Monthly Effect on the Volume of Currency in Circulation in Ghana

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Abstract

In this study, the month-of–the-year effect on the volume of Currency in Circulation in Ghana was studied. The "New Year effect" was seen in the volume of Currency in Circulation as the first three months of the year clearly indicate a decrease in the volume of Currency in Circulation. The months of January, February and March decreases the volume of the Currency in Circulation by 7.4309, 5.0307 and 0.2112 percent respectively. The "December effect" was also seen in the volume of Currency in Circulation as the month of December had the highest incremental effect (18.6046%). The findings of the study also revealed that the seasonal changes in Currency in Circulation are a reflection of the effect of celebrative periods on Currency in Circulation.

Keywords: Month-of-the-year, Currency in Circulation, Ghana, Liquidity management

1. Introduction

The Currency in Circulation is one autonomous factor that cannot be ignored so far as the development of an economy and liquidity management is concerned. The Currency in Circulation comprises the outstanding amount of notes and coins held outside banks and are the most liquid monetary aggregate. The key determinant of the Currency in Circulation is the cash demand of both the public and the banking system (Simwaka, 2006). An increase in volume of Currency in Circulation usually results in decrease in deposits and consequently, reduction in the availability of loan funds for investment which is imperative for overall economic growth (Simwaka, 2006; Stavreski, 1998).

Myriad of researches have been carried out in both developed and developing countries to identify the determinants of Currency in Circulation. For instance, Stavreski (1998) studied the Currency in Circulation in Macedonia and pointed out that low nominal interest rate on demand deposits is one of the causes of high level of Currency in Circulation. Also, Simwaka (2006) found out that small-scale agriculture is one important determinant of Currency in Circulation in Malawi. Simwaka (2006) study revealed that better performance of the small-scale agriculture sector injects cash in the economy and because of lack of banking facilities in the rural areas, most of the injected cash remains in circulation. In addition, a number of seasonal factors have been identified to influence the volume of Currency in Circulation various countries. Among these factors are the intra-monthly effects, day-of–the-week effect, monthly effect, Islamic calendar effect, Gregorian calendar effect, and public holidays (Balli and Elsamadisy, 2011; Guler and Talasli, 2010; Simawak, 2006; Halvacek *et al.,* 2005; Riazuddin and Khan, 2002).

This study thus aims to study the month-of–the-year effect on the volume of Currency in Circulation in Ghana.

2. Materials and Methods

2.1 Data and Source

The data for this study was monthly Currency in Circulation measured in billions of Ghana cedi from January, 2000 to December, 2011. The data was obtained from the Bank of Ghana database.

2.2 Regression Analysis

To investigate the effect of each month on the volume of Currency in Circulation, the Currency in Circulation was logarithmically transformed and first differenced; before regressing on time trend and full set of periodic dummies. The regression model is given by

$$\Delta \ln \mathrm{CiC}_t = \alpha_1 \mathrm{Time} + \alpha_2 \mathrm{Jan} + \alpha_3 \mathrm{Feb} + \alpha_4 \mathrm{Mar} + \alpha_5 \mathrm{Apr} + \alpha_6 \mathrm{May} + \alpha_7 \mathrm{Jun} + \alpha_8 \mathrm{Jul} + \alpha_9 \mathrm{Aug} + \alpha_{10} \mathrm{Sep} + \alpha_{11} \mathrm{Oct}$$
$$+ \alpha_{12} \mathrm{Nov} + \alpha_{13} \mathrm{Dec} + \varepsilon_t$$

where

Jan=January, Feb=February, Mar=March, Apr=April, Jun=June, Jul=July, Aug=August, Sep=September, Oct=October, Nov=November, Dec=December and ε_t is a random error component.

The coefficient of each month ($\alpha_i, i = 2, 3, 4, \dots, 13$) measures the incremental effect of that month. The existence of seasonal effect is confirmed when the coefficient of at least one dummy variable is statistically significant.

