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IMPACT OF MACROECONOMIC PERFORMANCE ON CORPORATE CASH HOLDINGS: SOME EVIDENCES FROM JORDAN

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ABSTRACT

The paper presents empirical evidences of macroeconomic determinants of cash holdings using panel data of 65 non-financial firms listed in ASE during the period from 2000 to 2011. The results of this study find a partial significant relationship between explanatory macroeconomic variables and corporate cash holdings. The corporate cash holdings related positively with gross domestic production (GDP), and credit spread (CS) as well as government budget deficit and cash (BD).While Inflation (INF) and cash surplus/deficit (SURP) do not determine cash holdings of the firms. This paper extends the existing liquidity literature around the world by using the Fully Modified Ordinary Least Square (FMOLS) method to find out the impact of macroeconomic variables on corporate cash holdings. Also this paper extends the existing liquidity literature the Middle East and Jordan by delivering the macroeconomic variables as a determinant of cash holdings, aside from the traditional firm-specific variables. Moreover, the results of this paper are expected to help the government decision makers, investors and firms' managers to understand the effects of macroeconomic variables and to hedge against the economic risks and take the right decisions insured the ongoing good performance of the firm.

Keywords: Cash holdings, Macroeconomic variables, GDP, Inflation, Budget defect, Credit spread, Cash surplus.

Contribution/ Originality

This study contributes in the existing literature by using the Fully Modified Ordinary Least Square (FMOLS) method to display the role of macroeconomic changes in corporate cash holdings decisions. This study is the first which have investigated the macroeconomic variables as determinants of cash holdings in the Middle East and Jordan.

1. INTRODUCTION

Cash holdings decision is one of the financial decisions that are taken by the management of firms. It considered as a tool to decrease the risk and cost of converting assets into cash at short notice (Tsiang, 1969). The managers have different motives for holding cash. These motives can be summarized in taking advantage of investment opportunities, hedging against the financial shocks, or meeting the operating costs (Damodaran, 2005). After the global financial crisis 2007-2009, the subject of corporate cash holdings and cash management has gained much attention in the empirical financial studies in order to help the firms in facing the negative effects of the changes in macroeconomic conditions by doing the necessary financial adjustments to timely receive the funds necessary to meet its obligations by holding cash without increasing its liabilities or incurring considerable losses by converting its assets (Lam, 2003).

This paper aims to investigate the impact of macroeconomic conditions on corporate cash holdings. Regarding this relationship, the present study is one of the advanced attempts that lights up the path for supplementary research by filling the gap of previous literature that ignored this role and focused only on the effect of firms' specific financial characteristics. The main contribution of this paper to the literature is to display the role of macroeconomic changes in corporate cash holdings decisions by using the Fully Modified Ordinary Least Square (FMOLS) method. Although Chen and Mahajan (2010) have provided a model which tested the impact of macroeconomic variables on cash holdings in 34 combined countries of the strongest fifty economies in the world, the results of the mentioned study are far from being generalized due to the difference in monetary policies from one country to another and also because they ignore the emerging markets. In the Middle East and Jordan, by reviewing the related literature, the present study, to the best of the researcher's knowledge, is the first to investigate the macroeconomic variables as determinants of cash holdings. The paper presents empirical evidences that macroeconomic changes determine the cash holdings decision by using panel data of 65 non-financial firms listed in Amman Stock Exchange (ASE) during the period from 2000 to 2011.

2. RELATED LITERATURE

After the Great Depression in 1930, the quality of money has gained more attention by economists as well as scholars. Disregard for the quality of liquid assets was identified as one of the causes of the great depression. The corporate financial management uses cash and cash equivalent as a lifeline when there is an urgent need for money; that is why it is considered the most important component of current assets. The managers in general hold a substantial portion of their assets in the form of cash and short term investments for the investor's payments, for the physical assets reinvestment, and to keep cash inside the firm in case they face any urgent needs (Almeida *et al.*, 2002).

This study relates to the application of econometric analysis on a firm-specific level. This application is a new approach of economic studies for financial stability purposes (Bunn and Redwood, 2003). In spite of the complexity of the relationships in the macroeconomic variables

(i.e., Exchange rates, interest rates, inflation changes in GDP, aggregate demand, monetary policy, among others), it is impossible to ignore its serious effects on the firm's financial performance (Oxelheim and Wihlborg, 2008) as well as stock prices (Ferson and Harvey, 1994; Bilson *et al.*, 2001; Donadelli, 2013). The causal relationship between macroeconomic variables and the stock exchange market was investigated as a new topic in macroeconomics. A fundamental issue for understanding the causality relationship considered the importance of macroeconomic disturbances for stock market fluctuations (Araújo, 2009).

