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Original Article

Role of Exchange Rate, Import, and Export in Economic Development of Nepal

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Abstract *- The basic objective of this study is to investigate the impacts of the exchange rate, import, and export on the gross domestic product (GDP) of Nepal using time series data from 1974/75 to 2016/17, employing Augmented Dickey-Fuller (ADF) unit root test to measure stationary of variables. The study has been used a Simple regression equation to be estimated by the Ordinary Least Square (OLS) method to draw the conclusion. The model is specified with four macro variables, namely, Gross Domestic Product (GDP), foreign exchange rate, Export, and Import. The finding reveals that there is a statistically significant relationship between all independent variables and dependent variables. Residuals are homoskedastic and free from serial autocorrelation, the residuals are normally distributed.*

Keywords *- Exchange Rate, Import, Export, GDP*

I. INTRODUCTION

The exchange rate is the relative price of the currency of one country to the currency of another currency. In other words, the rate at which domestic currency is traded for foreign currency is the exchange rate. A trading marketplace is a marketplace in which various currencies could be traded for a unique rate termed in trade rate. An exchange rate is the price of one currency

expressed in terms of another currency like below:

Exchange rates: $1= NRs 110

IC 100= NRs 160

There are various kinds of exchange rates such as fixed exchange rate, floating exchange rate, and managed floating rate. In a fixed exchange rate government determines the rate. Similarly, in a floating exchange rate, demand and supply of currency determine the exchange rate and managed floating rate is determined by market forces but within the given range of limits set by the government or the country's central bank.

Globalization is said to have enhanced the trading relationship between countries. The foreign exchange market indicates to be the largest financial market in the world. The greatest volume of currency is traded in the countries market. This is where banks of all sizes trade currency with each other and through electronic networks. Large banks account for a larger percentage of total currency trading in the international financial markets. The current global trend of large banks establishing corporate branches outside their country of the domain has further heightened their degree of exposure to exchange rate risk management. The profitability of such large banks might be significantly affected by fluctuations in the exchange rate (Offiong, Riman, & Emmanuel, 2016).

Foreign exchange, methods, and instruments used to adjust the payment of debts between two nations that employ different currency systems. A nation's balance of payments has an important effect on the exchange rate of its currency. Bills of exchange, drafts, checks, and telegraphic orders are the principal means of payment in international transactions. The rate of exchange is the price in the local currency of one unit of foreign currency and is determined by the relative supply and demand of the currencies in the foreign exchange market. Buying or selling foreign currency in order to profit from sudden changes in the rate of exchange is known as arbitrage. The chief demand for foreign exchange within a country comes from importers of foreign goods, purchasers of foreign securities, government agencies purchasing goods and services abroad, and travelers. Exchange rates were traditionally fixed under the gold standard and later by international agreements, but in 1973 the major industrial nations of the West adopted a system of "floating" rates that allowed for fluctuation within a limited range. The currencies of Western nations are generally allowed to fluctuate freely, although central banks will intervene in the foreign exchange markets in an attempt to control excessive or undesirable appreciation or depreciation. [1]

Imports are defined as purchases of goods or services by a domestic economy from a foreign economy. The word "import" derives from the word "port" since goods are often shipped via boat to foreign countries. An export is a function of

[1] https://www.questia.com/library/economics-and-business/economics/international-economic-issues/foreign-exchange

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international trade whereby goods produced in one country are shipped to another country for future sale or trade. Exports are a crucial component of a country's economy, as the sale of such goods adds to the producing nation's gross output. The misbalanced imports and export create a trade deficit and it has a direct impact on the GDP.

When a country exports goods, it sells them to a foreign market, that is, to consumers, businesses, or governments in another country. Those exports bring money into the country, which increases the exporting nation's GDP. When a country imports goods, it buys them from foreign producers. The money spent on imports leaves the economy, and that decreases the importing nation's GDP (Tom, 2003).

