

Comparison of Financial Intermediation Efficiency among Commercial Banks in Ethiopia Using Bank Level Data

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ABSTRACT

The study is designed firstly to assess the overall trend of spread rate of Ethiopian banking industry over longer period of time (1990 to 2017) and secondly to statistically determine the mean difference of financial intermediation efficiency among selected commercial banks using an appropriate statistical model. As a sample, seven commercial banks were taken on the basis of availability of data to obtain sufficient number of observation. There is high fluctuation in Spread rate during 1990 through 2000 and only slight ups and downs afterwards (i.e., 2001 to 2017). Using Kruskal Wallis H test, it has been found out that there is significant intermediation efficiency difference among commercial banks in Ethiopia where the government owned commercial bank, which is Commercial Bank of Ethiopia (CBE) has the lowest average NIM, and hence most efficient bank with respect to intermediation efficiency. This could be attributed to its total asset ownership, proxy of bank size, as it controls about 72% of total assets of the sampled banks for this study as compared to that of United Bank (UB), least efficient bank, which has the lowest average size (3.7%) next to Nib International Bank in the sampled banks during study period. This strengthens the argument that size has a positive impact on efficiency intermediation.

Keywords: NIM, intermediation efficiency, bank size, Kruskal Wallis H test.

INTRODUCTION:

Banking industry in Ethiopia is differentiated by such special features as absence of foreign commercial bank owing to the fact that the government officially ruled out foreign ownership of bank; strict credit controls and fixing of interest rates by government mostly in favor of government priority areas. A single government owned commercial bank possesses significant market share in the industry and the privately owned banks are compulsorily forced to acquire government bonds amounting to 27% of the loan they extend every time they do so at the interest rate far below risk free rate. Besides, it seems that the government strictly limits entry of new domestic firms in to the industry as it is evident that the minimum capital requirement to establish commercial bank, which was equal to Ethiopian Birr 75 million and endorsed by directive number SBB/24/99 has been repealed and replaced by directives number SBB/50/2011 in 2011 which increased the minimum requirement to Ethiopian Birr 500 million, as a result of which no single bank has joined the banking market since then (see <https://www.nbe.gov.et/pdf/directives/bankingbusiness/sbb-50-11.pdf> for more information). Given this unique context, therefore, it is essential to investigate intermediation efficiency difference among commercial banks in Ethiopia to come up with new scholarly contribution.

The objective of this study was first to assess the overall trend of spread rate of Ethiopian banking industry over longer period of time (1990 to 2017) on the basis of lending and deposit interest rates fixed by government. The second objective of the study was to statistically determine the mean difference of financial intermediation efficiency among selected commercial banks using appropriate statistical model.

LITERATURE:

Net Interest Margin (NIM), as a measure of bank efficiency is the ratio of the difference between interest revenue and interest expense to average earning asset (Marinković & Radović, 2014).

According to Levine (1998), banks, as typical financial intermediaries, play a significant role in the activities of most economies. The efficiency of financial intermediation could affect nations' economic performance. Particularly, financial intermediation influences the net saving and investment in general. The difference between the return the savers earn from deposited money and the return the banks generate from investing the fund is known as net interest margin. Thus, the margin between these two returns could be taken as indicator of efficiency of banking system.

A bank could achieve its desired efficiency level by pursuing different strategies in which one of the objectives is to maximize the difference between lending and deposit rates. Nonetheless, the likelihood of attaining this objective is constrained by the potential competitive efforts from other banks. Given this constraint, banks pursue the optimization of the NIM through individual bank's reaction towards market conditions. Thus, NIM reflects the available mix liabilities and assets as well as pricing policy. NIM is determined by banks to cover intermediation costs and the risks. Angbazo (1997) claims that sufficient net interest margin has to generate adequate income to enhance the capital base as exposure of risk rises.

