Date Palm (*Phoenix dactylifera* L.): Overview of Biology, Uses and Cultivation. *HORTSCIENCE Journal*, 42(5), 1077-1082.

[2] Al-Gboori, B, & Krepl, V. (2010). Importance of Date Palms as a Source of Nutrition. *Agricultura Tropica Et Subtropica***.**Review Articles, 43 (4), 341-347.

[3] Dada, M, Nwawe, CN, Okere RA, Uwubanwe, IO. (2012). Potentials of Date Palm Tree to the Nigerian Economy: *World Journal of Agricultural Sciences*, 8 (3), 309-315.

[4] Rajendran, G, & Karthikesan, P. (2014). Agricultural Marketing in India: An Overview. *Asia Pacific Journal of Research*, 1(27), 159-164.

[5] Olukosi, JO, Isitor SU, Moses, OO. (2012). *Introduction to Agricultural Marketing and Prices: Principles and Application*, 4th Edition, living Books Series, G.U. Publishing Abuja, Nigeria. P41.

[6] Yousef, MQ. (2014). Seasonal Price Variation in Some Date Palm Varieties in Saudi Arabia. *International Journal of Agriculture and Crop Sciences*, 7(12), 1014-1026.

[7] Akanni, KA. (2012): Economics of Marketing of Food Grains in South Western Nigeria. *Economia Mexicana Nueva Epoca* 21(2), 373-390.

[8] Farayola, CO, Akintan, OS, Yahya, AA, Oni, OO. (2013): Determinants of Marketing Efficiency among Small-holder Cocoa Marketers in Oyo StateNigeria. *International Journal of Management and Social Sciences Research*, 2(11), 38-43.

[9] Olukosi, JO, & Erhabor, P. O. (2005). *Introduction to Farm Management Economics: Principles and Application*, Second Printing. Agitab Publishers Zaria.

[10] Umar, A, Donga, M, Musa, S. (2013). An Empirical Investigation into the Effect of Unemployment and Inflation on Economic Growth, *Interdisciplinary Journal of Research in Business*, 2(12), 1-14.

Appendix 1

Regression Results of Sampled Respondents

(i) Multiple regression results for different functional forms

Dependent Variable: Y LINEAR
Method: Least Squares
Date: 11/12/15Time: 11:20
Sample: 122
Included observations: 122

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-47824.67	12999.97	-3.678830	0.0004
X1	584.8785	256.9861	2.275915	0.0247
X2	209.5732	399.7156	0.524306	0.6011
X3	578.0151	498.3836	1.159780	0.2486
X4	-20.48325	3.573899	-5.731347	0.0000
X5	-533.8050	279.1690	-1.912121	0.0584
X6	3.968641	0.991987	4.000696	0.0001
X7	-3.220490	1.140667	-2.823340	0.0056
X8	3076.221	241.6970	12.72759	0.0000

R-squared	0.785716	Mean dependent var	31483.81
Adjusted R-squared	0.770545	S.D. dependent var	44676.65
S.E. of regression	21400.77	Akaike info criterion	22.85115
Sum squared resid	5.18E+10	Schwarz criterion	23.05800
Log likelihood	-1384.920	Hannan-Quinn criter.	22.93517
F-statistic	51.79205	Durbin-Watson stat	1.885075
Prob(F-statistic)	0.000000		

Dependent Variable: Y EXPONENTIAL
Method: Least Squares
Date: 11/12/15 Time: 11:33
Sample: 1894 2015
Included observations: 122

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.761371	0.417575	16.19199	0.0000
X1	0.007476	0.008266	0.904473	0.3677
X2	0.000807	0.012793	0.063111	0.9498
X3	0.005221	0.016333	0.319682	0.7498
X4	8.57E-05	0.000140	0.610700	0.5426
X5	-0.001434	0.009122	-0.157202	0.8754
X6	0.000316	3.23E-05	9.789876	0.0000
X7	-0.000297	3.74E-05	-7.936263	0.0000
X8	0.053010	0.007855	6.749058	0.0000

R-squared	0.751517	Mean dependent var	9.648001
Adjusted R-squared	0.733609	S.D. dependent var	1.325931
S.E. of regression	0.684354	Akaike info criterion	2.151356
Sum squared resid	51.98580	Schwarz criterion	2.360418
Log likelihood	-120.0814	Hannan-Quinn criter.	2.236257
F-statistic	41.96393	Durbin-Watson stat	1.100747
Prob(F-statistic)	0.000000		

Dependent Variable: Y DOUBLE LOG
Method: Least Squares
Date: 11/12/15 Time: 12:02
Sample: 1894 2015
Included observations: 122

