# Attributing Sudanese Banks Profitability: An Overlooked Approach

Abuzar M. A. Eljelly
Department of Accounting and Financial Management
School of Management Studies,
University of Khartoum
Email:abuzarjelly@yahoo.com
a.eljelly@uofk.edu

***Abstracts**: This study attempts basically to decompose the profitability of the Sudanese banks for the period 2005-2010 by using the DuPont system of financial analysis which is based mainly on the analysis of return on equity (ROE). The return on equity model disaggregates performance into three main components: net profit margin, total asset turnover, and the equity multiplier. The trend analysis part of the study found that the shareholders' profitability as manifested by ROE is driven primarily by the net profit margin (PM), while the contribution of assets turnover and equity multiplier are not as much significant. The regression analysis reveals that the net profit margin is mostly the sole variable that impacts ROE, by an almost 1:1 basis. However, ROA is influenced by net profit margin and turnover, and bank size. Also net profit margin and turnover are positively and significantly related.The control variable, bank size is found to affect ROA, net profit margin and leverage in a positive and significant way, while affects turnover negatively. Business experience, as proxied by bank age has no influence over profitability components, except assets Turnover (efficiency measure) of the bank.*

**Keywords:** DuPont, Return on equity, Net profit margin, Equity multiplier, Asset utilization, Sudanese banks

## I. Introduction

In the wake of the world's financial crisis in 2008, banks found themselves at the center of attention of government regulators, as well as other stakeholders including investors. This is due mainly to the important role that banks in general could play in fostering the economic stability of the financial sector in particular and the economy at large. Hence, the soundness of the banking system and its performance are taking importance more than ever before. To help testing for banks performance and health, many performance measurement systems exist ranging from the most sophisticated risk metrics and stress testing models to the simple financial ratio analysis. This study falls under the simple analysis methods category. However, instead of

looking at individual financial ratios in isolation, it would be more useful if these ratios can be combined into a specific measurement system. Credit evaluation in the banking system and bankruptcy and distress prediction models are the most famous models that use financial ratios as systems. The second class of financial ratio models is the Du Pont system, although not so famous in the literature as the bankruptcy and credit evaluation models. Soliman (2004) emphasized this point by arguing that the Du Pont system is more famous in text books than in the academic research. Furthermore, a preliminary analysis of the core financial indicators gives a general picture of the banking sector performance and can highlight weaknesses which could be subjected to further analysis and examination.

Banks are a special type of financial institutions which are governed by regulatory frameworks that depend on the prevailing economic conditions in the country, and the objectives set for the banking sector. These special characteristics increase the number and range of interested parties in evaluating the performance of these institutions. No one comprehensive set of performance measures exist to meet the demand of all interested parties.

In general, surveying the literature on banks performance reveals that two approaches for performance measurement are generally used. The first one focuses on profit and cost X-efficiency frontiers, using mainly data envelopment analysis or stochastic frontier analysis. The second approach, however, examines the determinants of banks profitability, which is usually measured by return on assets, return on equity, and, in some cases, the non-interest margin. Most of these studies use accounting ratios and external economic variables as probable influencers on bank performance. This study falls under the second category, since the Du Pont system relies totally on financial and accounting ratios. However, it may indirectly belong to the first category, in that it tries to isolate efficiency of the bank, though in a rather different context.

As such this paper attempts to apply the DuPont system to decompose and identify sources of profitability of Sudanese banks and isolating the factors that affecting it. DuPont model makes detailed analysis of the return on equity and the factors that impact it. It allows outright detailed (component) comparison among firms and their industries as well as component trend analysis. On one hand, DuPont outweighs individual ratio analysis since it represents an integrated system, and on the other hand has advantage over the complex models since it is simple and the data for its inputs are readily available.

This paper is organized as follows. Section I introduces the study. Section II discusses the relevant literature review. Section III describes the data and methodology used in the study. Empirical results are then discussed in Section IV. In Section V the paper presents its conclusions and implications.

## II. Literature Review

### The Du Pont Model

The DuPont system for financial analysis is a system capable of decomposing financial performance of any firm, as reflected in retune on equity, into three major components:

1. Profits (or profitability),
2. Turnover (efficiency or effective use of assets), and
3. Leverage or equity multiplier (using debt to multiply profits and equity)

Although different extensions of the model exist in the literature, this basic format is capable in principle to achieve its objective of highlighting the sources of weaknesses and strengths in firm's performance. Since its introduction early last century, the DuPont model has been widely used by practitioners and analysts worldwide for financial analysis. However, the model has not realized similar success in the academic research and literature. As stated by Walker (2007) the main reasons for DuPont model continuous use lie in its ability to analyze the components that affect profitability and comparing them across similar firms or with industry averages, or its ability to discover trends in company's performance that are useful in isolating the sources of shifts in profitability. The DuPont model breaks ROE down into several components

- $ROE = ROA * EQU$ (1)
- $ROA = PM * TURN$ (2)