The NIM particularly reflects operational efficiency of a bank and the shows competitive nature in the traditional banking market that comprises both loan and deposit markets. In the context of traditional banking, banks make loans from the deposit they accept and hence the benefit is the interest revenue they earn. However, as banks engage more and more in nontraditional activities, the NIM would become less reliable indicator of overall efficiency. Rogers & Sinkey Jr (1999) emphasized that this is particularly important for larger banks, which have diverse sources of revenue and small NIM and have better ability to reduce risk.

NIM is a proxy for financial intermediation efficiency particularly in measuring the cost of intermediation. The prior research results such as Ho & Saunders (1981) contended that as banks are the dealers in the credit market and acting as intermediaries, the return they generates from this activity amounts to NIM, which approximates financial intermediation efficiency. Moreover, Lin, Chung, Hsieh, & Wu (2012) suggest that the NIM stands for the net return of banks and it generates sufficient earnings in order to improve capital base of banks

METHODS:

Currently, there are 17 commercial banks in Ethiopia, out of which 16 are private owned commercial banks and one (after two of them merged into one in December, 2015) is government owned commercial bank. National level average spread rate data, which is the difference between lending and deposit interest rates of 28 consecutive years were taken to show the trend of the score overtime with the aim of showing the overall banking efficiency in Ethiopia at the sector level. Net Interest Margin (NIM), proxy of financial intermediation efficiency was computed as the ratio of interest income less interest expense to average earning assets. Seven commercial banks were selected based on the inclusion criteria of availability of annual financial reports of sufficient number of years in line with getting maximum possible number of observations. Accordingly, including seven banks such as Commercial Bank of Ethiopia (CBE), Dashen Bank (DB), Awash International Bank (AIB), Bank of Abyssinia (BOA), Wegagen Bank (WB), United Bank (UB) and Nib International Bank (NIB) each having 18 years annual reports starting from 2000 until 2017. The statistical model initially proposed was one way Analysis of Variance (ANOVA) to compare the means of NIM, proxy of financial intermediation efficiency of the seven banks in order to determine whether there is statistically significant difference among the banks. However, after testing for parametric assumptions, it has been justified that the non parametric version of one way ANOVA, Kruskal Wallis H test is found to be more appropriate. Bank level data, particularly the annual reports of each commercial bank that were held at National Bank of Ethiopia (Central Bank for Ethiopia) were taken into account so as to statistically test whether there is significant difference in intermediation efficiency among the selected banks.

FINDINGS:

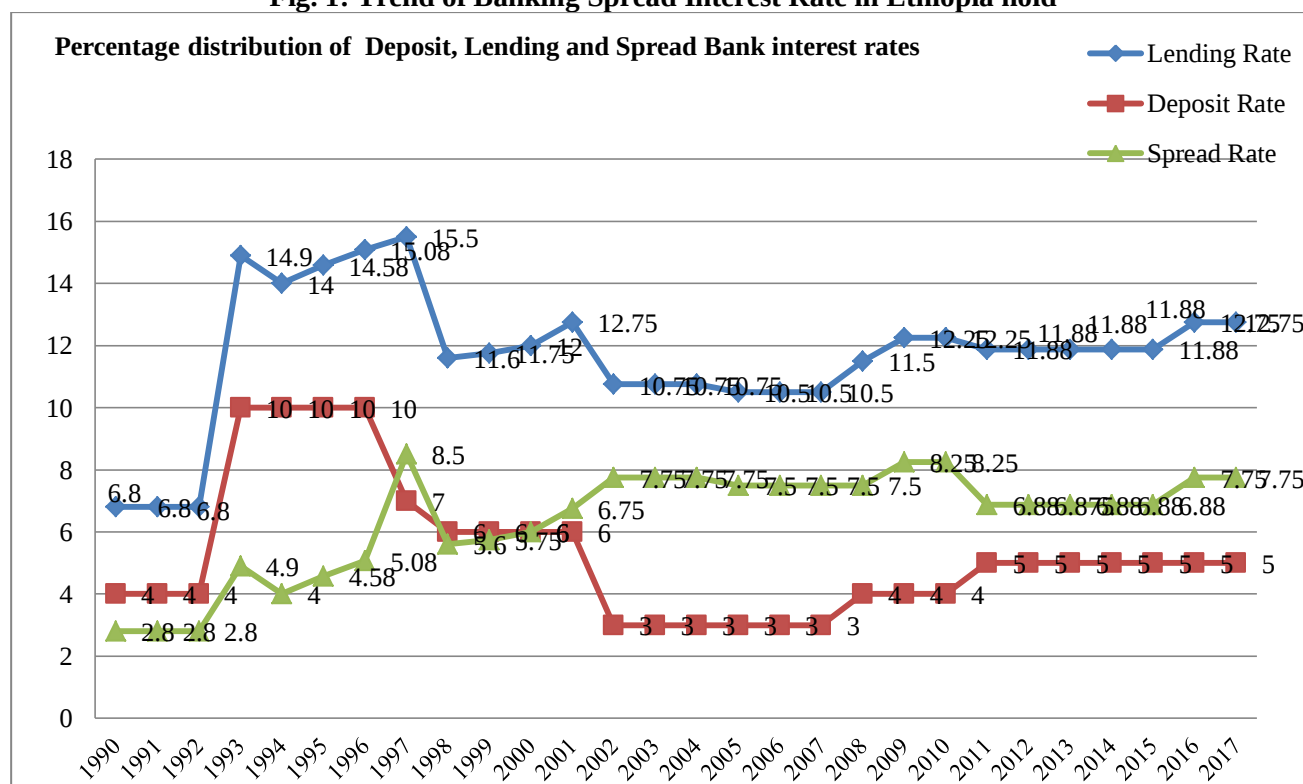
In this section, the study results are presented in two sub sections, where the first one is related to spread interest rate, which is the difference between lending and deposit rate at national level for 28 consecutive years to show the trend of the score overtime with the aim of uncovering the overall banking efficiency in Ethiopia at the sector level. The second sub section, the statistical test procedures are presented to show whether there is significant mean difference of the intermediation efficiency among commercial banks in Ethiopia, which is firm

level analysis.

Spread Rate (Lending Rate –Saving rate) – Macro level Analysis:

The spread rate of Ethiopian commercial banking industry was significantly varying in the earlier periods, where the minimum rate was 2.8% constantly during 1990 -1992 followed by substantial increase until 1997. This was particularly attributed to highest lending rate during the period, where on average the rate was nearly 15%, while the saving rate was constantly 10%. This is indicative of inefficiency in financial intermediation during the period. That period has been followed by the period of slight fluctuation of the spread rate, ranging between 5.6% and 8.3%. Particularly, the rate was almost stable at around 7.5% during 2002 through 2008. This could be still attributed to the high lending rate (nearly 11%), followed by falling deposit rate (fixed at 3%) during that period. This indicates that the depositors are discouraged to save as their rate of return was very low. Moreover, there is special feature of banking system in Ethiopia which is related to strict government regulation, where the government fixes interest rates irrespective of market trend. Coupled with the very low level of banking competition, this strict government regulation caused the spread rate to be wider, even if the trend curve is still flat at around 7% in the most times (see figure 1).