There has been an increasing attention around the world to the relationship between the stock market returns and the macroeconomic conditions. Some previous literatures (Chen *et al.*, 1986; Flannery and Protopapadakis, 2002) have analyzed the response of the stock market returns to macroeconomic conditions and vice versa. Many researchers investigated the effect of macroeconomic variables on corporate financial decisions (Gan *et al.*, 2006). Features of the financial system can amplify and propagate business cycle fluctuations (Ferreira Da Silva, 2002). Furthermore, macroeconomic stability can be achieved through the financial sector, especially from interest-rate induced or liquidity shocks (Scharler, 2008). For example, Using a sample of 13 emerging stock markets over the period from 1987 to 1996 Fifield *et al.* (2002) discovered that a mixture of national (GDP, inflation, money and interest rates) and international (industrial production and inflation) economic variables expected to explain up only 14.6 percent of the variance of monthly returns.

This paper relates to ASE which is an emerging market. Such markets have suffered from the global financial crisis of (2007-2009). Although the listing activity of public companies increased dramatically during the period prior to the global financial crisis, yet, the loss of trust in the investment activity coupled with the bad performance of the economy have contributed to the great losses in the value of public companies in Jordan after 2007 (Al-khatib and Al-Horani, 2012). According to statistics of the Edaa (2011), the number of companies that are trading below par value (one Jordanian dinar per share) on October, 2011 reached 117 companies out of 211 companies (about 55%) that were traded on the stock market. The same statistics clarified that the number of insolvent Jordanian companies listed in Amman Exchange for the last three years from (2008-2011) are 60 companies. While the number of companies that almost stalled, and which suffered from losses for two consecutive years, are 15 companies.

The decision of cash holdings is one of the most significant decisions required for management (Islam, 2012). In spite of an abundance of previous studies and many discussions of corporate cash holdings, the implications of firms' cash policy are not yet fully understood (Frésard, 2009). A number of researchers have investigated the determinants of cash held by firms of developed countries, but a few have analyzed the cash holdings patterns of the firms in developing countries (Afza and Adnan, 2007; Chen, 2012). Furthermore, Al-Najjar (2012) mentioned the importance of the strategic decision of cash holdings in emerging markets, and argued that under-researched or incompletely studies have been explored in such markets.

Cash holdings play a significant role in the economic growth of emerging countries. Chen (2012) suggested that corporate cash holdings in emerging markets promote economic growth. His study attributed this relationship to firms in developing countries' desire taking advantage of the investment opportunities. Furthermore, the attraction to dissipate cash may be especially strong during financial crises in the emerging markets because of increased market uncertainty can reduce the value of managers' self-interested behavior. Moreover, cash holdings may be useful to firms during the time of downturn markets; the reduction of liquidity may increase the troubles of securing alternative financing tools (Elkinawy and Stater, 2007). In many emerging markets, firms hold enormous cash balances in order to use cash during financial crises. This cash helps firms buy the assets of distressed firms at cheap prices and this may happen much less than in developed markets, but such practice still exists (Damodaran, 2005).

Classical literature focused on the investors' negative views towards cash holdings and also the negative effect of liquidity and cash holdings on the firms' financial performance. With the global financial crisis of 2007-2009, the financial markets around the world were hit by the most awful crisis since the great depression. This crisis caused problems the most financial institutions in the world which faced severe funding difficulties especially the non-financial firms, which were immediately forced to strengthen their funding strategies against financial constraints and transfer from indirect finance to direct finance to face this new situation (Mizen, 2008).

Currently, investors have realized the advantages of cash holdings and liquid investments for the firm operations and its performance. For example, a recent article published in the Economist (2008) stated "how time changes; not long ago, companies with cash piles were assailed by corporate activists to return money to shareholders, but currently it is only a slight exaggeration to say that the more cash that investors see in a firm's coffers, the happier they are". This leads to believe that increasing of cash will lead the firm to a better competitive position especially when market trend is bearish.

