Modeling Determinants of Private Banks Profitability in Ethiopia

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Profitability of financial institutions play a vital role in determining the effectiveness and efficiency of the financial system globally and it is dominated by the banking industry. These banks generates profits that results panel data that requires panel model to analyze and explore determinant factors associated with its profitability. The aim of this article to model determinants of private banks profitability in Ethiopia during 2012–2021 considering its dynamic nature. Return on assets, return on equity, and net interest margin were used as profitability indicators and analyzed using dynamic panel model estimation methods based on system generalized moment estimation techniques. The exploratory data analysis result showed the profitability; return on asset was seems stable while return on equity was decreased and net interest margin was increased with decreasing rate. The model specification result showed one-step system generalized moment method estimation was an appropriate estimation technique as model estimation result directs lagged profitability, capital adequacy, asset quality and branch of banks have positive significant effect on private banks profitability. Similarly inflation rate and economic growth rate have positively determine private banks profitability on macroeconomic side. Despite to this results liquidity was significant negative bank specific determinant of private banks profitability in Ethiopia. The study result recommends consideration on capital adequacy, asset quality, liquidity, branch of banks for the private banks profitability. In addition, this study will call upcoming research to include other financial determinants suggests such as credit risk and non-performing loan with improving the estimation method of panel autoregressive distributed lag models for modeling private banks profitability in Ethiopia.

***Key-Words**: Dynamic Panel Model, Ethiopia, Generalized Moment Method, Panel Data, Private Banks, Profitability*

1. INTRODUCTION

Background of the Study

Profitability is the ability to make profit from all the business activities of an organization. It indicates how efficient a company can earn a return from the use of its assets, capital and interest activities on a given investment (Fregenet, 2020). Financial institutions play a vital role in determining the effectiveness/efficiency of the financial system globally, since they are serving as a backbone in a state and also acts as a good facilitator for economic growth (Wesen and Beyene, 2019). Its power and improvement are key in providing services for sustainable economic prosperity; and widely believed that the financial system is highly dependent on the banking industry as banks are an indispensable financial sector (Ebrahimi *et al.,* 2021).

Profitability of the banks was given due attention after the great economic depression experienced in the USA in the 1940s. The recent Global Financial Crisis (GFC) at 2007-2009 verified the role of banks profitability in national and global economies that needs to keep under surveillance at all times and also the banking system is the direct victim of this crisis. Banks take the lion's share of the value of assets of global financial institutions. As in 2010, and 2020 the banks assumed 45.4%, and 38.75% of the total assets of global financial institutions respectively. In the last three decades, banks on average hold 42.75% of the asset of global financial institutions with an estimated value of over 150 trillion dollars (Yitbarek, 2021). Globally efficiency of banks at 2016, 2017 and 2018 were 54.55%, 53.15% and 52.1% respectively (Bellens *et al*., 2020). The profitability of several European banks is low, this becomes a constant feature of the financial crisis, it reflects various factors that vary across countries and banks these is consequence and cause of the weak economic situation. Private Banks profitability at Sub-Saharan Africa (SSA) has been characterized by low levels of private credit, high levels of non-performing loans, poor asset quality, and operational inefficiencies, among others (Francis, 2013).

The Ethiopian financial system consists of the National Bank of Ethiopia (NBE) responsible to regulate the whole financial institution; banks (public & private), insurance companies (public & private), savings and credit co-operation institutions and micro-finance organizations. Private banking industry involvement started after the Monetary and Banking Proclamation (MBP) No. 83/1994 of NBE. The access of capital banking sector in Ethiopia at 2020/21 reviewed as the private banking industry enjoyed high growth, and dividends, even in the middle of challenging situation all key areas of banking operations like collecting deposits, providing loans showed growth of more than 20%, profits were up 45% and total capital of banking industry increased by 36.2% and reached birr 153.7 billion birr. Generally, even if Ethiopian banks looks like profitable, lack of competition, limited number of branches, poor asset quality, higher level of liquidity and others are clearly indicated that they are still not performing well and not attaining the maximum profit that they can achieve. Likewise due to increased pressure of globalization and parallel competition from non-banking financial sectors that also offer financial services; private banks constantly seek ways to remain profitable as profitable private banks, tend to be more innovative, can diversify their business well, reward its owners and contribute to income generation, and overall of an economy during payment of taxes (Odusanya *et al.*, 2018).

Due to the characteristics of dynamic micro panel data, basically firm data used in this article a GMM estimator suggested by Arellano and Bover (1995) was employed. As dynamic theory of profit was formulated by J.B. Clark in 1908 stated that profitability and the society are dynamic by nature. Actually, a society is said to be dynamic when there is a change in its population, change in trends of the people, change in the stock of the capital, change in the supply of entrepreneur's, thus dynamic panel model is the right method to model this problem (Yonas, 2022).

Statement of the Problem and study objective

Private financial sectors are key's in the economy of developing countries like Ethiopia. Banks are the major player in finance and economic growth; because there is a large economic imbalance among firms and households. Banks face several risks during the operation affects their performance internally and externally ultimately threatens their profitability where no capital market exists and they are the leading financial institution in Ethiopia and like countries (Zemenu, 2021). In these developing countries, all the financial systems are dominated by the banking industry where there is no foreign bank involvement; the financial markets leave to only domestic private and public (state-owned) banks which are highly connected with each other for payment system or various functions (Worku, 2017). Thus the failure of one of the banks not only affects its shareholders and depositors/customers but also affects the performance of others and also overall business activity. However some scholar's like (Alem, 2017; Selamawit, 2018, Ashenafi, 2020, Haimiro, 2021) focused on single private banks profitability indicators and identified only bank-specific determinants of profitability. Conversely, it needs to identify the profitability determinants of private banks at a time on both bank-specific and macroeconomic factors as macroeconomic variables significantly affect private banks profitability in SSA like Ethiopia (Tesfaye, 2013).