Fig. 1: Trend of Banking Spread Interest Rate in Ethiopia hold



Source: Author's computation from National Bank Report

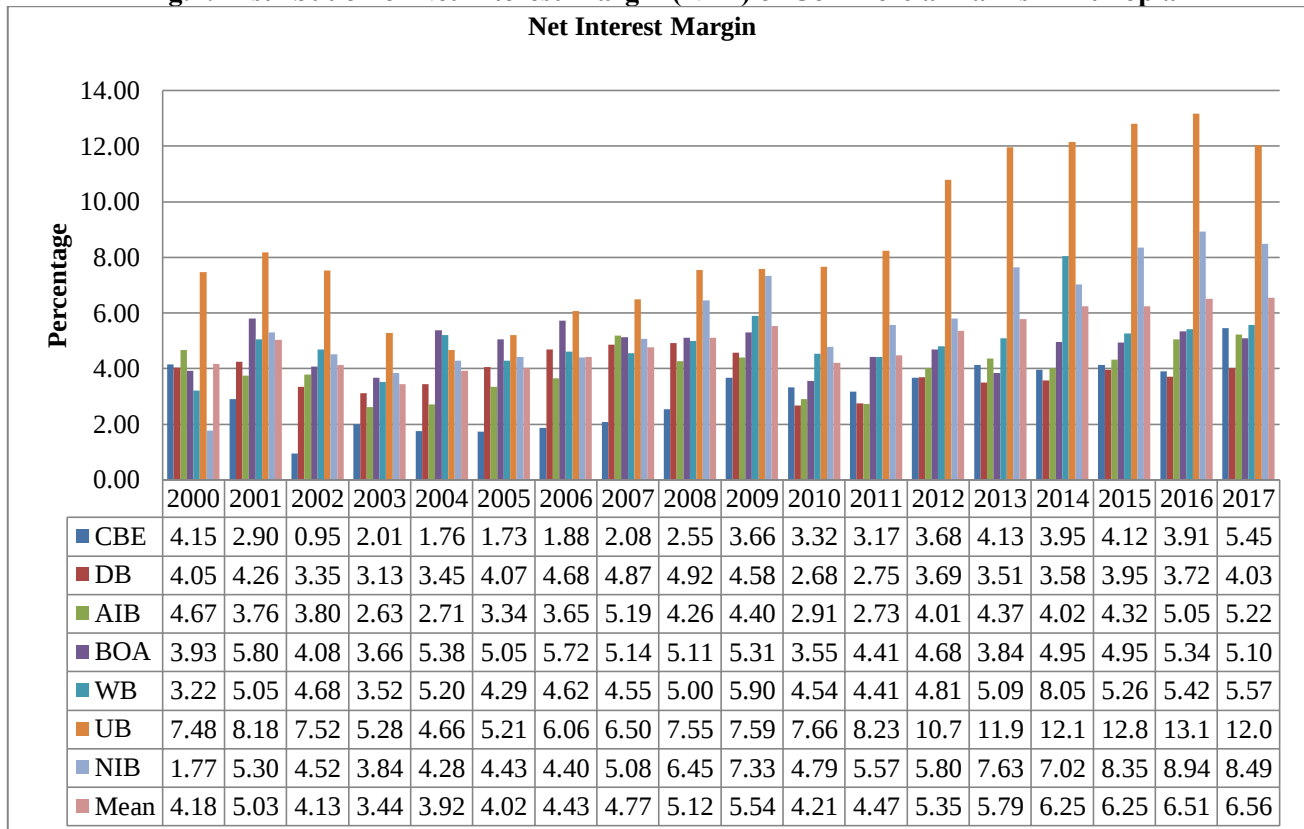
Net Interest Margin (NIM)-Firm level Analysis:

Net Interest Margin (NIM) defined as the ratio of the difference between interest income and interest expense to earning assets. Studies have shown that there is a wide range of views amongst different scholars that high interest rate spreads are attributed to the internal factors of the banks themselves, such as the propensity to maximize profits in an oligopolistic market, whereas others contend that the spreads are influenced by the institutional, macroeconomic and regulatory factors in which banks operate. These differing arguments can only be addressed via objective and quantitative analysis of the banking sector interest rate spreads in developing countries (Folawewo & Tennant, 2008).

Net interest margin of each commercial bank under consideration is applied to show the degree of variability in intermediation efficiency among commercial banks at firm level. Accordingly, it is assumed that a firm with narrower margin is better in intermediation efficiency and vice versa as per this specific measure of banking intermediation efficiency. However, it should be noted that this might not hold true in all the situation because, there are circumstances in which this might not work, particularly in the situation where the NIM could be higher or lower without attributing to intermediation related issues such as poor employee morale, resource

utilization etc, which are outside the intermediation process. On average, the NIM was lowest in 2003(3.4%) and highest in 2017(6.56%). United Bank (UB) has consistently highest NIM score almost all the time during the study period under consideration implying least efficiency and Commercial bank of Ethiopia (CBE) has lowest Score most of the time during the period, implying that it was best performer. In general, NIM has been increasing steadily starting from year 2011 indicating that banking intermediation efficiency was falling during the period. The degree of variability among banks was comparatively low during 2003 to 2006 and high during 2010 to 2017. Particularly the range of variability between best and worst bank has become wider during 2013 to 2017(see fig. 2).