Net exports can be either positive or negative. When exports are greater than imports, net exports are positive. When exports are lower than imports, net exports are negative. If a nation exports say, $100 billion dollars worth of goods and imports $80 billion, it has net exports of $20 billion. That amount gets added to the country's GDP. If a nation exports $80 billion of goods and imports $100 billion, it has net exports of minus $20 billion, and that amount is subtracted from the nation's GDP (Tom, 2003).

The relation between exchange rate, import, export, and GDP is among the most heavily studied. When the currency appreciates in one country, the export goods become more expensive while import goods are cheaper, accordingly, imports increase and exports decrease. Thus, the exchange rate adjustment is believed as an effective way to correct the trade imbalance between countries. Numerous experiential studies come this way, by measuring the fluctuation of imports and exports to the exchange rate change to extend should a country depreciate its currency against other's to reduce its trade deficit; or more recently to what extend should a country appreciate its currency to reduce its trade surplus.

As Nepal is a developing country, Nepal has a trade deficit because Nepal imports more than it export. Every year Nepal import in huge quantity and it export less as compared to import. As there is a very low demand for Nepalese currency in the international market so there is always the devaluation of Nepalese currency in the international market. If there is a devaluation of the Nepalese currency then the Nepalese should have to pay a high rate for the imported goods. As Nepal's import rate is higher than the export rate so if there is a floating exchange rate with the other country, then in the condition of high devaluation of the Nepalese currency, the import rate becomes high for the Nepalese and this leads to an increase the trade deficit for Nepal.

In this context, this paper quantitatively evaluates the impact of the exchange rate, import, and export on the GDP of the nation. The paper is organized as follows. Section 2 presents the review of literature, followed by methodology in section 3. The fourth section describes the data and sample period. Section 5 discusses the empirical results. Finally, Section 6 concludes the paper.

II. REVIEW OF LITERATURE

The exchange rate is one of the most persistent prices in the economy, perhaps affecting more transactions than any other single price. To change it, especially by the large amounts sometimes required, means changing the relative wealth of influential segments of the population. Not only are the relative prices of imports raised, but in order to prevent domestic prices from rising as much as the currency is devalued, wages and other incomes must be restrained by government policy. Especially the urban workers, middle-class professionals, civil servants, the upper classes, and others whose consumption depends substantially on imports tend to resist devaluation. For these reasons, governments have resisted devaluation, and when they have undertaken it, have often devalued by two little in the face of growing demand and continued inflation. Hence, there was a tendency for exchange rates to remain overvalued in the developing world (Grills, Perkins, Roemer, & Snodgrass, 1996).

The popular press contains numerous references to the impact of foreign exchange movements on U.S. banks. For example, in an article by (Boyd, 2011) he states that Fitch Ratings indicated that U.S. banks had substantial exposure to the Euro related to the European debt crisis. In fact, by the end of 2010, the combined U.S. bank exposure to the Greek debt crisis alone was at least $41 billion according to the Bank of International Settlements.

Additional data from the Office of the Comptroller of the Currency (OCC) indicates that U.S. banks generate substantial trading revenue from foreign exchange. In the second quarter of 2011, the revenue from foreign exchange was $491 million. However, in comparison with the second quarter of 2010, the U.S. bank revenue from foreign exchange was $4,261 million. The year-to-year volatility highlights the risk exposure of U.S. banks to foreign exchange movements. When the derivative exposure is added to this equation, the amounts of the risk attributable to foreign exchange can be staggering with many estimates ranging in the hundreds of billions of dollars (Durden, 2011)

Some developing economies, however, devalued their currencies to rectify their worsening trade deficit by improving export growth. For example, (Williams, 2006) and some other economists claim

that China and Japan engaged for many years in a program of buying massive volume of US dollar (USD) in order to keep the Chinese Yuan (CNY)/ USD or Japanese Yen (JPY)/ USD exchange rate lower, so as to make their exports more competitive in the United States market (p. 7). (Ng., Har, & Tan, 2008) Investigated the real exchange rate and trade balance relationships in Malaysia for a period between 1955 and 2006. The results from the empirical study in Malaysia indicated that a long-run relationship existed between trade balance and exchange rate and that depreciation improved the trade balance. (Shoup, 1998) To remain competitive in world markets, many developing countries with high inflation rates made steep devaluations to reverse changes in real exchange rates.