To address the bank profitability problems and their determinants previously several studies applied linear regression model and static panel model estimations; Pooled Ordinary Least Square and Fixed Effect or Random Effect methods. However these methods explain profitability at a point of time and not consider the dynamic nature of profitability. Instead, dynamic panel models reflect dynamic features of profitability coherent with society and it use endogenous regressor that most scholars fail to consider but one-period lagged was determines profitability (Shahidul and Shin-Ichi, 2015; Al-Homaidi *et al*., 2018; Yitbarek, 2021 and Yonas, 2022). There are several studies that have been conducted like (Fentaw, 2016; Buzayehu *et al.*, 2020, Haimiro, 2021) on private banks profitability in Ethiopia most of them take return on asset, return on equity or both as an indicator of banks profitability i.e. they measure the performance of banks respect to asset and equity/shareholders net capital only, they left the interest part of profit. However the main source of profit at private banks are interest income measured by NIM (Net Interest Margin) (Yao *et al*., 2018). As a result, this study take ROA (Return on Asset), ROE (Return on Equity) and NIM to analyze private banks profitability determinants and those researchers were gaps such like test of stationary, exploration data analysis and model diagnosis checking. Therefore all the missing points would be performed properly and dynamic panel model estimation

technique would be used throughout the study.

The main objective of this study was to model determinants of private banks profitability in Ethiopia. Additionally the study aims to make model specification and comparisons among dynamic panel data model estimation techniques and assess the effect of dynamic nature of private banks profitability in Ethiopia.

2. LITERATURE REVIEW

The leading financial institutions operating in Ethiopia are banks (public or private), insurance companies, and micro-finance institutions in that order. Currently, the Ethiopian financial system consists of 3 public and over 16 private banks with 7344 total number of branches, 1 public and 17 private insurance companies, 39 micro-finance institutions, and over 8200 saving and credit cooperatives (NBE, 2020/21). The financial system in Ethiopia is determined by banks where the banking industry account for around 88.33% of the total capital of the financial sector in 2018, its total capital extended to Birr 85.5 billion (Wesen and Beyene, 2019). The major task of the financial institution like banks is not only to shift funds from the depositor (surplus zones) to needy spaces but also to make sure that funds are being transferred to the sectors which are most essential for the economy and their profitability particularly banks are vital for employment and growth as the sound banking system is better to improve monetary (financial) stability and makes the economy more manageable to negative and external shocks (Tadesse and Enyew, 2019).

Determinants of profitability of banks in Ethiopia during 2008-2019 period, application of dynamic panel model; system GMM estimation technique was employed. The result of finding was indicated that lagged endogenous regressor, capital adequacy and annual GDP growth rate were positively determine private banks profitability (Yonas, 2022). Investigation on macroeconomic and firm-specific determinants of bank performance at Ethiopian private banks from 2011 to 2020 on fourteen private banks with application of system GMM estimation method of dynamic panel model conclude that the lagged ROA significant positive effect on private banks profitability (Yitbarek, 2021). However these authors find private banks profitability determinates on ROA only, they left the shareholders equity (net capital) and net interest income, but those profitability indicators were interrelated and also considered as the same time.

Findings on private banks profitability in Ethiopia were diverse most of investigators apply linear regression model, and static panel estimation; FEM/REM, model selection was based on Hausman test statistic. According to Melaku (2016) determinants of profitability at Ethiopian private banks during 2004 to 2011, FEM was appropriate over REM based on the Hausman specification test, which conclude that asset size, capitalization, labor productivity were significant positively related to private bank's profitability, and macroeconomic factors like GDP growth rate and inflation rate were inversely determine private banks profitability. Determinates of private banks profitability in Ethiopia during 2007-2016 with application of REM on panel data indicated capital adequacy was significant positive influence on profitability (Tadesse and Enyew, 2019). Based on Alem (2017) capital adequacy was positive determinant of profitability through FEM during 2000-2014. Investigation of bank-specific factors on profitability of private banks during

2011-2017 shows capital adequacy also again significantly positive effect while liquidity of the bank was negative determinant with multiple linear regression analysis (Abdu, 2018; Bekalu and Abel, 2017). As Gemechu (2016) examine the effect of bank-specific, and macroeconomic determinants of private banks' profitability in Ethiopia at the period 2002-2012 using OLS estimation method conclude, asset quality has a significant positive impact on profitability. Robel (2017) also verify this finding on private banks profitability during the 2005-2016 in Ethiopia.

On the macroeconomic aspect, GDP growth rate was statistically significant positive determinant of private banks profitability during 2000-2017 (Buzayehu *et al*., 2020). Inflation rate also significantly positive determinant (Tesfaye, 2014) i.e. as the economy inflates; price increase more currency with fewer commodities on the market banks spend more loan to the customers also received high interest in turn. Thus any of scholars do not estimate private banks profitability in Ethiopia through dynamic panel model estimation techniques except Yonas (2022). He examine the dynamic panel model with only singe profitability indicator (ROA). However it needs to identify all relevant indicators of profitability on both bank specific and macroeconomic determinants, this methodological gap would be achieved by this study.