Fig.2: Distribution of Net Interest Margin (NIM) of Commercial Banks in Ethiopia



Source: Author's computation from annual financial reports of commercial banks

Mean Comparison of Financial Intermediation Efficiency among Banks:

In this section, statistical test of financial intermediation efficiency at firm level has been conducted particularly using ANOVA. Accordingly, Net Interest Margin has been considered as proxy of intermediation efficiency of commercial banks. In order to use ANOVA as statistical tool, the basic assumptions should be held. Among those assumptions are normality of the dependent variable and homogeneity of variances. The violation of one or both of these assumptions could disqualify ANOVA as statistical tool in this study.

Test for Parametric Assumptions:

Test of Normality:

The test of normality has been conducted taking into account the residual of the dependent variable. As figure in appendix-1 indicates, the histogram plot is bell shaped and accordingly normality assumption is held. Moreover, the Kolmogorov-Smirnov and Shapiro-Wilk test of normality show that the NIM for each bank is normally distributed as the p-value in both tests is more than the default 0.05 level of significance. The test results are presented by table1.

Table 1: Test Statistics of Normality Assumption

Commercial Banks in Ethiopia		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Net Interest Margin	Commercial Bank of Ethiopia	.137	18	.200 [*]	.956	18	.532
	Dashen Bank	.093	18	.200 [*]	.968	18	.764
	Awash Bank	.115	18	.200 [*]	.944	18	.335
	Bank of Abyssinia	.206	18	.042	.922	18	.143
	Wegagen Bank	.162	18	.200 [*]	.872	18	.019
	United Bank	.219	18	.023	.897	18	.050
	Nib International Bank	.106	18	.200 [*]	.960	18	.609
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							
Source: Author's computation from annual financial reports of commercial banks							

Test of Homogeneity of Variances:

Here the assumed null hypothesis is that the banks have equal variance. The homogeneity of variance output table indicates that the null hypothesis is not accepted as the p-value is less than the default level of significance of 5% even in the robust test of Welch and Brown-Forsythe. This implies that the variances are non-homogeneous and hence the one way ANOVA assumption is violated. This forces the researcher to go for non-parametric tests to show whether there is statistically significant difference among seven selected commercial banks with respect to the intermediation efficiency.

Table 2: Test of Homogeneity of Variances

Net Interest Margin			
Levene Statistic	df1	df2	Sig.
12.960	6	119	.000

Source: Author's computation from annual financial reports of commercial banks

Table 3: Robust Tests of Equality of Means

Net Interest Margin				
	Statistic ^a	df1	df2	Sig.
Welch	15.748	6	52.206	.000
Brown-Forsythe	26.822	6	51.874	.000
a. Asymptotically F distributed.				

Source: Author's computation from annual financial reports of commercial banks

Therefore, Kruskal-Wallis H Test, the nonparametric test equivalent to one way ANOVA needs to be considered in order to test the statistical difference of intermediation efficiency among selected commercial banks in Ethiopia.

Statistical Procedure of Kruskal-Wallis H Test-Non Parametric Test:

Kruskal-Wallis H test is Non Parametric equivalent of one way ANOVA test, which will be applied if the one way ANOVA assumptions were violated.

Assumptions of Kruskal-Wallis H Test:

To use a Kruskal-Wallis H test, make sure that the data you have can satisfy the following assumptions that are requirements for a Kruskal-Wallis H test to provide you with a valid result.