Based on the overall study, in the Sri Lankan context, export and import have a significant positive relationship, and also, both export and import have a significant impact on economic growth. Further, export and import have been associated by 98 percent, which denotes that, there is a strong positive association between export and import (Velnampy & Achchuthan, 2013).

According to Piano, (2001), a faster GDP growth than that of trade partners usually results in a trade deficit, since imports are elastic to GDP (they rise more than proportionally). Currency real exchange rate can be very important: possibly due to a fixed exchange rate and a higher inflation rate than that of commercial partners. An overvaluation of the domestic currency can lead to deep trade deficits on most products and with most countries. A sharp devaluation can dramatically improve all these relationships.

Sugema, (2005) investigated the determinants of trade balance and adjustment to the crisis in Indonesia. His results suggested that the trade balance would improve due to the devaluation through an increase in exports and a decline in imports. Since the elasticity of import with respect to real exchange rate was higher than that of export then trade balance improvement would come from the import compression. Further, (Shao, 2008) investigated Exchange Rate Changes and Trade Balance in the Case of Japan by using time-series data for 26 years. He indicated three long-run relationships among five macro variables: trade balance, domestic income, foreign income, net foreign assets, and real exchange rate. He found the final effect of the exchange rate changes on the trade balance is undetermined. According to him, although appreciation can reduce trade surplus in the short run, in a longer horizon, there is no stable relationship. The positive sign of the relation is not guaranteed in this case, and appreciation is not surely able to correct the trade imbalance between countries.

By using OLS, Engle-Granger co-integration test, and FM-OLS based on the monthly data for the period 2006-2015, (Pant & Buddha, 2016) found that depreciation of Nepalese currency has a positive impact on remittance inflows. They also observed the tendency of Nepalese migrant workers to take advantage of the favorable exchange rate by sending back more remittance at the depreciated nominal exchange rates. Obviously, inflows of remittance increase foreign exchange reserves.

(Maskey & Thapa, 2000) There is a continual deficit in Nepal's international trade, two-thirds of which occurs with India. Nepal remains dependent on a relatively small basket of exports and a few destination markets. (NRB, 2016b) Nepal had devalued the peg rate with the INR four times up to 1993, with an intention of export promotion, ultimately targeting to reduce the trade deficit, particularly with India. But the results were never encouraging, as all of the devaluations could not improve the trade deficit for a sustained period.

(Chaulagai, 2015) examined whether the devaluation of NPR could be taken as the policy tool for improving the trade deficit with the rest of the world economies. He also observed the relationship between the nominal effective exchange rate (NEER) and the real effective exchange rate (REER) with trade balance. Contrary to conventional thinking, he found that there was no room for improving Nepal's trade deficit through currency devaluation (pp. 18-26). So, the nominal depreciation of the exchange rate could not be an effective tool to improve the Nepalese trade imbalance. As observed by him, devaluations are occasional events, which may lag macroeconomic changes, implying that infrequent one-time events may not provide the needed boost to exports. Further, there could be other obstacles, e.g., the inadequacy of power availability, inadequate shipping, and transportation infrastructure and bottlenecks, and unsupportive government policies, which could significantly choke the expected spike in exports consequent to devaluation. In this context of conflicting empirical findings, this study examines the impact of exchange rate on the trade deficit and foreign exchange reserve.

The economic growth performance of Nepal has not only remained slow but, in relation to the level of investment in the economy, also modest. It may be worth mentioning that, for attaining economic development objectives in an environment of a smooth and stable macroeconomy; saving and investments must be productive. The wide gap between exports and imports should be sustainably narrowed. Toward these ends, excessive consumption and unnecessary imports should be discouraged. Sound framework and incentives should be built to ensure that the resources are productively utilized.

The government policies and arrangements should help ensure such a framework (Basyal, 2011).