*Where:*

*ROE= Return on Equity (Net income/ shareholders equity)*

*ROA= Return on Assets (Net income / total assets)*

*EQU = Equity Multiplier (Total assets / total equity)*

*PM= Net Profit Margin (Net income / sales revenue)*

*TURN= Total Assets Turnover (Sales revenue / total assets)*

Combining the two equations yields:

ROE = (Net Income/Revenues) X (Revenues/Total Assets) X (Total Assets/ Equity) (3)

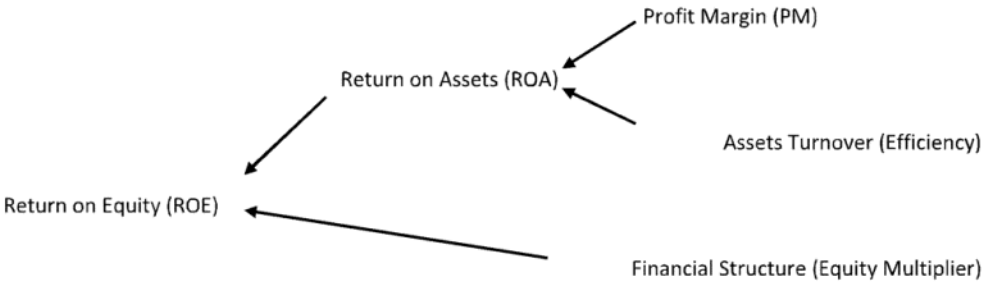
DuPont analysis, thus, takes into account three indicators to measure firm profitability: PM, ROA, and ROE.

***Net Income ratio*** – **PM** – measures how profitable a firm's revenue generating activities net of all expenses.

***Return on assets*** – **ROA** – measures the management effectiveness in utilizing its assets and resources entrusted to them to generate revenues. In the case of banks, assets include cash, loans portfolio, investments and less important are fixed assets.

***Return on equity*** – **ROE-** which is a ratio that reflects the return to owners of the firm. Figure (1) shows a graphic representation of the DuPont system:

**Figure (1): DuPont System**




**Previous Studies**

It is not uncommon to find wide spread use of individual measures of performance such as Return on assets (ROA), Return on Equity (ROE), and Interest margins (interest revenue - interest expense) or bank spreads (loans-spreads). They are used as measures of the performance of banks. Both ROA and ROE are considered more comprehensive measures of bank profitability as they include operational efficiency and loan loss provisioning and signal the earning capability of the entity (Bashir 1999, Alshammari and Salimi (1998), Greusning and Bratanovic (2003).

However, the literature on bank performance measurement cites Cole (1973) study as one of the earliest studies to suggest DuPont model to measure banks performance. Before that time most studies and practice relied on earnings per share and earnings growth as indicators of performance. The literature also shows that many versions and extensions of the basic DuPont model have been proposed and used by researchers and practitioners. For example, Nissim & Penman (2001) suggest using a modified version of the traditional DuPont model in order to eliminate the effects of financial leverage and other factors not under the control of those managers. The modified DuPont model has gained acceptance in the literature as a guiding analysis tool. Although this is valid in general it may not be of great concern to the banking and financial institutions industry, since most if not all banks assets are operating assets by nature. In addition, Soliman (2004) found that industry-specific DuPont analysis is more useful in isolating and identifying the underlying components of performance.

It is often claimed that the modified model is a powerful tool to highlight the relationships that exist between the bank's income statement and its balance sheet. It clearly exposes the factors that management of the bank should isolate for further analysis and examination.

In a study on credit evaluation indicators Isberg (1998) used the DuPont model to identify the aspect credit analysts should focus on in their evaluation of customer's credit worthiness and profitability position. He further suggested that by identifying the strengths and/ or weaknesses the DuPont model enables the analysts to quickly focus on detailed study on particular spot making the subsequent inquiry both easier and more meaningful.

More recently, Kyaw and Theinge (2009) used the DuPont model to analyze the performance differences between wholly-owned subsidiaries and joint ventures in Thailand for the period 2000-2004. In another recent study, Kalluci (2011) used the DuPont model, among other tools, to examine the performance of the Albanian banking system. Kirikal et al (2004) used the DuPont model and efficiency-type models to examine the performance of the Estonian banking sector during the period 1994-2002.

Herciu et al (2011) used DuPont model to demonstrate that in most cases the most profitable companies are not the most attractive for investors. The top most 20 profitable companies were found not to be so when ROA, ROE and ROS are taken into consideration.

Prendergast (2006) illustrated how a modified DuPont approach can be used to explore the true cause of financial performance problems in small manufacturing firms. Milbourn and Haight (2005) present examples of using DuPont analysis as a teaching aid to equip students with an understanding of how management decisions influence the profit figure.
Liesz et al (2008) expanded the role of the ratio analysis especially the DuPont model as an educational component of small business and/or entrepreneurial courses. The authors drew a conclusion that the DuPont model is underrepresented in the small business literature and textbooks. Then the authors introduced a modified DuPont analysis and demonstrated its relevancy.

