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Cointegration Approach to Determinants of Commercial Bank Deposit: Empirical Evidence from Commercial Bank of Ethiopia

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ABSTRACT

The objective of this study is to investgate determinants of banks deposit by using Vector Error correction model (VECM) approach. The study was conducted to find out the internal factors that affect deposit mobilization of CBE based on Vector Auto Regressive (VAR) model. The study has been conducted on secondary data for a period from 1987-2018. Co-integration and vector error correction model tests are applied to assess the relationship among dependent and independent variables. Total deposit is used as the measure of deposit mobilization. The study had found variables that can affect the total deposit of commercial banks. Six variables are regressed with the dependent variable, i.e. total deposit; these variables include total income, total expenses, total asset, total loan to advance, total revenue and total Liability, which are independent variables. A stationary test was carried out using Augmented Dickey Fuller (ADF) test. Variables are has no unit root at first difference at 5% level of significance. Then, appropriate lag length was determined. And then co integration test, VECM, Granger causality test, Variance Decompositions and finally stability test follows and its association with independent variables. The Johnson co-integration test showed that, there was long run co-integrating relationship between the variables. The result of Johansson co-integration test with lags in level shows in the long run Reserve Requirement is negatively affecting the Total Deposit in Commercial Bank of Ethiopia. Whereas, the Total Asset, Total Liability and Total Loans and Advance affect Commercial Bank of Ethiopia`s Deposit positively and all are statically significant. Finally the study had recommended what should be done to mobilize more deposits.

Keywords: *Total Deposit, Co-integration, Return on asset, Unit root, VAR*

INTRODUCTION

According to (Banson, et al, 2012), Mobilization of deposit for a bank is as essential as oxygen for human being". Deposit mobilization is one of the main functions of banking business and so an important source of working fund for the bank. Deposit mobilization is the collection of cash or funds by a financial institution from the public through its current, savings, fixed, recurring accounts and other banks specialized schemes. Hence, the competition for deposits is really a competition for profits. Commercial banks compete for deposits in order to become profitable and thus to be able to supply more funds to the public. However such financial growth is profitable only if the commercial bank does not incur additional expenses to obtain and retain cash (Davinaga, 2010). Commercial banks earn a return on their deposits and capital by investing deposit funds and capital funds in assets (Richard E, 1971). That is for commercial banks to attain profit deposits are one of the most important sources of capital. Moreover, according to Richard (1971) capital structure in commercial banks are made up of shareholders' funds, borrowing and deposits. Therefore, deposits are one of the sources of capital for commercial banks. According to (Nwanko, et al, 2013) savings mobilization and subsequent investment is the key to economic growth and development. According to (Laura E. et.al, 1999) At the level of the national economy, high levels of savings increase the amount of national resources and decrease the need to resort to foreign indebtedness in order to cover domestic investment and consumption demand.

Numerous countries with low internal savings rates must borrow from abroad, which results in a debt service burden. This clearly underlines the importance of savings mobilization to sustain economic growth with national financial resources.

Statement of the Problem

Bank deposits consist of money placed into

banking institutions for safekeeping. These deposits are made to deposit accounts such as savings accounts, checking accounts and money market accounts. The account holder has the right to withdraw deposited funds, as set forth in the terms and conditions governing the account agreement. Bank deposits consist of money placed into banking institutions for safekeeping. These deposits are made to deposit accounts such as savings accounts, checking accounts and money market accounts. These deposits are made to deposit accounts such as savings accounts, checking or current accounts and time deposit. The account holder has the right to withdraw deposited funds, as set forth in the terms and conditions governing the account agreement. The deposit itself is a liability owed by the bank to the depositor, and the word refers to this liability rather than to the actual funds that have been deposited. When someone opens a bank account and makes a cash deposit, the person surrenders legal title to the cash, and it becomes an asset of the bank. In turn, the account is a liability to the bank. In the present study, researcher considered how bank-specific factors affect for deposit mobilization. However, studies mainly focus on factors affecting for deposit mobilization, some of them has used secondary data while some of them entirely based on secondary data. Also, most of them studied the particular research topic from the banker's point of view by using banks as their research area. Therefore, the present study focuses on how bank-specific factors affecting for deposit mobilization. Since a deposit is most valuable asset of the bank it immaterial to find out the factors affecting it and determining the relationship between them. The researcher believes to fill gaps by identifying the internal factors that can affect the deposit mobilization of commercial bank of Ethiopia.