Panel data were analyzed with many statistical/econometrical models like multiple linear regression, static panel model (Robel, 2017); Pooled OLS, FE/RE estimations, dynamic panel model, and Panel Autoregressive Distributed Lag (PARDL) models. Pooled OLS model applied to the profitability of banks with its determinants by removing the individual heterogeneity, and FE or RE were performed to measure the performance of banks by considering the heterogeneity across individual subjects, with Hausman test of specification (Moges, 2017; Bakkeri and Ali, 2020; Haimiro, 2021; Yakubu and Egopija, 2021). However these estimation techniques cannot consider the dynamic nature of profitability rational with the society and also when the lagged endogenous variable (lag of dependent variable) included as explanatory variable, static panel estimation becomes biased and inconsistent through Pooled OLS, FE/RE estimation techniques' for violation of strict exogeneity assumption of regressors. At these moment another panel data method is appropriate and more relevant for the underlined problem which so-called dynamic panel model. Accordingly, profitability is investigated through dynamic panel model to deal with the dynamic nature and the effect of lagged endogenous variable that used as a regressor. This estimation method was familiar in Europe, Asian and SSA countries on private banks profitability. It needs more advanced techniques than static panel one, as lagged endogenous regressors correlated with the error term. Therefore introducing first difference and system GMM estimation through valid IVs; Arellano and Bond (1991) and Blundell and Bond (1998) estimation methods respectively were significant (Isik and Tasign, 2017; Yuksel, 2018).

If the study involved to deal with the short or long term relationship among profitability indicator variables and their determinants, when not only the lagged dependent variable but also the lagged independent variables are included as a regressor, PARDL model is appropriate. As Banda (2021) revealed that determinants of private banks' performance in Malawi with application of PARDL model. Pokharel

(2020) also analyze the effect of loan growth in three performance aspects; profitability, stock return, and credit risk of Nepalese private banks from 2012-2019. Based on Teshager (2021) and Samuel (2021) determinant factors of Ethiopian financial sector development such like banks apply the PARDL approach. According to Banapon and Yotenka (2020) vector autoregressive modeling (VEC estimation technique) of profitability sharia rural bank in Indonesia from 2013 to 2019 shows that non-performing finance and ROE has a negative and positive effect on profitability respectively. However PARDL needs long period panel data while Ethiopian private banks started to operate since 2002, it have 20 years history and also all of these private banks cannot operate at the same time. Therefore these facts were draw back to carry out PARDL estimation method. To sum up viewing all relevant and related studies the current study employed dynamic panel model estimation method to model the determinants of private banks profitability in Ethiopia.

3. METHODOLOGY

This study was conducted in Ethiopia based on private banks from 2012 to 2021 G.C. These private banks includes Awash International Bank, Dashen Bank, Abyssinia Bank, Wegagen Bank, United Bank, Nib International Bank, Cooperative Bank of Oromia, Lion International Bank, Oromia International Bank, Zemen Bank, Buna International Bank, Birhan International Bank, Abay Bank, Addis International Banks (NBE, 2020). The study utilized secondary panel data obtained from NBE. Regarding the sources of the data bank-specific determinants are collected from the banks financial statements (balance sheet statement and income statement) annually.

Dependent Variables

Bank profitability is measured by ROA, ROE, and NIM. Profitability is represented by the ratio of net profits to assets and net profits to equity or to shareholders capital. However the analysis in this study would be based on ROA, ROE and NIM.

Data Analysis

In this study test stationary, dynamic panel specification methods (rule of thumb) to come up with an appropriate linear dynamic panel model estimation techniques (first differenced or system GMM), and model diagnosis checking were performed.

Dynamic Panel Modeling

Dynamic panel model is the one step extension of static panel model by including lagged endogenous variable as a regressors in the model; is used to measure the persistence of profits, i.e., the extent to which a bank remains in the same profit distribution, then endogeneity problem would be in the model. For this endogeneity problems, the GMM estimator uses lagged values of the dependent variables (in levels or/ and first differences) and lagged values of other regressors which potentially suffer from endogeneity as instruments.

$$y_{it} = \mu + \rho y_{i,t-1} + x_{it}{}^{T}\beta + \alpha_i + \varepsilon_{it}$$

y_{it} is the dependent variable (private banks profitability) on i^{th} cross-section (bank) at time t, $y_{i,t-1}$ is the lagged endogenous regressors, x_{it} is row vector of explanatory variables (strictly exogenous regressors), α_i is individual specific effects are assumed to be uncorrelated across individuals $E(\alpha_i, \alpha_j) = 0, \forall i \neq j$ and with the disturbance of any individual at all leads and

lags $E(\alpha_i, \varepsilon_{jt}) = 0, \forall i, j, t$, and ε_{it} normally distributed with zero mean, constant variance, and also uncorrelated across time and individuals, ρ represents the degree of persistence in the dependent variable, it is unknown parameter of the lagged endogenous variable (auto-regressive coefficient): |ρ|<1, and β unknown parameter vector of the k explanatory variables, α_i and ε_{it} are assumed to be independent for each i over all t . Dynamic panel model is characterized by two sources of persistence over time; autocorrelation due to the presence of lagged endogenous variable among the regressors, and individual effects characterizing the heterogeneity among the individuals. Therefore there are two main issues to deal when estimating a dynamic panel model: presence of endogenous covariates, and the small time-series and cross-sectional dimensions of the typical data set. Specifically, y_{it} is the function of α_i, $y_{i,t-1}$ also a function of α_i, this can be seen from the fact that $y_{it-1} = \alpha_i + \rho y_{i,t-2} + x_{it-1}{}^T \beta + \varepsilon_{it-1}$, it implies that $y_{i,t-1}$ is correlated with the error term in the equation 3.2 this renders OLS estimator biased and inconsistent even if ε_{it} is not serially correlated, in other words as $y_{i,t-1}$ is correlated with α_i because, it is a function of α_i, OLS and GLS estimators are biased and inconsistent, FE within group estimators are also biased and inconsistent because in the transformed model when using variable deviations from mean the independent variable would be endogenous (Branas-Garza *et al*., 2011).