Kim *et al.* (1998) using a panel of U.S. industrial firms show that the volatility of economic conditions' effects on cash holdings when profitable opportunities come along. Baum *et al.* (2008) discussed the relationship between liquidity and macroeconomic uncertainty. They indicated that firms rise their liquid assets ratios as a result of macroeconomic uncertainty or idiosyncratic uncertainty rises of the U.S. non-financial firms. Natke (2001) studied the corporate liquidity in Brazil and argued that interest rates affect corporate liquidity and provide empirical evidence on the existence of economies of scale.

Ferreira *et al.* (2005) related the changes of cash holdings levels to firm-specific variables and macroeconomic conditions. They also argued that firms with financial constraints hold more cash at times of macroeconomic troubles. Furthermore, Almeida *et al.* (2004) found that the cash flow sensitivity of cash was highly significant for constrained firms. Otherwise, it was insignificant for unconstrained firms but positive. They also posited that patterns of cash flow should adjust over the business cycle. Moreover, they argued that on the contrary of financially unconstrained firms, the financially constrained firms' cash flow sensitivity of cash rises after macroeconomic shocks.

Ramírez and Tadesse (2009) examined the relationship between uncertainty avoidance, multi-nationality and corporate cash holdings using a large panel of firms in 55 countries. They provided evidence that firms in countries with high uncertainty avoidance tend to accumulate vast amount of cash. This result is different from other commonly held views in cash management, which implies that multi-nationality firms tend to accumulate more cash.

Chen and Mahajan (2010) provided a model which tested the impact of macroeconomic variables on cash holdings in the combined 34 countries of the 50 strongest economies in the world. The results argued that macroeconomic variables play a key role in firm's cash holdings decision. Macroeconomic variables such as GDP growth, inflation, real short-term interest rate, government budget deficit, credit spread, private credit, and corporate tax rate have jointly shown significant impact on corporate cash holdings.

This study examines the effects of macroeconomic variables on corporate cash holdings in the Amman Stock Exchange during the period from 2000 to 2011. The study fills the gap of the previous literature, whereas the effects of macroeconomic variables on corporate cash holdings have been rarely examined in literatures. Generally, the results are inconclusive (Natke, 2001; Dittmar *et al.*, 2003; Kalcheva and Lins, 2007; García-Teruel and Martínez-Solano, 2008; Chen and Mahajan, 2010). Particularly, the lake of studies on cash holdings issues in Middle East and Jordan, to the best of our knowledge, leads us to investigate the role of macroeconomic changes on cash holdings decision. ASE is one of the stock markets in the emerging countries that excluded from the sample of Chen and Mahajan (2010). Using one country most likely helps in avoiding the problems due to the difference in monetary policies between countries. The work in this paper is different from the related previous empirical studies in which the statistical approach uses the Fully Modified Ordinary Least Square (FMOLS) method. This method avoids the high correlation between macroeconomic conditions variables. This study demonstrates that beyond the traditional determinants of cash holdings which related to firm specific factors, macro variables like GDP growth, inflation, government budget deficit, and corporate tax rate also is expected to affect corporate liquidity and cash holdings.

3. DATA DESCRIPTION

The main sources of data for this study include the firms' financial reports (income statements and balance sheets) of the non-financial listed firms in ASE. This research depends on financial statements of non-financial firms listed in ASE over 12 years from 2000 till 2011. While the macro data are obtained from the website of International Monetary Fund (IMF) and the database of Jordanian Ministry of Economic. All financial data are collected in currency terms of Jordan Dinar. This study started with all firms on ASE as of the end 2011, which turned out to be 232 firms. Consistent with previous literatures, this study excludes financial firms due to their regulated environment and the dissimilarity in their financial statement structure. This procedure reduced the sample to 125 firms. Only firms listed in ASE that have their domicile in Jordan were included. As the next step, this study dropped all firms-years observations for which there were missing

variables during the sample period. Lastly, from these firms, only those firms with least twelve continuous time series observations during the sample period will be included in the sample. These criteria were implemented to get consistency in the data set, even though we realize there is a risk of survivorship bias. However, the firms realize the previous conditions are 65 firms; there is the sample of the study over the whole entire 12 year period from 2000 to 2011.