Objectives of the Study

The general objective of the study is to identify internal factors determining the deposits mobilization in Commercial Bank of Ethiopia. The specific objective of the study are assessing the impact of total income, total expenses, total asset, total Liability, total revenue and total loan to advance on the Deposit mobilization of CBE;

The Research Hypotheses

Hence, based on the objective, the present study seeks to test the following 6 alternative hypotheses with respect to the determinants of deposit mobilization in Commercial Bank of Ethiopia (CBE):

H1: Total income has significant and negative effect on Deposit mobilization of CBE,

H2: Total expenses has significant and negative effect on the Deposit mobilization of CBE

H3: Total asset has significantly and negatively determine CBE Deposit mobilization,

H4: Total Liability has significantly and positively determine CBE Deposit mobilization,

H5: Total revenue has significantly and positively determine CBE Deposit mobilization,

H6: Total loan and advance has significantly and positively determine CBE Deposit mobilization,

Scope of the Study

The scope of the study will be limited to studying the impact of internal factors that affect deposit mobilization of commercial bank of Ethiopia, total income, total expenses, total asset, total loan and advance, total revenue and total Liability. The study was also limited to see the assessment of internal factors that affect the profitability of commercial banks in Ethiopia from 1987 to 2018 G.C.

Literature Review

Abdi (1977) asserted that the role of banks and other financial institutions in economic development could be summarized under two distinct hypotheses: The Mckinnon-Shaw financial repression hypothesis and the structuralist explanation. The structuralist hypothesis was derived from historical interpretations of the role of banks in the capital formation processes of early European industrialization. This has little relevance to developing countries like Kenya which have undergone socio-economic transformations in its financial front.

The concept of liquidity in finance principally lies in two areas (Ismal, 2010): liquidity of financial instruments in the financial market and the liquidity related to solvency. The former related to liquid financial markets and financial instruments, smooth transactions and no barriers. The latter discusses the obligation of banks to make payments to third parties (Fiedler, 2000). Some examples of this includes: setting up liquidity management policies, reserve liquidity, balancing assets and liabilities and preparing liquid financial instruments (Ismal, 2010). Other studies such as those of

Giovannini (1983), Lanyi and Saracoglu (1983) and Kirakul, et.al., (1984) have investigated the relationship between aggregate savings and the rate of interest in developing and developed countries.

However, it was difficult to find an empirically positive and significant relationship between the two variables. High savings rates may have an insignificant impact on saving mobilization as revealed by Mwcga, Ngola and Mwangi (1990), who indicated that at times savers may not respond to higher interest rates if the saving instruments are not suited to their needs, technology, education levels and customs.

The study recommends a number of factors that need to be taken into account when evaluating the impact of savings rate on private savings. These involve investigation of the factors that motivate private sector to save, fiscal and monetary policies practiced in the country and the investment climate. The conclusion that emerged from these studies was that the definition of money distorted the relationship between aggregate savings and interest rates.

According to Voon-Choong et al (2010), the basic need for liquidity, asset, liability, capital adequacy, credit and interest rates risks management are now more challenging than before (Mishkin, 2007). The banks' liquidity management involves acquiring sufficient liquid asset to meet the bank's obligation to depositors (Voon-Choong et al, 2010).

According to the findings of Dorothee and Andrea (2009) it is more profitable for savings banks to hold liquid assets than to invest in illiquid assets, such as medium-term interbank lending to other credit institutions.

Erna and Ekki (2004) find the long run relationship between commercial banks deposits and the profitability of the banks. Higher bank profits would tend to signal increased bank soundness, which could make it easier for these banks to attract deposits (Herald and Heiko, 2009).

However, the effect of bank profitability and bank size are found to be insignificant once controlling for the other variables. So, the effect of profitability and banks size on commercial bank deposit is lower as compared with other variables.

Oumah (1988) noted that there was an indication of a relationship between the level of deposits and branch network in Kenya, especially for the state owned Commercial banks. For example, banks which had deposit levels of Kenya shillings one billion and over, had more branches than those that had less this amount.

These results were supported by Maende (1992) and Asclc (1997) but they hasten to add that this may not necessarily be the case with foreign owned banks as they operate on a different platform as regards determinants such as exchange rate, deposit rate and others. However, the study did not test the hypothesis empirically.

METHODOLOGY

In time series data analysis there are several techniques of parameter estimations including classical regression methods and co integration based techniques. A classical regression method is based on the assumption that all the variables to be included in a regression are stationary. The co-integration and error correction models are used under this study.

There are also several co-integration based methods, but the majority of them suffer from numerous problems when applied to multivariate models. The technique in this category that has emerged as the most powerful and popular is the Johansen technique, which is the technique employed in this study.