Dependent variable should be in ordinal or continuous (ratio or interval). The independent variable should comprise two or more categorical, independent groups. Customarily, a Kruskal-Wallis H test is applied when there are three or more categorical, independent groups, but it could also be applied for just two groups. Independence of observations, i.e. there is no relationship between the observations in each group or between the groups themselves. This means that no participant in the observation belongs to more than one group.

Kruskal-Wallis H test procedures:

Table 4: Descriptive statistics-Net Interest Margin (NIM)

Descriptive Statistics					
	N	Mean	Std. Deviation	Minimum	Maximum
Net Interest Margin	126	.04997	.022245	.009	.132
Commercial Banks in Ethiopia	126	4.00	2.008	1	7

Source: Author's computation from annual financial reports of commercial banks

Table 4 indicates the range of variability of Net Interest Margin with minimum of 0.9% and 13.2% which means that on average commercial banks in Ethiopia earn at least about 1 cent and at most about 13 cents from one Ethiopian Birr investment in earning asset during the past 18 years.

The mean rank table helps to show the rankings of the banks based on the scores generated by the software. The higher mean rank means the higher overall score. Accordingly, United Bank (UB) has the highest mean score implying that it has the highest mean net interest margin. As a reverse measure of intermediation efficiency, the higher NIM is, the lower the efficiency. Therefore, United Bank is said to attain least intermediation efficiency. CBE (Commercial Bank of Ethiopia) has the lowest mean rank implying the lowest NIM and is thus the most efficient bank with respect to intermediation efficiency. Perhaps this could be thought of in terms of the fact that banks having large size have better efficiency results.

Table 5: Kruskal Wallis test-Mean Rank

	Commercial Banks in Ethiopia	N	Mean Rank
Net Interest Margin	Commercial Bank of Ethiopia	18	25.39
	Dashen Bank	18	38.67
	Awash Bank	18	43.44
	Bank of Abyssinia	18	70.28
	Wegagen Bank	18	72.89
	United Bank	18	110.28
	Nib International Bank	18	83.56
	Total	126	

Source: Author's computation from annual financial reports of commercial banks

The null hypothesis is that the distributions net interest margin is the same across categories of commercial banks in Ethiopia. To test this, the Kruskal Wallis test has been conducted and presented in table 6. The table therefore shows that there is statistically significant mean difference in NIM among commercial banks in Ethiopia, implying the existence of intermediation efficiency difference among commercial banking in Ethiopia(p-value=0.000).

Table 6: Test Statistics of Kruskal Wallis

TableTest Statistics ^{a,b}	
	Net Interest Margin
Chi-Square	70.135
df	6
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: Commercial Banks in Ethiopia	

Source: Author's computation from annual financial reports of commercial banks

Table 7: Pair wise mean comparison of NIM for commercial banks in Ethiopia

Each node shows the sample average rank of Commercial Banks in Ethiopia.

Sample1-Sample2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj.Sig.
Commercial Bank of Ethiopia-Dashen Bank	-13.278	12.172	-1.091	.275	1.000
Commercial Bank of Ethiopia-Awash Bank	-18.056	12.172	-1.483	.138	1.000
Commercial Bank of Ethiopia-Bank of Abissynia	-44.889	12.172	-3.688	.000	.005
Commercial Bank of Ethiopia-Wegagen Bank	-47.500	12.172	-3.902	.000	.002
Commercial Bank of Ethiopia-Nib International Bank	-58.167	12.172	-4.779	.000	.000
Commercial Bank of Ethiopia-United Bank	-84.889	12.172	-6.974	.000	.000
Dashen Bank-Awash Bank	-4.778	12.172	-.393	.695	1.000
Dashen Bank-Bank of Abissynia	-31.611	12.172	-2.597	.009	.198
Dashen Bank-Wegagen Bank	-34.222	12.172	-2.811	.005	.104
Dashen Bank-Nib International Bank	-44.889	12.172	-3.688	.000	.005
Dashen Bank-United Bank	-71.611	12.172	-5.883	.000	.000
Awash Bank-Bank of Abissynia	-26.833	12.172	-2.204	.027	.577
Awash Bank-Wegagen Bank	-29.444	12.172	-2.419	.016	.327
Awash Bank-Nib International Bank	-40.111	12.172	-3.295	.001	.021
Awash Bank-United Bank	-66.833	12.172	-5.491	.000	.000
Bank of Abissynia-Wegagen Bank	-2.611	12.172	-.215	.830	1.000
Bank of Abissynia-Nib International Bank	-13.278	12.172	-1.091	.275	1.000
Bank of Abissynia-United Bank	-40.000	12.172	-3.286	.001	.021
Wegagen Bank-Nib International Bank	-10.667	12.172	-.876	.381	1.000
Wegagen Bank-United Bank	-37.389	12.172	-3.072	.002	.045
Nib International Bank-United Bank	26.722	12.172	2.195	.028	.591