Model Specification

Rule of thumb I: Blundell and Bond (1998)

If the lagged endogenous variable in the initial equation was persistent and close to being a random walk (non-stationary series), $\rho \geq 1$, then the application of first difference GMM yields both a biased and inefficient estimates of ρ in finite sample, this is particularly serious when T is short. Blundell and Bond (1998) attribute the poor performance of difference GMM estimators in such case the use of poor instruments. To address this a system GMM estimation techniques is most appropriate (Bosede, 2020)

Rule of thumb II: Bond (2001)

The dynamic panel model $y_{it} = \mu + \rho y_{i,t-1} + x_{it}{}^T \beta + \alpha_i + \varepsilon_{it}$ the auto-regressive coefficient should be initially estimate by pooled OLS (ρ considered estimate biased upwards) and FE (ρ considered estimate biased downwards) approach; to be precise, pooled OLS and FE estimate should be considered as upper bound and lower bound estimate for AR estimate (ρ) respectively. if the first difference GMM estimate obtained ρ value is close to or below the FE estimate, then difference GMM estimate is downward biased because of weak instrumentation then system GMM estimator should be preferred instead (Bosede, 2020).

Model Estimation

Generalized Method of Moment

Consider the dynamic panel data model: $y_{it} = \mu + \rho y_{i,t-1} + x_{it}{}^T \beta + \alpha_i + \varepsilon_{it}$, By construction, the lagged dependent variables are correlated with the unobserved panel-level effects, making standard estimators inconsistent. Arellano and Bond (1991) derived a consistent GMM estimator for this model. With many panels and few

periods, the Arellano–Bond estimator is constructed by first-differencing to remove the panel-level effects and using instruments to form moment conditions. Blundell and Bond (1998) show that the lagged-level instruments in the Arellano–Bond estimator become weak as the AR process becomes too persistent or the ratio of the variance of the panel-level effects α_i to the variance of the idiosyncratic error becomes too large. Building on the work of Arellano and Bover, Blundell and Bond proposed a system GMM estimator that uses IVs in which lagged differences are used as instruments for the level equation in addition to the moment conditions of lagged levels as instruments for the difference equation. The additional moment conditions are valid only if the initial condition $E(\alpha_i \Delta y_{i2}) = 0$ holds for all subjects. The popularity of the first differenced and system GMM estimators for DPD has grown rapidly in recent years. The reasons are several; estimators handle important modeling concerns, FE and endogeneity of regressors while avoiding dynamic panel bias (Nickell bias), and a flexible GMM framework accommodates unbalanced panels and multiple endogenous variables (Roodman, 2007).

System GMM Estimator (Arellano and Bover (1995) and Blundell and Bond (1998))

System GMM augments difference GMM by estimating simultaneously in differences and levels, the two equations being distinctly instrumented, one equation is expressed in first difference form with levels as instruments and second equation is expressed as in levels form with first difference as instruments; to perform system GMM, a stacked data set is built out of a copy of the original data set in levels and differences (Roodman, 2007). To improve the properties of the first differenced GMM by Arellano and Bond (1991), Blundell and Bond (1998) suggest making use of additional level information besides the differences. The combination of moment restrictions for differences and levels results in an estimator which was called GMM system-estimator by Arellano and Bond (Behr, 2003). One main reason for their popularity in empirical research is that the GMM estimation approach may provide asymptotically efficient inference employing a relatively minimal set of statistical assumptions (Bun and Sarafidis, 2015). System GMM estimator exploits a new set of instruments while retaining the original set for the differenced equation (Youssef *et al*., 2014 and Mertens, 2017).

Blundell and bond (1998) suggest "a system GMM" estimator that stacks the model "in levels" and that in "first difference" generalized method of moment equation is written as follows:

$$\begin{pmatrix} \Delta y_{it} \\ y_{it} \end{pmatrix} = \delta \begin{pmatrix} \Delta y_{i,t-1} \\ y_{i,t-1} \end{pmatrix} + \begin{pmatrix} \Delta x'_{it} \\ x'_{it} \end{pmatrix} \beta + \begin{pmatrix} \Delta \varepsilon_{it} \\ \alpha_i + \varepsilon_{it} \end{pmatrix}$$

$$\hat{\theta}^{S1}(\hat{\rho}, \hat{\beta}) = ((Y_{-1}, X^+)' Z^+ W^+{}_N Z^+{}' Y_{-1}, X^+)^{-1} ((Y_{-1}, X^+)' Z^+ W^+{}_N Z^+{}' Y_i^+)$$

$\Delta\hat{\varepsilon} = Y - X\hat{\theta}^{S1}(\hat{\rho}, \hat{\beta})$, where G^D and G^L are operator matrix of first difference and level equations respectively.

The residuals $\Delta\hat{\varepsilon}$ are used in the two step for calculating the optimal weighting matrix, $W^{Opt}{}_N = (Z' \Delta\hat{\varepsilon} \Delta\hat{\varepsilon}' Z)$, therefore the two step system GMM estimator written as follows:

$$\hat{\theta}^{S2}(\hat{\rho}, \hat{\beta})' = [\left(X^+{}_i'\right)\left(Z^+ W^{+Opt}{}_N Z^+{}'\right)\left(X^+{}_i\right)]^{-1} [\left(X^+{}_i'\right)\left(Z^+ W^{+Opt}{}_N Z^+{}'\right)\left(Y_i^+\right)]$$

Model Diagnosis

Test of over Identification Restrictions and Absence of Serial Correlation in Error Term