Nature and Source of Data

This study used Time Series data from secondary sources mainly from the data centre of the Commercial Bank of Ethiopia, in annually frequency based over the period 1987 to 2018.

Research Design

The study used quantitative methods of data analysis and the researcher tries to explain the relation between profitability of CBE and its' internal determinants based on the result that found from Co-integration and VAR multivariate regression equations. The data analysis of this research is used Vector Auto Regressive (VAR) model.

Variable Description

This research considered the following bank specific variables to examine factors affecting deposit mobilization of Commercial Bank of Ethiopia:

Table1. *Explanation of Dependent and Independent Variables Along with their Proxies*

Variable	Equation	Symbol
Total Deposit	Natural logarithm of Total deposit	TD
Total Income	Natural logarithm of Total Income	TI
Total expense	Natural logarithm of Total Expenses	TE
Total asset	Natural logarithm of Total Asset	TA
Total Liability	Natural logarithm of Total Liability	TL
Total revenue	Natural logarithm of Total revenue	TR
Total loan and advance	Natural logarithm of Total loan and advance	TLA

Functional Relationship and Model Specification

Functional relationship - The functional relation and the expected signs of dependent variable, Deposit in commercial Bank of Ethiopia and its independent variable

TD = F (TI, TE, TA, TL, TR, TLA)

Where:

TD = Total deposit of CBE

TI = Total Income of CBE

TE = Total expense of CBE

TA= Total asset of CBE

TL= Total Liability of CBE

TR= Total Reserve of CBE

TLA= total Loan Advance of CBE

Specification of the Econometric VAR model - The variables under the study were changed into natural logarithm LN data to avoid hetroscedasticity and to show elasticity of the variables. Then, the econometric VAR model is specified as the unstructured VAR model:

Log (TD) =β0 + βi1 log (TI) t-i + βi2log (TE) t-i + βi3log(TA) t-i + βi4 og(TL) t-i + βi5 log (TR) t-i +βi6 log (TLA) t-i +ε1t…….....(1)

Where,

β0 is constant term

β1, β2, β3 and β4 are coefficients of 1x k matrix to be estimated related with each predictor variables.

i = 1……., k the VAR order

ε1t=the error term

Ln =Natural logarithms of the variables.

Specification of Vector Error Correction Model

In line with the econometric VAR model equation the error correction model is:

Δlog (TD) = Ω (β1Log (TI) t-1 – β2Log (TE) t-1) + β4Log (TA) t-1 β5Log (TL) t-1 β6Log (TR) t-1 β7Log (TLA) t-1 +C-[+β9ΔLog (TD) t-I+β10ΔLog(TI)t-I+β12ΔLog(TE)t-I +β13ΔLog (TA)t-I+β14Δlog(TL)t-I+β15ΔLog(TR)t-I+ β16 ΔLog(TLA)t-I+ ε1t……...(2)

Where:

Ω is the speed of adjustment term or the coefficient of the error term

β5…….. β17 are 1X K matrix of short run coefficients to be estimated

I = 1, 2, 3….where k is lag order

εt is vector of exogenous shocks

Methods of Data Analysis and Estimation Techniques

In order to get more precise results the researcher utilized Vector Autoregressive Model (VAR). Because VAR model employee all empirical tools used to estimate the data. Vector autoregressive model (VAR) is one of the most powerful methods of analysing multivariate data. It is one of the most successful, flexible, and easy to use models for the analysis of multivariate time series. The VAR model has proven to be especially useful for describing the dynamic behaviour of economic and financial time series and for forecasting.

There are some prerequisites dealing with data before realizing VAR models that should be implemented. First, time series included in VAR model have to be stationary. Therefore, unit root test is applied. The test primarily utilizes Augmented Dickey Fuller (ADF).

Secondly, the appropriate lag length is determined. And then co integration test, VECM, Granger causality test, Variance Decompositions and finally stability test follows. The regression analysis known as Co

integration and Error Correction model to estimate the relationship between profitability and its determinants was used. This is the distinguishing factor for this study as previous research works on this topic make use of simple OLS Regression technique or Pooled OLS Regressions. To arrive at a result that will not lead to spurious regressions the study tested for stationarity at different levels in the variables making up the model. To further shed more light of the result, the study also made use the Partial Correlation Matrix to test for the absence of Multi co linearity. Other tests were carried out on the model which includes test of Normality, Durbin Watson Test of Serial Correlation, Test of Heteroskedasticity and Test of Model Specification so as to achieve the objectives of the study as well as answer the research question and Hypotheses.