4. METHODOLOGY

This relationship will be examined by using fully modified OLS principles in order to testing the hypotheses of co-integrating vectors in panels. When order of integration is decides than for the long run elasiticities, utilize the FMOLS method. FMOLS was originally designed first time by (Gregory and Hansen, 1996); (McCoskey and Kao, 1998); (Pedroni, 2000); and (Phillips and Moon, 1999) to deliver optimal estimates of co-integration regressions. This method provides reliable and effective estimation of co-integrating vectors (An and Jeon, 2006).

Many literature and empirical researches use the methods for non-stationary panel data that included tests of unit root and co-integration (Pedroni, 2001). Moreover, the method of FMOLS has gained many acceptance in economic research see (Apergis and Payne, 2009), (Christopoulos and Tsionas, 2004), and (Lee, 2005) with many more since. In this regard, the equation explains the relationship between macroeconomic variables and cash holdings will take the following form,

$$LOGCASHH_{i,t} = \beta_0 + \beta_1 GDP_{i,t} + \beta_2 INF_{i,t} + \beta_3 BD_{i,t} + \beta_4 CS_{i,t} + \beta_5 SURP_{i,t} + \varepsilon_{cj}$$

(4.1b)

$LOGCASH_{i,t}$: is Cash holdings
$GDP_{i,t}$: is percentage change of gross domestic product
$INF_{i,t}$: is inflation rate
$BD_{i,t}$: are government budget deficits
$CS_{i,t}$: is credit spread
$SURP_{i,t}$: is Cash surplus or deficit

The present study largely uses annual growth in gross domestic product (GDP) in percentage as a proxy the o measure the GDP in order to examine its effect on the cash holdings decision. Also, the study uses the percentage change in the consumer price index to represent inflation (INF). Moreover, this study uses the government budget deficit/surplus (BD) as percentage of central government's budget deficit over GDP as a proxy of government budget deficits. The interest rate that charged by banks on loans to private sector customers minus the interest rate paid by commercial or similar banks for demand, time, or savings deposits will be used as a proxy of credit spread (CS). Finally, the revenue (including grants) minus expense, minus net acquisition of nonfinancial assets will be used as a proxy of Cash surplus/ deficit (SURP).

4.1. Significant Macroeconomic Variables

The first variable has been tested in this study is Gross Domestic Production (GDP) which is defined as "the market value of all final goods and services produced within a country in a given

period of time" (Eatwell, 1998). (GDP) is one of the most widely used measurements of economic production (Zhang and Xu, 2011). GDP has been widely used in literatures provide a general idea about the status of a country's development (Lu and Lo, 2006).

The second macroeconomic variable tested in this study was inflation. The first and the most commonly used measure of inflation was introduced by Gordon (1975), as "the aggregate price growth excluding food and energy". Even the widely acceptance of core inflation as a macroeconomic variable in the previous studies, but there is no agreement on either how to measure the core inflation indicator or to define the core inflation indicator (Tekatli, 2010).

According to the Federal Reserve in the U.S., the favored core an overall inflation is the core and overall Personal Consumption Expenditures indices (PCE). To face higher inflation the firms' management tends to reduce non-interest-bearing cash as cash holdings become costly. Otherwise, firms have to increase interest-bearing cash equivalents as a result of increasing nominal interest rates during inflation periods (Chen and Mahajan, 2010). The literatures above show that the net effect of inflation on corporate liquidity is unclear (Natke, 2001).

The third variable is the government budget deficit which might indicate to the change in future interest rates. The higher deficit on government budget forces the governments raising the interest rates. Thus, management in this case tends to hold less cash and investing more in assets with higher returns (Cebula, 2005).

The fourth variable is credit spread which is the interest rate that charged by banks on loans to private sector customers minus the interest rate paid by commercial or similar banks for demand, time, or savings deposits. The terms and conditions attached to these rates differ by country, however, limiting their comparability.

The fifth variable is Cash surplus or deficit, which is revenue (including grants) minus expense, minus net acquisition of nonfinancial assets. In the 1986 GFS manual nonfinancial assets were included under revenue and expenditure in gross terms. This cash surplus or deficit is closest to the earlier overall budget balance (still missing is lending minus repayments, which are now a financing item under net acquisition of financial assets). It is argued that earnings per share reflect the underlying real economic activity. Thus, the relationship between macroeconomic activity and firm returns is expected to be significant in the long run.