III. METHODOLOGY

A. Research design

The research design adopted in this study is based on the deductive method. Gross domestic product is a dependent variable whereas foreign exchange rate, export, and import are independent variables. It deals with the impact of the foreign exchange rate, export, and import on the GDP of Nepal.

B. Nature and Source of data

The study is based on secondary data. The secondary sources of data have been taken from the various issues of the Quarterly Economic Bulletin published by Nepal Rastra Bank and Economic Survey published by Ministry of Finance, Government of Nepal spanning from 2074/75 to ***2016/17.***

C. Mode of Data Analysis:

The study follows a time series data approach where it runs initially descriptive statistics. Then, In order to investigate the relationship between variables, the study has used a multiple regression equation which is estimated by the Ordinary Least Square (OLS) method. Here, Statistical software Evievs-10 is used to perform all tests.

Since this study is investigative as it intends to determine the impact of the foreign exchange rate, import, and export (as in independent variable) on GDP in Nepal (dependent variable), and in order to identify the relationship, a regression model is suitable. Another advantage of the regression model is that it assists in estimating the value of the dependent variables and the coefficients of the independent values both of which are used in the following ways:

(a) Policymaking and control
(b) Forecasting and prediction and
(C) Testing theories

D. Hypothesis and Estimation Equation:

The statistical analysis of data collected is to lead to the testing of the following null hypothesis:
Ho: There is no positive and significant relationship between exchange rate fluctuation, import, and export with GDP.

H1: There is a positive and significant relationship between exchange rate fluctuation, import, and export with GDP.

In order to test this hypothesis, the regression equation was drawn.

$Y = \beta_0 + \beta_1 X1 + \beta_2 X2 + \beta_3 X3 + \varepsilon$ …….…….. (I)

Where:
Y= Gross domestic product
β_0 = the constant term.
β_1 = coefficient of variable (Average exchange rate)
β_2 = coefficient of variable (exports)
β_3 = coefficient of variables (imports)
X1= Average exchange rate (USA$)

X2= Export
X3= Import

ε= Error term

The equations are estimated using annual time series data. As described in the functional forms, the impact is examined using the ordinary least squares (OLS) method by converting non-stationary time series data into stationary data.

IV EMPIRICAL RESULTS

Empirical work begins by examining unit root tests for identifying time-series properties of the selected data. Secondly, the empirical relationship of the nominal exchange rate with foreign exchange reserve is examined. Thirdly, the empirical relationship of the nominal exchange rate with the trade deficit is examined.

A. Unit root test

The time-series data usually have the property of non-stationary, which can be identified by using an econometric test, i.e., the unit root test. The regression equations estimated with the non-stationary data may be spurious. To identify the problem of non-stationary, the Correlation and Regression test has been applied. To verify whether the variables integrated of order zero I(0) or I(1), the tests of stationary are performed on Y, Gross domestic product of Nepal, Average exchange rate (USA$) (x1), Export (x2), and Import (x3) using time series regression model test. The time series regression model test statistic is applied to check the order of integration of time series, i.e., whether they follow the unit root process.

The basic objective of this taste is to examine the null hypothesis and alternative hypothesis.

Null hypothesis (H0): Variable is not stationary or got unit root

Alternative hypothesis (H1): Variable is stationary

Table 1. Unit Root Test Result using ADF Procedure

In the case of level (Constant)			In case of the first difference		
Variables	**t-statistics**	**P-value**	**Variables**	**t-statistics**	**P-Value**
Lny	0.2424	0.9720	D(lny)	-8.0973	0.0000
Lnx1	-1.4124	0.5672	D(lnx1)	-7.2995	0.0000
Lnx2	-1.5039	0.5219	D(lnx2)	-5.00312	0.0002
Lnx3	-0.6284	0.8533	D(lnx3)	-9.1649	0.0000

Gross domestic product, money supply, inflation, and real exchange rate are tested by Augmented Dickey-Fuller (ADF) test to find out the variables are stationary or not.

$$D(LnY) = \beta_0 + \beta_1 D(Lnx1) + \beta_2 D(Lnx2) + \beta_3 D(Lnx3) + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots \text{(II)}$$

Where,

y = Gross Domestic Product (GDP)

x1= Average exchange rate (USA$)

x2= Export

x3= Import

Now, equation (II) is the required regression equation to be estimated.