Standard test for testing the validity of moment conditions used in the GMM estimation procedure is Sargan (1958) test of identifying restriction and Hansen (1982) shown test for the assumption about the absence of any (asymptotic) correlation between the instrumental variables and the disturbances. Sargan/Hansen tests are applicable when more candidate external instruments are available than the regression has potentially endogenous explanatories, and they just test the over identifying restrictions (Kiviet and Kripfganz, 2021). The statistic for testing the validity of moment condition/instruments used in the GMM estimation procedure in Sargan test of overidentifying restrictions and the development for GMM in Hansen, tests the null hypothesis of overall validity of the instruments used (overidentifying restriction are valid). For the GMM estimator in the first differenced model Sargan test statistic given by: $Sar_d = \frac{1}{N}\Delta\hat{u}' Z_d W_N Z_d' \hat{u} \sim \chi^2{}_{p-k}$, where $\hat{u}$ is two step residual in the differenced model, Z_d is matrix of IVs, W_N is optimal weighted matrix, p is the number of IVs and k is the number of estimated parameters (Blundell *et al*., 2001). Thus Hansen (1982) test will develop that tests weather all restriction imposed by the model are jointly satisfied (Wondesen and Fekadu, 2019). Hansen test assumes on the null hypothesis of joint validity of all the identifying restriction, test statistic written as $J = (\frac{1}{N}\sum Z_i \varepsilon_i)' W^{Opt} (\frac{1}{N}\sum Z_i \varepsilon_i) \sim \chi^2{}_{L-K}$, where L is the number of column of IV matrix Z_i. If the null hypothesis is rejected (joint validity of all the identifying restrictions), the specification of the model is not valid, as the observation in the sample don't suit to all the moment restriction jointly or instruments don't satisfy the orthogonally conditions required for them to be valid. If the null hypothesis of joint validity of the over-identifying restrictions cannot reject for the one-stage GMM estimator, this suggests that the model is correctly specified. Hansen excluding group were examines the validity of the model without the specified set of instruments and the difference in Hansen exogeneity test examines the validity of the specified set of instruments by computing the difference between the validity of the model with and without the specified set of instruments (Kripfganz and Schwarz, 2019).

The existence of serial correlation in the error term would typically overthrow the use of lagged values and first differences of the endogenous variable as instruments. So, it is crucial to test for such serial correlation, Arellano–Bond (1991) test for serial correlation in the first-differenced errors. The moment conditions are valid only if there is no serial correlation in the idiosyncratic errors. Because the first difference of independent and identically distributed idiosyncratic errors would be auto-correlated, rejecting the null hypothesis of no serial correlation at order one in the first-differenced errors does not imply that the model is misspecified. Failure to reject the null hypothesis of no second order serial correlation implies that the original error term is serially uncorrelated and moment condition are correctly specified despite the fact that rejecting the null hypothesis at higher orders implies that the moment conditions/IVs are not valid.

4. RESULTS AND DISCUSSION

Table 4.1 revealed that the summary statistics of the variables considered in the study. The result depicted that the average ROA, ROE and NIM was estimated 2.88%,

20.51% and 5.43% with standard deviation of 0.78, 6.37 and 1.46 respectively. Similarly, average lagged endogenous regressors was estimated -0.094, -0.34, and 0.12 with standard deviation of 0.71, 5.56 and 1.01 for ROA, ROE and NIM respectively. In addition, estimated average values of capital adequacy was 14.48% with variability of 4.10, and that of liquidity and asset quality were 50.94% and 76.66% with standard deviation of 7.88 and 5.65 respectively and that of macroeconomic variables GDP and inflation rate were estimated 8.65 and 14.78 with standard deviation of 1.52 and 7.84 respectively. To know the distribution of the data, the skewness result indicated that almost all the included variables lies between -0.5 and 0.5, showing the data was normally distributed.

Table 1: Summary statistics of private banks profitability in Ethiopia

Variables	Min	Max	Mean	Std. dev.	Skwnss
ROA	0.0	5.13	2.8	0.78	0.84
ROE	3.0	41.1	20.5	6.37	0.00
NIM	1.8	8.79	5.43	1.46	0.99
Capital	7.8	38.24	14.5	4.10	0.00
Asset Quality	32.4	72.6	50.9	7.88	0.11
Liquidity	49.8	86.7	76	5.65	0.00
Branch	5	675	181	142	0.00
Size (Ln. asset)	6.05	11.7	9.45	1.08	0.02
GDP	6.10	10.4	8.65	1.52	0.03
Infl.	7.40	34.1	14.78	7.84	0.00

Exploratory Data Analysis

To explore the average change over a time, the average values computed at each year separately and connected for balanced data. The result showed that it was low at the beginning, the time of introducing of the banks and increased through time specifically ANIM was increased with decreasing rate in case the income of banks on interest activities increase since customer deposit and loan of the banks increases whereas ROAA and ROAE revealed that decreased within small variation, this shows the main source of profit of banks were interest income (Figure 2).

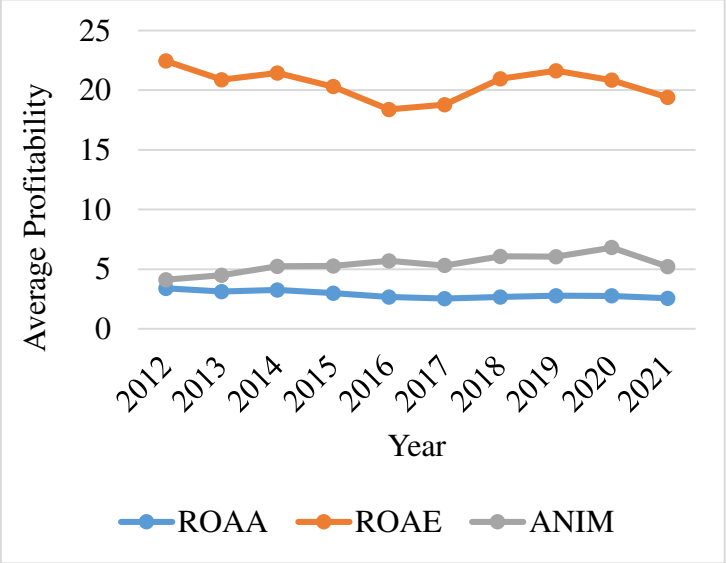

Figure 2: Average profitability of Ethiopian private banks profitability

Test of Stationary

LLC test of stationary shows ROA, ROE, NIM, and lagged endogenous regressors, and capital adequacy are stationary at level whereas others were non-stationary at this level. Then, after first differencing asset quality, liquidity, size of the banks, and inflation rate achieved stationary while branch of the banks, age of the banks, and GDP growth rate are not at first difference and they achieved stationarity based on log transformation (Table 2).