5. RESULTS

Table 1 presents the descriptive statistics of the macro economic variables for Jordanian economics from 2000 to 2011. The table gives us some information about these variables. Table 2 shows the trend of macroeconomic variables within the same period of time. The results show that the average of inflation during the whole period was 4.12 percent with standard deviation 3.71 percent, while the average of GDP for the same period was 5.84 with standard deviation 2.13 percent. Also the results show a deficit of cash as well as government budget by 4.07, and 0.95 respectively. The results on annually descriptive data shows that the inflation increased from 0.98

percent in 2000 to 4.12 percent in 2011, and GDP failed from 4.11percent in 2000 to 2.63percent in 2011.

Results obtained using multiple regression analysis, using OLS, were not significant. This is due to the high correlation between the independent variables. The possibility of applying FMOLS for co-integrating regression was then tested; with two models the Agumented Dicky Fuller, and Philips Perron (see table 4). The outliers problems of the dependent variable was addressed by ignoring them, using the condition if LOGCASH > -7.2, the residuals of the model were found to normally distributed, as seen in figure 1, and the VIF of all independent variables were below 10. The results in table 5 show a partial significant relationship between cash holdings and set macroeconomic variables. Table 5 shows that R-Squared is 0.472, which means that independent variables are explain 47.2 percent from the cash holdings changes.

In more details, the study proves a positive significant relationship between GDP and cash holdings, which means that corporate cash holdings have been affected by the growth domestic production, as the results indicate that firms tend to hold more cash when the GDP is high, and vice versa. Moreover the study indicates a negative significant relationship between government budget deficit/surplus and credit spread on one hand and cash holdings on the other hand. The negative significant relationship between government budget deficit/surplus and credit spread on one hand and cash holdings implies that corporate cash holdings have been affected by government budget deficit/surplus. Also, this result shows that firms tend to hold more cash when the government budget deficit/surplus is low, and vice versa. The study fails in finding a significant relationship between inflation and cash surplus/deficit on one hand and cash holdings on the other hand, which means that corporate cash holdings have not been affected by inflation levels or cash surplus/deficit. The corporate cash holdings related positively with gross domestic production (GDP), and credit spread (CS) as well as government budget deficit and cash (BD). These results are in line with (Chen and Mahajan, 2010). On other hand, this paper fails on find a significant relationship between cash holding and both inflation (INF) as well as cash surplus/deficit (SURP)

6. CONCLUSION

As the results of multiple regression analysis, using OLS were not satisfying due to the high correlation between the independent variables, the co-integrating regression method was used; Better results were obtained using the Agumented Dicky Fuller, and the Philips Perron methods (see table 4). The results in table 5 show a partial significant relationship between set macroeconomic variables and cash holdings. Among all macro variables used in this study, GDP, inflation, government budget deficit, cash surplus/deficit and credit spread have more consistent impact on firm's cash holdings. In more details, GDP has a positive effect on corporate cash holdings. This implies that firms hold vast cash in response to higher economic growth, which is consistent with the income effect prediction of the money demand theory. The results in table 5 show an insignificant relationship between inflation and cash holdings. This result goes in line with the fact that the non-financial Jordanian firms relatively have low inventory in relation to total

assets, so firms' specific characteristics are less affected by inflation. However, the results in table 5 show a significant negative relationship between government budget deficit and cash holdings.

This result reflects that the signals of future economic slowdown, represented in higher government budget deficit, lead firms to hold less cash in anticipation of the reduced investment opportunities that accompany economic slowdown. Moreover, credit spread has positive effect on corporate cash holdings. This indicates that when the market is illiquid, firms increase their cash holdings for the transaction cost motive. Alternatively, firms hold more cash when the credit risk is higher, that is, when debt financing is more difficult. Finally this study does not support the negative effect of cash surplus on cash holdings, therefore, cash holdings decision is not related to economic cash surpluses (explanation). To the best of Knowledge, the present study, to the best of the researcher's knowledge, is the first to investigate the macroeconomic variables as determinants of cash holdings in the Middle East and Jordan. This paper uses a different approach to examine the above mentioned relationship which is FMOLS for co-integrating regression method that was supported by Agumented Dicky Fuller, and Philips Perron (see table 4.16). The paper supports public organizations research with unique models, which emphasizes the impact of macroeconomic determinants on cash holdings. The paper also links between the macroeconomic variables and firms' financial decisions, as the firms characteristics affected by economic conditions and governmental decisions. Finally, the results of this paper are expected to help the government decision makers, investors and firms' managers to understand the effects of macroeconomic variables and to hedge against the economic risks and take the right decisions insured the ongoing good performance of the firm.