In table 1 unit root test analysis is shown above which explains how data goes stationary. In case of level series, ADF test shows that GDP t-statistic value 0.2424 and p-value0.9720, serially average exchange rate t- statistic value -1.4124 and p-value 0.5672, export t-statistic value -1.5039 and P-value 0.5219 and import t-statistic value -0.6284 and p-value 0.8533 are non-stationary at 5% of significance level. It's explaining the null hypothesis where the variable is not stationary or got a unit root. In the case of the first differenced series, all the variables are significant. Where GDP t-statistic value -8.0973 and p-value 0.0000, continuously average exchange rate t- statistic value -7.2995 and p-value 0.0000, export t-statistic value -5.00312 and P-value 0.0000 and import t-statistic value -9.1649 and p-value 0.000. It means that GDP, exchange rate, export, and import are stationary. It explains the alternative hypothesis "variable is stationary" has proved.

Results of simple regression estimation are in the following table 2.

Table 2. Results of Estimated Regression

Variables	**Coefficients**	**Std. Errors**	**t-statistics**	**P-value**
D(lnx1)	-0.096970	0.044097	-2.199030	0.0340
D(lnx2)	0.0864630	0.016827	5.029542	0.0000
D(lnx3)	0.062419	0.02981	2.089637	0.0434
R-squared value = 0.474888, P-value of F-statistics = 0.000017, D-W statistics = 1.92261				

In table 2, variable average exchange rate, export, and import are significant to influence gross domestic product as their P-values 0.0340, 0.0000, and 0.0434 are less than 5% level of significance. It indicates that the average exchange rate, export, and import has a role in achieving economic growth. Since the P-value of inflation of all variables is less than 5%, an alternative hypothesis is accepted. It means exchange rate fluctuation, import, and export with GDP has a positive and significant relationship.

The positive sign of variables indicates that gross domestic product is affected by country export, import, and exchange rate fluctuation. The P-value of F-statistics is 0.000017 which is less than a 5% level of significance i.e. exchange rate fluctuation, import, and export jointly influence the gross domestic product. 47.488% R-square value is acceptable in the case of the first differenced variables. D-W statistics is 1.92261 which is greater than the R-squared value; the estimated regression is not spurious.

Table 3. Results of Serial Correlation, Heteroskedasticity and Normal Distribution

Particulars	F- statistics	Observed R-squared	P-Value
Breusch-Godfrey Serial Correlation LM Test.	0.129823	0.300752	0.8787
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.68429	2.152691	0.5672
Histogram Normality: Jarque-Bera Test	**	**	0.541079

According to table 3, the Breusch-Godfrey Serial Correlation LM Test shows that the residuals are free from serial correlation as f-statistics is 0.129823 and P-value of observed R-squared is 0.300752 which is more than 5% level of significance. Breusch-Pagan-Godfrey test shows that residuals are homoscedastic as f-statistic is 0.68429 and P-value of observed R-square is 0.5672 which is greater than 5% level of significance. Likewise, the Jarque-Bera test also indicates that residuals are normally distributed because the null hypothesis is accepted here too as P-value is 0.541079 which is greater than the 5% level of significance.

V. SUMMARY AND CONCLUSION

The aim of this study was to determine the relationship between foreign exchange rate fluctuation, exports, imports, and gross domestic product (GDP) of Nepal in the period 1974/75-2016/17. The unit root properties of the data were examined using the Augmented Dickey-Fuller test (ADF) was conducted. Where the study has used a multiple regression equation which is estimated by the Ordinary Least Square (OLS) method.

According to an estimation of the regression equation, all variable exchange rate fluctuation, import, and export are significant to gross domestic product. This study had hypothesized that independent variables exchange rate fluctuation, import, and export with the gross domestic product have good relation which proved the alternative hypothesis. It means that there is a relationship between an independent variable and a dependent variable.