Table 2: Levin Lin and Chu Test of Stationary of Private Banks Profitability Determinants

Model Specification

As shown in Table 3, lagged endogenous regressor estimated of profitability indicators at both one and two step first

Variables	P-values			Test statistic (t-statistic)	
	At level	At first difference	At log transformation	Unadjusted t	Adjusted t
ROA	0.000	-	-	-8.59	-5.36
ROE	0.000	-	-	-9.44	-5.13
NIM	0.000	-	-	-7.65	-3.89
Capital Adequacy	0.006	-	-	-5.81	-2.53
Asset Quality	0.513	0.000	-	-11.28	-7.13
Liquidity	0.205	0.003	-	-8.75	-2.70
Size of banks	0.365	0.002	-	-7.63	-2.81
Age of banks	0.999	0.752	0.000	-23.83	-24.47
Bank branches	0.998	0.053	0.000	-8.59	-7.70
GDP growth rate	1.000	0.922	0.000	-28.56	-11.85
Inflation rate	1.000	0.000	-	-28.26	-22.67

differenced GMM estimators are below the FE estimator (considered as lower bound estimate), therefore system GMM estimator is appropriate. For this moment first difference GMM is downward biased in case of weak instrumentation (poor IVs). Based on this model specification result, system GMM estimation technique was appropriate for parameter estimation of the overall model.

Table 3: Model Specification of Private Banks Profitability in Ethiopia

Estimation method	Prof. indicators		
	ROA	ROE	NIM
	AR parameter (P-value)	AR parameter (P-value)	AR parameter (P-value)
Pooled OLS	0.51 (0.000)	0.47 (0.000)	0.45 (0.000)
FE	0.50 (0.000)	0.42 (0.000)	0.36 (0.003)
Diff. GMM (one step)	0.37 (0.018)	0.32 (0.000)	-0.55 (0.004)
Diff.GMM (two step)	0.23 (0.575)	0.38 (0.000)	-0.37 (0.278)

Model Estimation: System Generalized Moment Method

System GMM was an appropriate estimation techniques for profitability of private banks as model specification result above presented. As shown in Table 4 the lagged endogenous regressors were significant positive effect on private banks profitability. The coefficients indicated that when the first lag profitability were improved by a unit the current profitability would rise by 0.39%, 0.35% and 0.26% with respect to banks total asset, shareholders' equity (net capital) and net interest income (income from interest activities) respectively. Bank specific regressors, capital adequacy of the banks (percentage ratio of net capital to total asset) have direct positive relationship with profitability with respect to asset (ROA; P-values 0.000) and interest margin (NIM; P-values 0.000) of the banks. Explicitly as the capital adequacy of the banks improved by a unit profitability respect to their asset and interest income will be rise by 7% and 26% respectively. Despite to this result capital adequacy have negatively determine ROE. These indicates

that as the bank has more asset (sum of liability and ownership equity) and net income, its profitability would rise but the net capital decline since it expended its capital in turn to receive improved interest income. In general capital adequacy have a positive determinant of profitability at Ethiopian private banks.

Asset quality (the percentage ratio of total loan and advances to total asset) has statistically significant positive effect on profitability of banks. This result indicated that the first lag of asset quality is directly related with profitability. As more loan the bank have, it would be more profitability in turn to its asset and net shareholders capital. The profitability indicators ROA and ROE will increase by 6.6% (P-values 0.001), 57% (P-values 0.004) as the asset quality of the banks enriched by a unit. However asset quality was insignificant determinant of NIM. Contrary, liquidity of the bank was statistically negative effect on ROA (P-values 0.01), ROE (P-values 0.006) on profitability. It shows as the bank more liquid (convert more of its asset in to cash within short period and also it is more liquid to the customers) its profitability would be reduced on its asset and shareholders capital. Therefore first lag of liquidity of private banks was negative determinant of profitability even if it was slightly positive relationship with NIM. The non-financial bank specific determinant such like branch of the banks positively determine the net interest margin and it have insignificant effect on ROA and ROE of the private bank. As a result the bank have an additional branches net interest income would be rise as it becomes more accessible for the customers. In view of that as the private banks have one additional branch their profitability would be increased by 1.44% in turn on interest activities. Accordingly the natural logarithm of branch of private banks was significant positive effect on their profitability. The other remain bank specific determinants such like age and size of the banks was insignificance effect on profitability of private banks in Ethiopia.

The macroeconomic determinants of profitability illustrated as the annual inflation rate was significant positive relationship with ROA (P-values 0.014) and NIM (P-values 0.001) but insignificance with ROE. This shows that as the economy inflate; price change (mostly increment) on commodities, private banks make spend their asset and capital for customers (may be companies, firms, households etc.). These leads to banks make more return on their asset and interest income would be increase. Consequently as the economy inflate a unit the bank profitability would be rise by 3.6% and 8.9% with respect to their total asset and net interest income. The annual economic growth rate (GDP) was statistically positive significant effects on NIM (P-values 0.004), while it was insignificant determinant of profitability on indicators, ROA and ROE. This implies as the economy indicate involvement the profitability (NIM) of private banks also improved.