2.3 *Ljung-Box Test*

In order to ensure that the residuals of the regression model are free from serial correlation, the Ljung-Box test was used for testing the assumption that the residuals contains no serial correlation up to any order *k*. The Ljung-Box test statistic is given by

$$Q_m = T(T + 2) \sum_{k=1}^{m} (T - k)^{-1} r_k^2$$

where

r_k^2 represent the residual autocorrelation at lag *k*

T is the number of residuals

m is the number of time lags included in the test

When the *p*-value associated with Q_m is large, the model is considered adequate else the whole estimation process has to start again in order to get the most adequate model.

3. Results and Discussion

An exploration of the Currency in Circulation for the various months indicates that, the highest average Currency in Circulation occurred in the month of December and the least average occurred in the month of February and March as shown in Table 1. In terms of the maximum (Max) and minimum (Min) volume of Currency in Circulation, December and February had the highest and lowest values respectively. The month of October has the largest variability followed by November as shown by their coefficient of variations (CV) in Table 1. Again, it was observed that the Currency in Circulation for each month were positively skewed and leptokurtic in nature.

To provide better economic interpretation for the effect of each month on the volume of Currency in Circulation, the Currency in Circulation was logarithmically transformed and first differenced. The first difference of the transformed Currency in Circulation was regressed on time trend and the full set of the periodic dummies. The intercept was not included in the model to avoid dummy variable trap. The result (Table 2) revealed that there is pronounced month of the year effect in the growth rates of the Currency in Circulation. This results supports the findings of Dheerasinghe (2006) that there is pronounced month of the year effect in the volume of Currency in Circulation. The regression model was significant with an *F*-statistic of 15.7664 and a *p*-value of 0.0000. The Durbin-Watson statistic of 2.5510 with a *p*-value of 0.9994 indicates that there is no serial correlation of the first order in the model residuals. Also, the estimated Ljung-Box statistic (Table 2) provides evidence that the model residuals are white noise as the *p*-values for the three lags were all greater than the 0.05 significance level. As shown in Table 3, the model clearly indicates significant negative seasonality for the month of January and February and a positive significant seasonality for the month of October, November and December. From the estimated model parameters it can be seen that within a year the Currency in Circulation decreases from the month January to March and then begins to increase gradually in zigzag manner from the month of April to December.

Since the estimated coefficients of the dummy variables in Table 3 are incremental month effects of each year, their significance does not really matter. Hence, using Halvorsen and Palmquist (1980) approach of interpreting differential coefficients in semi-logarithmic equation, the differential coefficients are transformed to show differential effects in terms of percentage change. The effect for each month is calculated with the aid of an exponential transformation and further multiplied by 100% to show percentage change as indicated in Table 4. The months of January, February and March decreases the volume of Currency in Circulation by 7.4309, 5.0307 and 0.2112 percent respectively. The

decrease in the volume of the currency circulated in these months can be attributed to the fact that many people spend more in the Christmas period and for that matter at the beginning of each year, do not have much money to spend. Also, the New Year and Independence Day are the only Public Holidays in Ghana in the first three months. People therefore do not have any occasion to prepare towards and therefore much money is not injected into the economy by way of withdrawals from banks.

In addition, the volume of Currency in Circulation starts increasing from the months of April with this month increasing the volume of currency circulated in the economy by 1.9835 percent. This increment which is much higher than its neighbouring months can be attributed to the Easter celebration. Also, May and June showed a much lower increase in the volume of currency circulated in the economy; thus a relative decrease in the volume of Currency in Circulation as compared to that of April. Comparatively, this shows that the volume of currency decreases from May to June. This could be due to continuous expenditure after the Easter for the celebration of less important festivities as the May Day and African Union day. The month of July showed higher increment (3.4635%) than the months before it. This increment can be linked to the celebration of the Republic holiday in the country and the celebration of the Islamic Eid al-Fitr festival which usually occur in the month of July and August. The month of October revealed a sharp increment of 13.2410% in the volume of currency circulated in the economy. This sharp increment can in some way be linked to the preparation towards the Islamic pilgrimage and the Eid al-Adha festival which usually occur in the month of October and November.