Finally, and from the test, we find that exchange rate fluctuation, import, and export cause economic growth. These results indicate that exchange rate fluctuation, import, and export are presented and seen as a source of economic growth in Nepal. Therefore, our findings have led to the discovery that exports and imports cause economic growth; these results are expressed using the several advantages that characterize the social and economic situation of Nepal, like controlling the imports of goods and services, increasing the export level of goods and services and constant the exchange rate fluctuation which mostly affect the GDP of Nepal.

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Appendix

Annual Data

year	x3	x2	x1	y
1974/75	1,814.60	889.60	10.60	143,079.60
1975/76	1,981.70	1,185.80	12.20	148,042.00
1976/77	2,008.00	1,164.70	12.50	149,537.70
1977/78	2,469.60	1,046.20	12.30	154,214.80
1978/79	2,884.70	1,296.80	12.00	157,500.00
1979/80	3,480.10	1,150.50	12.00	155,131.20
1980/81	4,428.20	1,608.70	12.00	170,692.70
1981/82	4,930.30	1,491.50	13.00	178,222.80
1982/83	6,314.00	1,132.00	13.90	178,949.00
1983/84	6,514.30	1,703.90	15.50	194,692.10
1984/85	7,742.10	2,740.60	17.90	205,170.20
1985/86	9,341.20	3,078.00	19.90	214,537.70
1986/87	10,905.20	2,991.40	21.70	218,184.30
1987/88	13,869.60	4,114.50	22.20	234,977.20
1988/89	16,263.70	4,195.30	25.60	239,500.50
1989/90	18,324.90	5,156.20	28.60	255,847.40
1990/91	23,226.50	7,387.50	32.00	272,235.00
1991/92	31,940.00	13,706.50	42.70	285,012.80
1992/93	39,205.60	17,266.50	45.70	294,040.10
1993/94	51,570.80	19,293.40	49.30	319,727.30
1994/95	63,679.50	17,639.20	49.90	330,290.80
1995/96	74,454.50	19,881.10	55.20	347,921.10
1996/97	93,553.40	22,636.50	57.00	366,223.10
1997/98	89,002.00	27,513.50	62.00	376,956.10
1998/99	87,525.30	35,676.30	68.00	393,948.60
1999/00	108,504.90	49,822.70	69.10	417,985.90

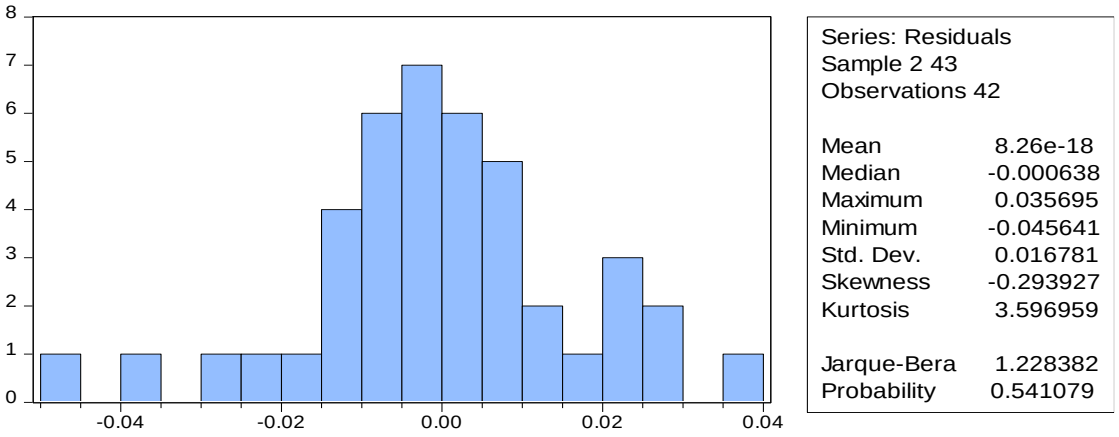
2000/01	115,687.20	55,654.10	73.80	441,518.70
2001/02	107,389.00	46,944.80	76.90	442,048.10
2002/03	124,352.10	49,930.60	77.80	459,489.10
2003/04	136,277.10	53,910.70	73.80	481,004.00
2004/05	149,473.60	58,705.70	72.10	497,739.00
2005/06	173,780.30	60,234.10	72.30	514,486.00
2006/07	194,694.60	59,383.10	70.50	532,038.20
2007/08	221,937.70	59,266.50	65.00	564,516.90
2008/09	284,469.60	67,697.50	76.90	590,107.20
2009/10	374,335.20	60,824.00	74.50	618,529.10
2010/11	396,175.50	64,338.50	72.30	639,694.10
2011/12	461,667.70	74,261.00	81.00	670,279.40
2012/13	556,740.30	76,917.10	88.00	697,954.20
2013/14	714,365.80	91,991.40	98.30	739,754.40
2014/15	774,684.20	85,319.10	99.50	759,914.70
2015/16	773,599.10	70,117.20	106.49	768,835.00
2016/17	990,113.20	73,049.10	105.55	829,617.00