Table 4: Model Parameter Estimation of
Private Banks Profitability in Ethiopia

Variables	Dependent variables								
	ROA			ROE			NIM		
	Coeff. (P-values)	Std. error (Z-value)	95% Conf. Inter.	Coeff (P-values)	Std. error (Z-value)	95% Conf. Inter.	Coeff (P-value)	Std. error (Z-value)	95% Conf. Inter.
Lag. ROA	0.39 (0.000)	0.05 (7.78)	(0.29, 0.49)	-	-	-	-	-	-
Lag. ROE	-	-	-	0.35 (0.000)	0.101 (3.46)	(0.15, 0.55)	-	-	-
Lag. NIM	-	-	-	-	-	-	0.26 (0.001)	0.076 (3.42)	(0.11, 0.41)
Capital adequacy	0.07 (0.000)	0.02 (3.50)	(0.036, 0.14)	-0.85 (0.011)	0.336 (-2.53)	(-1.51, -0.95)	0.26 (0.000)	0.035 (7.43)	(0.19, 0.33)
Asset quality	0.066 (0.001)	0.020 (3.30)	(0.026, 0.11)	0.57 (0.004)	0.20 (2.85)	(0.18, 0.97)	0.024 (0.192)	0.018 (1.33)	(-0.012, 0.06)
Liquidity	-0.063 (0.01)	0.024 (-2.63)	(-0.11, -0.015)	-0.67 (0.006)	0.24 (-2.79)	(-1.14, -0.19)	0.057 (0.008)	0.021 (2.71)	(0.014, 0.098)
Branch	-0.20 (0.11)	0.13 (-1.54)	(-0.45, 0.046)	-1.51 (0.137)	1.01 (-1.49)	(-3.50, 0.48)	1.44 (0.000)	0.136 (10.6)	(1.18, 1.71)
Inflation	0.036 (0.014)	0.15 (0.24)	(0.007, 0.066)	0.45 (0.055)	0.236 (1.92)	(-0.009, 0.915)	0.089 (0.001)	0.03 (2.97)	(0.034, 0.144)
GDP	0.154 (0.73)	0.44 (0.35)	(-0.71, 1.01)	-2.50 (0.74)	7.6 (-0.33)	(-17.38, 12.38)	1.52 (0.004)	0.53 (2.87)	(0.488, 2.56)
Constant	2.32 (0.075)	1.3 (1.78)	(-0.23, 4.87)	44.87, (0.047)	22.63 (1.98)	(0.53, 89.23)	-7.53 (0.000)	1.76 (-4.27)	(-10.98, -4.08)

Model Diagnosis Checking

The model diagnosis checking tests were held for each the system GMM model after model estimation. As specified in Table 4.6 below, ACR (1); the first order serial correlation was significant with P- values 0.022, and 0.027 for the ROA, and ROE respectively. ACR (2); the second order serial correlation was insignificant (P-values were 0.092, 0.068 and 0.071 for each profitability indicators respectively).The result exhibited that don't reject the null hypothesis of no second order serial correlation that implies original error term is serially uncorrelated and the moment condition are correctly specified. Thus test statistics for second-order serial correlation of the models Arellano and Bond, shows there is no second order residuals correlations.

F-statistics have high for overall significance of the models, this directs the joint (overall) significance of the all variables included in the model. The over-identification restrictions or joint validity of instrumental variables need to be tested. The study followed the Sargan/ Hansen test statistics of over-identification restrictions, the result was shows fail to reject the null hypothesis claims that over-identification restrictions are valid and the result founds over-identification restrictions are valid in the model. Hansen test excluding group tests the null states the model is not valid without the included instruments, the result shows don't reject the hypothesis to be tested on both level and first difference. Similarly difference in Hansen exogeneity test fail to reject the null hypothesis of IVs are exogenous. From these results it can be conclude that the model is not valid without instruments and those instruments used in the model are exogenous respectively (Table 5).

Table 5: Model Diagnosis Checking of Private Banks Profitability in Ethiopia

Diagnosis Checking methods	Test statistic	ROA	ROE	NIM
		Test statistic (P-value)	Test statistic (P-value)	Test statistic (P-value)
Serial Auto-correlation test				
AB ACR(1)	Z	-2.27 (0.023)	-2.22 (0.027)	0.24 (0.812)
AB ACR(2)	Z	-1.77 (0.077)	-0.52 (0.602)	-1.73 (0.084)
Wald statistics	F	14109.32 (0.000)	17051.17 (0.000)	15627.76 (0.000)
Over-identification restriction test (joint validity of instruments used)				
Saragn test	χ^2 Statistic	9.13 (1.000)	0.16 (1.000)	4.47 (1.000)
Difference in Hansen test of exogenity of instrument subsets				
GMM instruments for "Levels"				
Hansen test excluding group	χ^2 Statistic	8.91 (0.999)	2.57 (1.000)	2.56 (1.000)
Difference in Hansen exogeneity test	χ^2 Statistic	0.23 (1.000)	-2.41 (1.000)	1.92 (0.964)
GMM instruments for Additional IVs for "First Difference"				
Hansen test excluding group	χ^2 Statistic	6.76 (1.000)	1.28 (1.000)	4.06 (1.000)
Difference in Hansen exogeneity test	χ^2 Statistic	2.37 (0.305)	-1.12 (1.000)	0.42 (0.981)

DISCUSSION

The main aim of this study was to model the determinants of profitability of private banks in Ethiopia. Before directly

proceeding to modeling part preliminary analysis was done using descriptive statistics and exploratory data analysis which helps to know the trend of profitability of Ethiopian private banks. These studies employed were multiple linear regression model and static panel models (Pooled OLS or FE/RE models). However, the current study was differ from those scholars with estimation techniques which employed dynamic panel data model with GMM estimation method. The observed ROE and NIM were good since they are above 15% and positive respectively, whereas ROA was low (below 5%) since asset is the sum of liability (to be paied for outsiders/ depositors may be firms, or households) and equity in case in turn on these asset will be lesser. Consequently, private banks was less return (profit) on their asset at the indicated time which is consistent with finding of Yakubu and Egopija (2021) at Nigeria during 2010-2017.