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

Mean plot of NIM of commercial Banks in Ethiopia:

The pictorial presentation in figure on appendix-2 shows that there is dramatic difference in the mean of NIM for commercial banks in Ethiopia, which ranges between 3.1% for Commercial Bank of Ethiopia to 8.6% for United Bank. This indicates that there is a significant variation in terms of intermediation efficiency in Ethiopian commercial banking industry.

DISCUSSIONS:

The test statistics of Kruskal Wallis shows that there is statistically significant mean difference among commercial banks in Ethiopia with respect to NIM. The question here is which bank significantly varies from which bank. To answer this question, the pair wise mean comparison has been done as indicated in **table 7**. Accordingly, Commercial Bank of Ethiopia (CBE) has lowest mean value of all other commercial banks, particularly, the mean score NIM of commercial bank of Ethiopia has statistically significant difference from that of Bank of Abyssinia, Wegagen Bank, Nib International Bank and United Bank. Moreover, the mean value of NIM of both Dashen Bank and Awash International bank is significantly lower than that of both Nib

International Bank and United Bank; the mean score of NIM of both Bank of Abyssinia and Wegagen bank is significantly lower than United Bank. The fact that Commercial bank of Ethiopia is more efficient could be attributed to its size. For instance, the average relative, total assets owed, proxy of bank size of commercial bank of Ethiopia (CBE) is about 72% of the total banks sampled and that of United bank, which is least efficient is about 3.7%. The result of study at hand is consistent with the result of previous studies. For Instance, Andries(2011) as per the argument of Drake(2001) contends that the higher the bank size, measured by total assets the higher will be the technical efficiency though the optimum size is a matter of argument. In fact, the bank size-efficiency nexus is subject to unresolved arguments as the empirical results are mixed. Bautista Mesa, Molina Sánchez, & Ramírez Sobrino (2014) suggest a positive relationship exists between banking efficiency and the size of the bank, only for small and medium-sized banks and the relationship is insignificant for large banks. A traditional argument used also justifies that the bank with higher concentration are supposed to show greater efficiency

CONCLUSION:

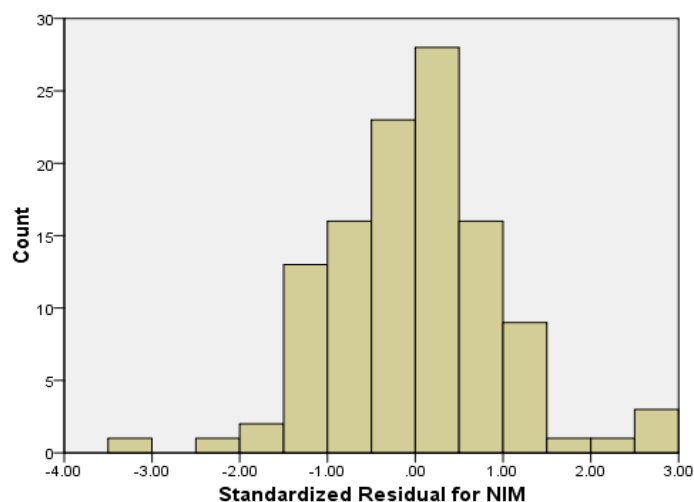
The study under consideration shows that intermediation efficiency of commercial banks at sector level, using banking spread interest rate shows there is significant fluctuations during 1990 to 2000 and only slight fluctuations afterwards (2001 to 2017). It has been observed that these fluctuations are artificial as government sets interest rates and the rates are not market based. There is significant intermediation efficiency difference among commercial banks in Ethiopia where the government owned commercial bank, which is Commercial Bank of Ethiopia (CBE) has the lowest average NIM, and hence most efficient bank with respect to intermediation efficiency. This could be attributed to its large size, as it controls about 72% of the total banks sampled for this study. In line with this, United Bank (UB) is least efficient and it has the lowest average size (3.7%) next to Nib International Bank in the sampled banks. This strengthens the argument that size has a positive implication on efficiency intermediation.