Unit Root Tests

This test is an extension of the Dickey–Fuller (DF) test called the augmented Dickey-Fuller test (ADF), which removes all the structural effects (autocorrelation) in the time series and then tests according to the methodology. Brooks (2008) shows that if the dependent variable is a function of non-stationary variables, the regression will produce spurious results (a nonsense regression).

Even though the trending variables are completely unrelated, it is likely that significant t-ratios and a high R2 will be obtained. Thus, to avoid the problem of spurious regression it is necessary to test for stationary of time series variables before running any sort of regression analysis.

There are several tests for Stationarity including a visual plot of the data, unit root tests and those that directly test for Stationarity. Among these, unit root test specifically augmented Dickey-Fuller will be performed in this paper.

Augmented Dickey-Fuller Tests

Presence of unit roots of the variables can be examined by Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF), which is the most frequently, used unit root tests. The DF test estimates the following equation:-

$\Delta yt = \delta + \beta t + \alpha yt{-}1 + \varepsilon t$ ……. (3)

Where, yt is the relevant time series variable, Δ is a first difference operator, t is a linear trend and εt is the error term. The error term should satisfy the assumptions of normality, constant error variance and independent (uncorrelated) error terms. DF test does not take into account the possible autocorrelation in the error term (εt). The ADF test corrects this shortfall for high-order serial correlation by adding a lagged differenced term on the right-hand side in the DF equation (3.4). ADF employs the following equation:-

$\Delta yt=\delta+\beta t+\alpha yt{-}1+$ ……..……....(4)

Co Integration Model Analysis

To examine the extent to saving mobilizations instruments are correlated TD, the theory of co integration and Error Correction Models (ECM) is applied. With the help of this procedure it is possible to examine the short-run and long-run correlation among the variables.

Analysis of the Dynamic Behaviour of the Model

Once the determinants of the ROA are identified in a well-specified model, the interesting issues that remain are how the Profitability reacts to shocks in any of those determinants. The detail discussion of this topic concerns with which shock is relatively the most important and how long, on average, it will take for the ROA to restore its equilibrium following such shock.

To show which of the variables in the model have statistically significant influences on the future values of each of the variables in the system, the usual block F-tests and an examination of causality in a VAR can be used.

But these tests will not reveal whether changes in a value of a given variable have a negative or positive influence on the other variables in the system or how long it would take for the effect to work through the system (Brooks, 2002). To provide such information impulse response and forecast error variance decomposition analyses for a VAR process with co-integrated variables are used.

Result and Interpretation

Unit Root Tests

The unit root tests reveal that all variables are non-stationary at levels. When the test is applied to first differences of all variables stationary with constant and with constant and trend, hence the variables are considered as I(1) process. At first difference dependent and all independent variables become stationary with constant and with constant and trend.

Table2. *Unit root test*

ADF Test										
Variables	Intercept					Trend and intercept				
	At level	P .value	1st difference	P .value	order[]	At level	P .value	1st difference	P .value	order[]
Log(TD)	3.600170	0.9981	3.670170	0.1815	[L]at1%	2.078861	0.5354	4.296729	0.2792	[L]at1%
Log(TA)	3.699871	0.9959	2.621007	0.0163	[L]at1%	4.339330	0.8130	3.218382	0.0740	[L]at1%
Log(TE)	3.679322	0.9631	2.627420	0.0952	[L]at1%	4.309824	0.7914	3.229230	0.1642	[L]at1%
Log(TI)	3.699871	0.9840	2.627420	0.0008	[L]at1%	4.339330	0.6655	3.229230	0.0042	[L]at1%
Log(TL)	3.699871	0.9957	2.627420	0.0680	[L]at1%	1.552728	0.7849	3.229230)	0.1460	[L]at1%
Log(TLA)	3.670170	0.9867	2.627420	0.1147	[L]at1%	4.296729	0.5221	3.229230	0.1950	[L]at1%
Log(TR)	3.679322	0.9682	2.963972	0.0469	[L]at 1%	4.309824	0.5325	3.218382	0.0972	[L]at 1%
Log(TD)	3.600170	0.9981	3.699871	0.0013	[L]at 1%	2.078861	0.5354	4.339330	0.0066	[L]at 1%
With constant and no trend Test critical values: 1% = -3.639, 5% = -2.951, 10%=-2.617						With constant and trend Test critical values: 1% = -4.2627, 5% = -3.5529, 10%=-3.2096				

Source: *Author's Estimation using Eviews 8.0*

VAR Lag Order Selection Criteria

Selection of VAR order in the VAR regression must be known before co integration test is conducted. Information criteria method is the optimal way to identify the proper lag length for VAR model. There are few ways; one of the ways is to choose the lowest Akike Information Criteria (AIC) value. The lower the AIC value, better the model. The lag length also is -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 Inverse Roots of AR Characteristic Polynomial Internal Determinants of Banks Profitability: A study on CBE Page 46 indispensable to determine the rank of co integration. Lag orders 1 to 3 were supported by information criteria. By using AIC as provided by the Table 4.3 appropriate lag length was selected by applying a simple VAR model.