1. Regression

Dependent Variable: DLNY
Method: Least Squares
Date: 01/17/19 Time: 21:36
Sample (adjusted): 2 43
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLNX1	-0.096970	0.044097	-2.199030	0.0340
DLNX2	0.084630	0.016827	5.029542	0.0000
DLNX3	0.062419	0.029871	2.089637	0.0434
C	0.028905	0.005351	5.402040	0.0000

R-squared	0.474888	Mean dependent var	0.041847
Adjusted R-squared	0.433431	S.D. dependent var	0.023157
S.E. of regression	0.017431	Akaike info criterion	-5.170772
Sum squared resid	0.011546	Schwarz criterion	-5.005279
Log likelihood	112.5862	Hannan-Quinn criter.	-5.110112
F-statistic	11.45515	Durbin-Watson stat	1.922261
Prob(F-statistic)	0.000017		



3. Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.129823	Prob. F(2,36)	0.8787
Obs*R-squared	0.300752	Prob. Chi-Square(2)	0.8604

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 01/17/19 Time: 21:41
Sample: 2 43
Included observations: 42
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLNX1	0.006238	0.048976	0.127365	0.8994
DLNX2	-0.000337	0.017921	-0.018809	0.9851
DLNX3	-0.001507	0.030731	-0.049025	0.9612
C	-0.000157	0.005494	-0.028596	0.9773
RESID(-1)	-0.006480	0.182962	-0.035416	0.9719
RESID(-2)	-0.091474	0.179532	-0.509513	0.6135

R-squared	0.007161	Mean dependent var	8.26E-18
Adjusted R-squared	-0.130734	S.D. dependent var	0.016781
S.E. of regression	0.017844	Akaike info criterion	-5.082720
Sum squared resid	0.011463	Schwarz criterion	-4.834482
Log likelihood	112.7371	Hannan-Quinn criter.	-4.991731
F-statistic	0.051929	Durbin-Watson stat	1.924317
Prob(F-statistic)	0.998181		

4. Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.684298	Prob. F(3,38)	0.5672
Obs*R-squared	2.152691	Prob. Chi-Square(3)	0.5413
Scaled explained SS	2.288155	Prob. Chi-Square(3)	0.5148

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 01/17/19 Time: 21:42
Sample: 2 43
Included observations: 42

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000149	0.000139	1.071948	0.2905
DLNX1	-0.000639	0.001148	-0.556577	0.5811
DLNX2	0.000332	0.000438	0.758175	0.4530
DLNX3	0.000838	0.000777	1.077885	0.2879

R-squared	0.051255	Mean dependent var	0.000275
Adjusted R-squared	-0.023646	S.D. dependent var	0.000448
S.E. of regression	0.000454	Akaike info criterion	-12.46817
Sum squared resid	7.82E-06	Schwarz criterion	-12.30268
Log likelihood	265.8316	Hannan-Quinn criter.	-12.40751
F-statistic	0.684298	Durbin-Watson stat	1.427647
Prob(F-statistic)	0.567179		