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.072110	1.339066	-3.041008	0.0030
X1	-0.039082	0.135345	-0.288759	0.7733
X2	-0.008764	0.018615	-0.470800	0.6387
X3	0.000791	0.008102	0.097639	0.9224
X4	-0.015171	0.008424	-1.800995	0.0745
X5	-0.000829	0.041095	-0.020176	0.9839
X6	7.928478	0.374081	21.19456	0.0000
X7	-6.819272	0.341928	-19.94359	0.0000
X8	0.977832	0.035829	27.29197	0.0000

R-squared	0.959878	Mean dependent var	9.643855
Adjusted R-squared	0.956933	S.D. dependent var	1.334372
S.E. of regression	0.276916	Akaike info criterion	0.342999
Sum squared resid	8.358373	Schwarz criterion	0.554322
Log likelihood	-11.23692	Hannan-Quinn criter.	0.428802
F-statistic	325.9649	Durbin-Watson stat	1.557008
Prob(F-statistic)	0.000000		

Dependent Variable: Y SEMI-LOG
Method: Least Squares
Date: 11/16/15 Time: 12:01
Sample (adjusted): 1894 2011
Included observations: 122 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-265911.1	182002.0	-1.461034	0.1513
X1	-629.7213	19939.10	-0.031582	0.9750
X2	3727.304	6878.381	0.541887	0.5907
X3	-4643.052	11411.37	-0.406879	0.6861
X4	-4756.033	3879.632	-1.225898	0.2269
X5	414.7892	4706.768	0.088126	0.9302
X6	76196.44	42122.90	1.808908	0.0775
X7	-49022.90	37976.13	-1.290887	0.2036
X8	25741.51	4991.296	5.157279	0.0000

R-squared	0.728149	Mean dependent var	29204.13
Adjusted R-squared	0.677572	S.D. dependent var	39386.44
S.E. of regression	22364.70	Akaike info criterion	23.02447
Sum squared resid	2.15E+10	Schwarz criterion	23.36218
Log likelihood	-589.6361	Hannan-Quinn criter.	23.15394
F-statistic	14.39686	Durbin-Watson stat	1.674958
Prob(F-statistic)	0.000000		

(ii)Test for Autocorrelation Results

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.153075	Prob. F(2,111)	0.3194
Obs*R-squared	2.483097	Prob. Chi-Square(2)	0.2889

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 11/22/15 Time: 09:50
Sample: 1894 2015
Included observations: 121
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2798.956	13143.65	-0.212951	0.8318
X1	90.92112	264.1065	0.344259	0.7313
X2	-77.68101	402.8154	-0.192845	0.8474
X3	-137.9396	507.5853	-0.271757	0.7863
X4	0.161431	3.606235	0.044765	0.9644
X5	-118.8717	290.4045	-0.409332	0.6831
X6	0.329099	1.018471	0.323131	0.7472
X7	-0.340670	1.165804	-0.292219	0.7707
X8	52.49783	243.9124	0.215232	0.8300
RESID(-1)	0.061449	0.098888	0.621400	0.5356
RESID(-2)	0.139701	0.100339	1.392286	0.1666

R-squared	0.020353	Mean dependent var	-2.71E-12
Adjusted R-squared	-0.067903	S.D. dependent var	20681.21
S.E. of regression	21371.84	Akaike info criterion	22.86337
Sum squared resid	5.07E+10	Schwarz criterion	23.11619
Log likelihood	-1383.666	Hannan-Quinn criter.	22.96606
F-statistic	0.230615	Durbin-Watson stat	2.002861
Prob(F-statistic)	0.992714		

(iii)Test for Heteroskedasticity

Heteroskedasticity Test:

F-statistic	0.696267	Prob. F(1,119)	0.4057
Obs*R-squared	0.703851	Prob. Chi-Square(1)	0.4015

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 11/22/15 Time: 09:53
Sample (adjusted): 1895 2015
Included observations: 121 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.93E+08	1.09E+08	3.610766	0.0004
RESID^2(-1)	0.076278	0.091414	0.834426	0.4057

R-squared	0.005817	Mean dependent var	4.26E+08
Adjusted R-squared	-0.002538	S.D. dependent var	1.12E+09
S.E. of regression	1.12E+09	Akaike info criterion	44.52610
Sum squared resid	1.49E+20	Schwarz criterion	44.57232
Log likelihood	-2691.829	Hannan-Quinn criter.	44.54487
F-statistic	0.696267	Durbin-Watson stat	2.007703
Prob(F-statistic)	0.405713		

Appendix II:

Granger Causality Test Result

Pairwise Granger Causality Tests
Date: 11/12/15 Time: 12:26
Sample: 1894 2015
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
X1 does not Granger Cause Y	121	0.18687	0.6663
Y does not Granger Cause X1		0.05166	0.8206
X2 does not Granger Cause Y	121	0.26157	0.6100
Y does not Granger Cause X2		2.40032	0.1240
X3 does not Granger Cause Y	121	6.48111	0.0122
Y does not Granger Cause X3		0.52296	0.4710
X4 does not Granger Cause Y	121	8.51038	0.0042
Y does not Granger Cause X4		7.05159	0.0090
X5 does not Granger Cause Y	121	1.45820	0.2296
Y does not Granger Cause X5		0.96651	0.3276
X6 does not Granger Cause Y	121	7.51508	0.0071
Y does not Granger Cause X6		0.18388	0.6688
X7 does not Granger Cause Y	121	9.45711	0.0026
Y does not Granger Cause X7		0.18343	0.6692
X8 does not Granger Cause Y	121	6.39390	0.0128
Y does not Granger Cause X8		0.00758	0.9308
X2 does not Granger Cause X1	121	0.29243	0.5897
X1 does not Granger Cause X2		0.00323	0.9548
X3 does not Granger Cause X1	121	7.38980	0.0075
X1 does not Granger Cause X3		10.4260	0.0016
X4 does not Granger Cause X1	121	1.29879	0.2567
X1 does not Granger Cause X4		1.27232	0.2616
X5 does not Granger Cause X1	121	1.20569	0.2744
X1 does not Granger Cause X5		0.57632	0.4493
X6 does not Granger Cause X1	121	2.26358	0.1351
X1 does not Granger Cause X6		1.53236	0.2182
X7 does not Granger Cause X1	121	1.60160	0.2082
X1 does not Granger Cause X7		3.05738	0.0830
X8 does not Granger Cause X1	121	0.40232	0.5271
X1 does not Granger Cause X8		2.75100	0.0998
X3 does not Granger Cause X2	121	7.63801	0.0066
X2 does not Granger Cause X3		8.85313	0.0035
X4 does not Granger Cause X2	121	13.2703	0.0004
X2 does not Granger Cause X4		26.0742	1.E-06

X5 does not Granger Cause X2	121	0.98046	0.3241
X2 does not Granger Cause X5		0.72849	0.3951
X6 does not Granger Cause X2	121	0.61749	0.4336
X2 does not Granger Cause X6		0.28988	0.5913
X7 does not Granger Cause X2	121	1.76573	0.1865
X2 does not Granger Cause X7		0.17316	0.6781
X8 does not Granger Cause X2	121	5.78916	0.0177
X2 does not Granger Cause X8		0.01178	0.9138
X4 does not Granger Cause X3	121	3.21259	0.0756
X3 does not Granger Cause X4		4.32689	0.0397
X5 does not Granger Cause X3	121	2.44098	0.1209
X3 does not Granger Cause X5		6.03242	0.0155
X6 does not Granger Cause X3	121	0.58755	0.4449
X3 does not Granger Cause X6		1.68027	0.1974
X7 does not Granger Cause X3	121	0.53276	0.4669
X3 does not Granger Cause X7		4.29153	0.0405
X8 does not Granger Cause X3	121	0.35786	0.5508
X3 does not Granger Cause X8		12.7190	0.0005
X5 does not Granger Cause X4	121	15.9074	0.0001
X4 does not Granger Cause X5		0.03706	0.8477
X6 does not Granger Cause X4	121	1.06740	0.3036
X4 does not Granger Cause X6		1.08876	0.2989
X7 does not Granger Cause X4	121	1.03317	0.3115
X4 does not Granger Cause X7		1.09171	0.2982
X8 does not Granger Cause X4	121	11.8507	0.0008
X4 does not Granger Cause X8		1.40728	0.2379
X6 does not Granger Cause X5	121	0.14845	0.7007
X5 does not Granger Cause X6		1.96797	0.1633
X7 does not Granger Cause X5	121	0.21019	0.6475
X5 does not Granger Cause X7		3.17777	0.0772
X8 does not Granger Cause X5	121	0.06098	0.8054
X5 does not Granger Cause X8		0.51205	0.4757
X7 does not Granger Cause X6	121	1.18684	0.2782
X6 does not Granger Cause X7		2.14627	0.1456
X8 does not Granger Cause X6	121	0.74551	0.3897
X6 does not Granger Cause X8		1.99680	0.1603
X8 does not Granger Cause X7	121	0.00142	0.9700
X7 does not Granger Cause X8		2.09032	0.1509