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APPENDIX-1

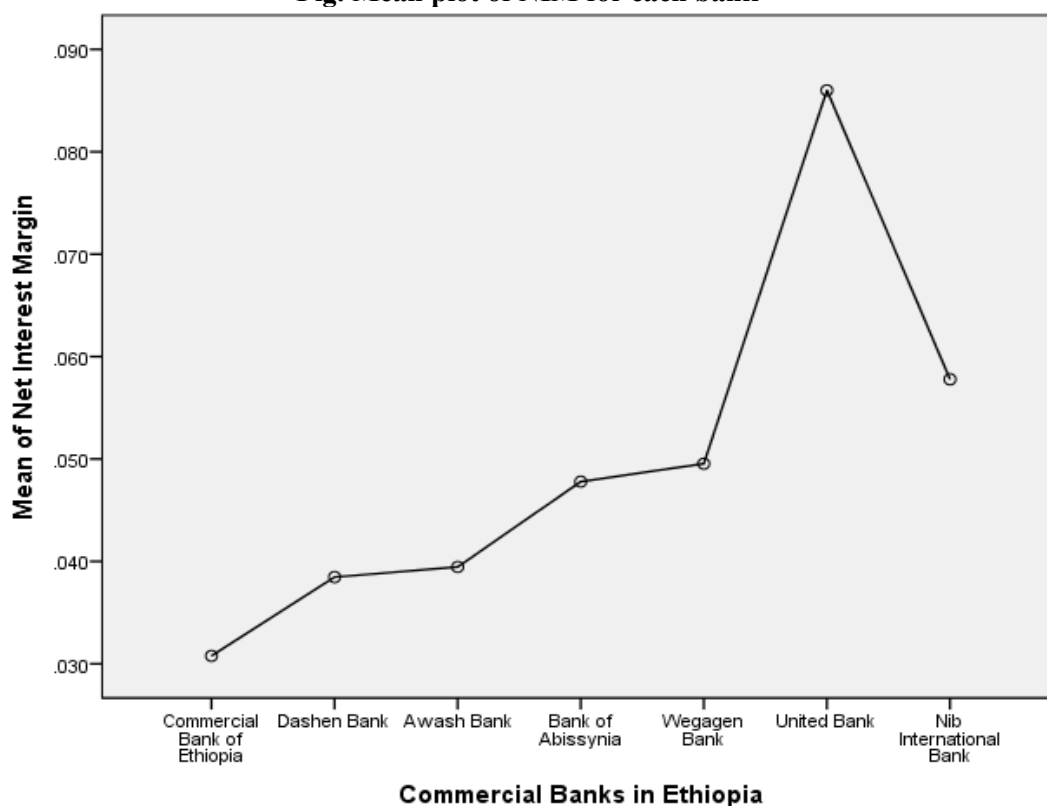
Fig. Histogram plot to check normality of NIM residual



Source: Author's computation from annual financial reports of commercial banks

APPENDIX-2

Fig. Mean plot of NIM for each bank



Source: Author's computation from annual financial reports of commercial banks