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Appendix

Table-1. Descriptive statistics of macroeconomic variables

	BD	CS	GDP	INF	SURP
Mean	-0.95	4.82	5.84	4.12	-4.07
Median	-0.67	4.80	5.79	3.40	-3.60
Maximum	1.67	6.20	8.56	14.90	-0.30
Minimum	-6.28	3.20	2.31	0.70	-8.90
Std. Dev.	2.36	0.94	2.13	3.71	2.28
Skewness	-0.71	-0.33	-0.26	1.87	-0.38
Kurtosis	2.70	1.87	1.76	6.12	2.72
Jarque-Bera	68.11	54.76	58.44	767.04	21.57
Probability	0.00	0.00	0.00	0.00	0.00

Note. These variables are; government budget deficit (BD) which is the percentage of central government's budget deficit over GDP, credit spread (CS) which is the interest rate that charged by banks on loans to private sector customers minus the interest rate paid by commercial or similar banks for demand, time, or savings deposits., (GDP) which gross domestic production in percentage, the inflation (INF) which is the percentage change in the consumer price index, and cash surplus or deficit (SURP) which is revenue (including grants) minus expense, minus net acquisition of nonfinancial assets.

Table-2. Descriptive statistics of macroeconomic variables, 2000-2011

		BD	CS	GDP	INF	SURP	MC
2000	Mean	1.27	5.13	4.11	0.98	-2.37	0
	Std.	1.39	0.11	0.47	0.99	1.29	0
2001	Mean	0.57	5.68	5.04	2.05	-3.29	2
	Std.	1.99	0.40	0.79	0.86	0.67	0
2002	Mean	0.81	6.00	5.77	1.72	-3.55	1
	Std.	0.81	0.70	0.08	0.30	1.56	0
2003	Mean	-0.75	5.60	4.41	2.62	-0.61	2
	Std.	0.31	0.70	0.82	3.57	1.07	0
2004	Mean	1.21	4.62	8.53	3.55	-1.65	2

Continue

		BD	CS	GDP	INF	SURP	MC
	Std.	0.70	0.30	0.10	0.54	0.89	0
2005	Mean	1.16	3.68	8.12	3.72	-4.98	2
	Std.	1.15	0.30	0.00	0.75	0.40	0
2006	Mean	-2.46	3.40	8.11	6.08	-3.72	0
	Std.	1.15	0.70	0.00	0.75	0.40	0
2007	Mean	-1.01	3.80	8.21	5.25	-4.45	2
	Std.	0.70	0.70	0.10	0.54	0.89	0
2008	Mean	-1.73	4.42	7.00	13.88	-3.99	0
	Std.	0.31	0.40	0.82	3.57	1.07	0
2009	Mean	-1.74	5.47	5.50	0.78	-8.45	0
	Std.	0.81	0.11	0.08	0.30	1.56	0
2010	Mean	-5.71	5.26	2.54	4.75	-5.41	0
	Std.	1.99	0.13	0.79	0.86	0.67	0
2011	Mean	-3.12		2.63	4.12	-6.43	0
	Std.	1.39		0.47	0.99	1.29	0

Note. These variables are; government budget deficit (BD) which is the percentage of central government's budget deficit over GDP, credit spread (CS) which is the interest rate that charged by banks on loans to private sector customers minus the interest rate paid by commercial or similar banks for demand, time, or savings deposits., (GDP) which gross domestic production in percentage, the inflation (INF) which is the percentage change in the consumer price index, and cash surplus or deficit (SURP) which is revenue (including grants) minus expense, minus net acquisition of nonfinancial assets.

Table 3 shows non-significant relationships between cash holdings and macroeconomic variables as panel data during the study period. On the other hand the table shows a moderated relationship between macroeconomic variables with each other.