The month of December has the highest incremental effect on the volume of currency circulated in the economy. It increases the volume of currency circulated in the economy by 18.6046%. This increment can be ascribed to the preparation towards the Christmas festival and the celebration of the New Year eve. The highest increment in the volume of Currency in Circulation could be linked to the higher inflation digits usually recorded in the month of December in the country. This is because as more money is injected into the economy there is a higher tendency for monetary inflation and also a decline in the purchasing power of the Ghana cedi. It can therefore be inferred that the seasonal changes in Currency in Circulation is a reflection of the effect of celebrative periods (holidays) on Currency in Circulation.

4. Conclusion

In this study, the monthly volume of Currency in Circulation in Ghana from January, 2000 to December, 2011 was studied. The monthly characteristics of the Currency in Circulation were explored. The Currency in Circulation revealed clear evidence of the effect of the various month of the year. The "New Year effect" was seen in the volume of Currency in Circulation as the first three months of the year clearly indicates a decrease in the volume of Currency in Circulation within that period. The "December effect" was also seen in the volume of Currency in Circulation as the month of December had the highest percentage increment. The findings of this study revealed that most of the months in which there was significant increase in the volume of Currency in Circulation were months of festivities. It can therefore be inferred that the seasonal changes in Currency in Circulation is a reflection of the effect of celebrative periods (holidays) on Currency in Circulation.

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Table 1: Monthly descriptive statistics for Currency in Circulation

Month	Mean	Min	Max	CV (%)	Skewness	Kurtosis
January	1044.72	161.09	3056.35	83.90	1.29	1.19
February	988.37	154.47	2877.04	83.70	1.27	1.13
March	988.24	159.14	2899.40	84.46	1.28	1.16
April	1009.41	164.98	3068.45	86.22	1.39	1.65
May	1017.95	168.12	3069.22	86.01	1.40	1.72
June	1010.62	175.09	3073.89	85.70	1.41	1.76
July	1036.86	184.27	3005.59	82.98	1.24	1.12
August	1042.16	189.48	3079.61	84.57	1.31	1.29
September	1082.69	191.99	3194.95	85.64	1.28	1.10
October	1295.72	200.52	3680.78	94.45	1.34	0.67
November	1270.21	227.67	3666.38	86.75	1.23	0.61
December	1476.24	275.31	4222.27	84.50	1.22	0.73

Table 2: Ljung-Box test

Lag	Test statistics	*P*-value
12	19.7813	0.0713
24	23.0260	0.5180
36	29.5447	0.7680

Table 3: Regression parameters of the transformed first differenced series

Variable	Coefficient	Standard error	T-statistic	P-value
January	-0.0777	0.0187	-4.1648	0.0001*
February	-0.0516	0.0178	-2.9040	0.0043*
March	-0.0021	0.1780	-0.1186	0.9058
April	0.0196	0.0179	1.0989	0.2738
May	0.0129	0.0179	0.7216	0.4718
June	0.0015	0.0180	0.0857	0.9318
July	0.0340	0.0180	1.8890	0.0611
August	0.0050	0.0181	0.2785	0.7811
September	0.0300	0.0181	1.6567	0.1000
October	0.1243	0.0182	6.8391	0.0000*
November	0.0380	0.0182	2.0860	0.0389*
December	0.1706	0.0183	9.3292	0.0000*
Time	-0.00004	0.0001	-0.3983	0.6911

F (12,130) =15.7664 P-value=0.0000   Durbin-Watson=2.5510 P-value=0.9994

*: Means significant at the 5% level of significance

Table 4: Monthly effects on Currency in Circulation

Month	Coefficients	Percent effect
January	-0.0772	-7.4309
February	-0.0516	-5.0307
March	-0.0021	-0.2112
April	0.0196	1.9835
May	0.0129	1.3017
June	0.0015	0.1541
July	0.0341	3.4635
August	0.0050	0.5047
September	0.0300	3.0490
October	0.1243	13.2410
November	0.0380	3.8771
December	0.1706	18.6046

NB: Effect of January $= (e^{-0.0772} - 1) \times 100$

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