Table3. *VAR Lag Order Selection Criteria*

Endogenous variables: LOG(TD) LOG(TI) LOG(TE) LOG(TA) LOG(TL) LOG(TR) LOG(TLA)						
Exogenous variables: C						
Date: 04/06/20 Time: 16:29						
Sample: 1981 2012						
Included observations: 27						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	150.6966	NA	3.55e-15	-10.57012	-10.18617	-10.45595
1	345.4260	259.6392	2.73e-19	-20.25378	-16.79822	-19.22626
2	491.4127	108.1382*	3.01e-21*	-26.32686*	-19.79969*	-24.38599*
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: *Author's Estimation using Eviews 8.0*

Co-Integration Equation

Co-integration equation estimates the long run relationship between CBE deposit and it determinants using the Johansen maximum likelihood method. This method is selected because it produces consistent estimates of the long run parameter, which could be tested using likelihood ratio (LR) statistics.

Table4. *Co Integrated Equation Result*

1Co-integrating Equation(s):		Log likelihood	366.8695				
Normalized co-integrating coefficients (standard error in parentheses)							
LOG(TD)	LOG(TI)	LOG(TE)	LOG(TA)	LOG(TL)	LOG(TR)	LOG(TLA)	LOG(CPI)

1.000000	-0.035618	0.010839	-0.569565	-0.380257	0.135655	-0.170638	-0.123396
	(0.05194)	(0.01947)	(0.82410)	(0.78478)	(0.04767)	(0.02826)	(0.03599)

Source: *Author's Estimation using Eviews 8.0*

The above table 4 is not in the equation form the real sign of coefficients are changed Equation: Log (TD) = 5.350127 + 0.035618log (TI) - 0.010839log(TE) + 0.569565log(TA) + 0.380257log(TL) - 0.135655log(TR) + 0.170638 log(TLA).....(4)

CONCLUSION

The empirical result implies that a percentage increase in the Total income of Commercial Bank of Ethiopia causes 3.5% increase in Commercial Bank of Ethiopia Deposit and it has positive effect on the bank deposit in the long run. Unlike the total income, total expenses of the bank have negative effect on the Deposit of Commercial Bank of Ethiopia. The above long run equation tells us, the total Asset of the Commercial Bank of Ethiopia positively affects the deposit of the Bank and statically significant in the long run. A percentage increase in the total Asset of Commercial Bank of Ethiopia causes 57% increase in Commercial Bank of Ethiopia Deposit. Whereas, a percentage increase in the total liability of Commercial Bank of Ethiopia causes 38% increase in Commercial Bank of Ethiopia Deposit. That is, it positively affects Commercial Bank of Ethiopia deposit in the long run. 1 % increase in commercial Bank reserve requirement will tend to decrease the total commercial Bank deposit by 13.5% it is significant and affects negatively commercial Bank of deposit in the long run.

A percentage increase in the total loans and advance granted in commercial bank causes 17.06% increase in commercial Bank of Ethiopia Deposit and it affects the deposit growth positively as the CBE granted more loans to those customers. The empirical result implies that increase in total income, total asset, total liability and total loan and advance of Commercial Bank of Ethiopia increase Deposit and it has positive effect on Commercial Bank of Ethiopia deposit in the long run. Whereas, increment in the bank total income and reserve requirement will decrease the bank deposit and it have negative effect on the deposit mobilization of Commercial bank of Ethiopia. The Bank has the responsibility of supporting national development. In view of this, it should play an important role in promoting growth through mobilizing deposits for productive investment. The developmental role of the Bank includes, among others, financing imports of strategic importance, financing priority sectors and supporting extensive public investment. To accomplish this, the Bank should grow in mobilizing deposits. Finally, to ensure Financial Soundness, CBE should aggressively work on the financial health of the Bank through reducing NPL, and adhering to national and international standards of sound financial management (e.g. capital adequacy ratio, Asset and Liability position, NBE's reserve requirement…etc.) and possible to enhance its credibility and goodwill.

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