Table-3. Correlation matrix between cash holdings and macroeconomic variables

Probability	**LOGCASH**	**BD**	**CS**	**GDP**	**INF**	**SURP**	**R**
LOGCASH	1.00						
BD	-0.009	1.00					
CS	-0.009	0.165*	1.00				
GDP	0.043	0.456*	-0.507*	1.00			
INF	0.012	-0.362*	-0.538*	0.295	1.00		
SURP	-0.00	0.522*	0.394*	0.1731*	-0.100*	1.00	00
R	-0.051	0.173*	-0.523*	-0.025	0.073**	-0.024	1.00

Note: *P < 0.01 **P < 0.05 and ***P < 0.10

Note. The variables in this table are; cash holdings (LOGCASH) the natural logarithm of cash and cash equivalents to net assets, as dependent variables and the independent variables are; government budget deficit (BD) which is the percentage of central government's budget deficit over GDP, credit spread (CS) which is the interest rate that charged by banks on loans to private sector customers minus the interest rate paid by commercial or similar banks for demand, time, or savings deposits., (GDP) which gross domestic production in percentage, the inflation (INF) which is the percentage change in the consumer price index, and cash surplus or deficit (SURP) which is revenue (including grants) minus expense, minus net acquisition of nonfinancial assets.

Table-4. Test for co-integrating regression method

No.	Test	Statistic	Prob.	Statistic
1.	Panel v-Statistic	-0.522652	0.6994	-3.526416
2.	Panel rho-Statistic	7.097553	1.0000	7.460964
3.	Panel PP-Statistic	-7.534086	0.0000	-6.146780*
4.	Panel ADF-Statistic	-2.225507	0.0130	-2.347702*

Note: *P < 0.01 **P < 0.05 and ***P < 0.10

Figure-1. The residuals normal distribution

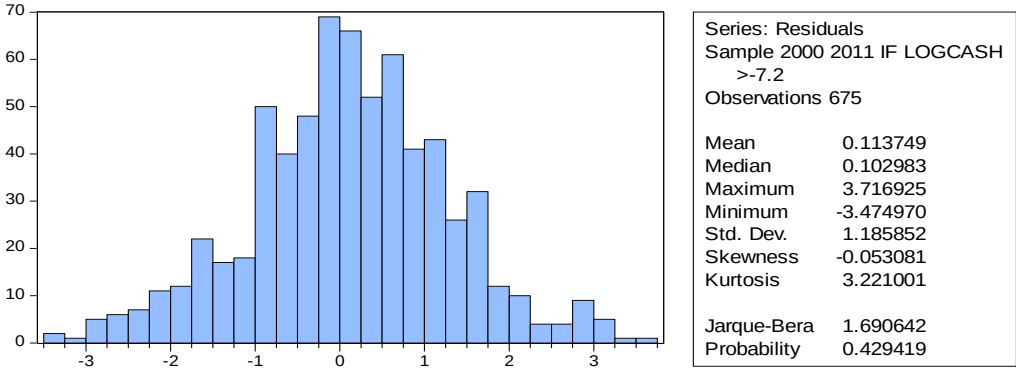

Table-5. The Regression Analysis for the Relationship between macroeconomic variables and cash holdings

No.	Variable	FMOLS Coefficient
1.	GDP	0.105727*
2.	BD	-0.055866*
3.	INF	-0.010861
4.	CS	0.121287**
5.	SURP	-0.009913
	R-squared	47.2%
	Adjusted R-squared	43.1%
	Durbin-Watson stat	1.27

Note: *P < 0.01 **P < 0.05 and ***P < 0.10
Dependent Variable: LOGCASH

Note. The variables in this table are; cash holdings (LOGCASH) the natural logarithm of cash and cash equivalents to net assets, as dependent variables and the independent variables are; government budget deficit (BD) which is the percentage of central government's budget deficit over GDP, credit spread (CS) which is the interest rate that charged by banks on loans to private sector customers minus the interest rate paid by commercial or similar banks for demand, time, or savings deposits., (GDP) which gross domestic production in percentage, the inflation (INF) which is the percentage change in the consumer price index, and cash surplus or deficit (SURP) which is revenue (including grants) minus expense, minus net acquisition of nonfinancial assets.

Table-6. VIF test for macroeconomic variables

Variable	VIF
BD	3.1
CS	4.4
GDP	4.5
INF	1.9
SURP	2.1

The variables in this table are; government budget deficit (BD) which is the percentage of central government's budget deficit over GDP, credit spread (CS) which is the interest rate that charged by banks on loans to private sector customers minus the interest rate paid by commercial or similar banks for demand, time, or savings deposits., Gross domestic production (GDP) which gross domestic production in percentage, the inflation (INF) which is the percentage change in the consumer price index, and cash surplus or deficit (SURP) which is revenue (including grants) minus expense, minus net acquisition of nonfinancial assets.