The profitability of private banks exhibited that the lagged endogenous variables (previous profitability) study through one-step system GMM estimation of dynamic panel model was statistically positive effect on the current profitability of private banks on profitability indicators (ROA, ROE and NIM), that confirmed the finding of Yonas (2022) and Yitbarek (2021). This result indicated the lagged values of profitability; return on asset, net interest margin, return on net capital of shareholders influence the current profitability (performance) of private banks. As summary of model estimation revealed that the bank specific determinants, asset quality have significant positive determinant of profitability this finding was stable with Gemechu (2016) and Robel (2017). It indicate as the asset quality rise, the bank obtain more interest income successively on the loan as per loan are a part of an asset. Capital adequacy also positive effect on private banks profitability showing a bank with a sound capital position can pursue business opportunities more effectively and has more time and flexibility to deal with problems arising from unexpected losses, thus achieving increased profitability, this result was reliable with Alem (2017); Tadesse and Enyew (2019); and Abdu (2018). Similarly, branch of the bank was positively affect profitability, as the bank increase its branch it become accessible to the customers corresponding profitability would rise, within the same way Moges (2017) was conclude.

In contrary, this study showed that liquidity of banks have statistically negative impact on the financial soundness (profitability or performance) of private banks of Ethiopia. The higher liquid the banks are the lesser their ability they generate profit (more liquid a bank is that the less profitable it might be) of course a bank should be liquid enough to meet its depositors' demand of withdrawing money at any time they need to withdraw, this is often according to finding of Bekalu and Abel (2017) and also Abdu (2018). The macroeconomic determinants rate of inflation and economic growth were positive determinants of profitability; inferred that the economy inflate (price increase, more cash with fewer commodities on the market) profitability of private banks would be rise and annual economic growth rate also directly related with profitability of private banks these is equivalent with result of Buzayehu *et al. (*2020).

The model diagnosis checking indicates the ACR (1) was significant and ACR (2) was insignificant. It tests the null hypothesis there is no second order serial correlation for the disturbance of the first difference equation and also the result don't reject the null it gives an evidence there is no second

order serial correlation on residuals. The calculated F-statistics was high value shows the overall significance of the variables included within the model. Test of joint validity of instruments by Saragan and Hansen tests assumes on the null hypothesis of joint validity of all the identifying restriction the result was indicated don't reject the null hypothesis. Therefore the joint validity identifying restriction indicated that instruments were valid and also those instruments were exogenous this explanation were consistent with Yonas (2022) at Ethiopian private banks.

CONCLUSION

The rationale for this study was to model the determinants of private banks profitability in Ethiopia. Balanced panel data on 14 private banks were analyzed with regard to secondary panel data based on dynamic panel model; system generalized moment method estimation method was employed. The stationary test was allotted using Levin, Lin and Chu panel unit root test. The null hypothesis of series have unit root was rejected for all series at level, first difference and log transformation, the test indicated absence of unit roots. The exploratory data analysis of the study implied that the private banks were getting profit successfully on their interest income activities relatively than its asset and net shareholders capital and also the observed ROE and NIM were good since they are above 15% and positive respectively, whereas ROA was low (below 5%).

The fitted model result appears evident that lagged profitability with respective parameters 0.39, 0.35 and 0.26 for ROA, ROE and NIM were significant positive effect on profitability of private banks in Ethiopia. The bank specific determinant, capital adequacy was positive determinant of profitability, this can be in line with the expectation as a bank build-up adequate capital. It able to pursue business opportunities more effectively and has longer and suppleness to provide problems arising from unexpected losses, thus achieving increased profitability. Asset quality was positive effect on profitability, asset quality increases implies an increment within the loan of the bank which successively rise the available profit of the bank.

Branch of banks (non-financial bank specific determinant variable) also have positive and statistically significant impact on the profitability of private banks. This positive relationship is suggesting that when number of private bank branches expand, there earning in terms of profit would be higher. Based on the result it conclude that banks are gaining from branch expansion and hence branch expansion strategy is successful in determining profitability. However, liquidity of banks was significant negative internal determinants whereas macroeconomic factors inflation rate and economic growth rate were positive determinants.

RECOMMENDATIONS

Based on the findings of the study, the following feasible recommendations were forwarded.

- Ethiopian private banks should consider the dynamic features and both bank specific (financial & non-financial) and macroeconomic determinants in their strategy design.
- Moreover, the liquidity of private banks should be managed wisely to obtain optimal amount of liquid assets to avoid its negative relationship with profitability as it has reverse movement with profitability.

- ❖ It is recommended that to the FDRE government established a monetary policy that allow for foreign financial investment to finance on Ethiopian private banking industry.
- ❖ In the area of profitability of financial institutions like banks, it is recommended to the future researcher shall conduct study by improving the estimation method such like Panel Auto-Regressive Distributed Lag model with Mean Group and Pooled Mean Group estimation techniques with including relevant bank specific determinants that are not included in this study (financial determinants such like non-performing loan, credit risk, interest rate and non-financial one like managerial quality, efficiency and productivity) and also macroeconomic variables like exchange rate later the problem is dynamic corresponding with the society.

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