Although no studies on using DuPont model on Sudanese banks exist in the published literature, there are some studies which examined the performance of Sudanese banks in terms of their input-output efficiency. Saaid et al. (2003) investigated the x-efficiency (technical and allocative) of Sudanese Islamic banks and found that Sudanese Islamic banks had low levels of x-efficiency. Hassan and Hussien (2003) showed that the larger the banks, the more cost and profit efficient they were. A more recent study by Onour and Abdulla (2010) showed that bank size in Sudan is an important factor for scale efficiency. Also, an earlier study by Bashir (1999) studied two Sudanese banks and found a positive and significant relationship between performance and profitability and size, implying that banks become more profitable as they grow in size. In a study on non-Sudanese banks, Al-Tamimi and Charif (2008) used multiple approaches for measuring the profitability of United Arab Emirates banks taking into effect the bank size. The study found that, generally, larger banks perform better than their smaller counterparts

**III. Data and Methodology**

The banking sector in Sudan is one of the most important sectors of the Sudan economy, since it represents the major source of financing for both the public and private sector activities. Equity and debt markets are still underdeveloped and they are not yet attractive and significant sources of financing for both the corporate and public sectors. Due to the banking industry's importance to the Sudanese economy, it has attracted the attention of academic research although it is still in its early stages.

The performance data for this study was preliminarily chosen from 29 banks in operation at the end of 2011 and for which data are available from 2005 to 2010 (See table 1). These banks comprise government- owned, joint venture and foreign banks branches. However, data are not available for each and every year in the sampling period for all the banks included in the study. Most of the banks have full data during the period. All in all we have 128 bank years performance observations for each of the examined variables used in this study.

Table (1): The Sampled Sudanese Banks at the end of 2010 (million SDGs)

| Serial No | Bank | Established | Equity | ROE |
|---|---|---|---|---|
| 1 | Omdurman National Bank | 1995 | 734.2 | 12.82% |
| 2 | Bank of Khartoum | 1931 | 589.4 | 10.33% |
| 3 | United Capital Bank | 2005 | 323.3 | 11.82% |
| 4 | Islamic Cooperative Development Bank | 1983 | 86.7 | 6.60% |
| 5 | Sudanese French Bank | 1978 | 141.2 | 15.86% |
| 6 | El –Nilien Bank | 1993 | 325.7 | 0.98% |
| 7 | Farmers Commercial Bank | 1993 | 106.6 | 15.5% |
| 8 | Faisal Islamic Bank | 1978 | 269.9 | 40% |
| 9 | Alsalaam Bank | 1992 | 312.3 | 7.23% |
| 10 | Savings and Social Development Bank | 1995 | 90.8 | 12.88% |
| 11 | Kenya Commercial Bank Ltd | 2006 | 52.5 | 30.65% |
| 12 | Sudanese Egyptian Bank | 2005 | 103.6 | 16.69% |
| 13 | Tadamon Islamic Bank | 1983 | 263.6 | 28.07% |
| 14 | Saudi Sudanese Bank | 1986 | 71.4 | 12.75% |
| 15 | National Bank of Sudan | 1983 | 190.8 | 17.13%* |
| 16 | Blue Nile Almashreq Bank | 1982 | 94.3 | 41.46%** |
| 17 | Workers' National Bank | 1988 | 91.6 | 14.4%* |
| 18 | Byplos Bank (Africa) | 2002 | 175.5 | 13.16% |
| 19 | Alshamal Islamic Bank | 1992 | 104.7 | 11.65% |
| 20 | Baraka Bank (Sudan) | 1984 | 122.4 | 13.56% |
| 21 | Industrial Development Bank | 1983 | 438.6 | 0.50% |
| 22 | Exports Development Bank | 1981 | 72.9 | 10.84% |
| 23 | Sudanese Islamic Bank | 1983 | 118.6 | 8.35% |
| 24 | Animal Resources Bank | 1992 | 89.6 | -0.87%** |
| 25 | Buffalo Commercial Bank | 2005 | 8.5 | 34% |
| 26 | Sahel and Sahra Bank | 2005 | 20.9 | 0.96%** |
| 27 | Equity Bank (southern Sudan) | 2006 | 33.3 | 29.43% |
| 28 | Arab Sudanese Bank Company Ltd | 2008 | 118.2 | 0.76% |
| 29 | Aljazeera Sudanese Jordanian Bank | 2006 | 158.4 | 7.76% |

*end of 2009

**end of 2008

Some researchers prefer using return on assets and return on equity, as assets and equity are more stable bases for comparison than revenue because revenue may be subject to considerable year-to-year fluctuations due to external environments (Brouthers et al.2003). Return on assets and return on equity focus on the relative efficiency with which resources available have been utilized by a firm to earn profits on behalf of its shareholders. However, other researchers prefer using return on sales because sales are generally expressed in more current monetary terms than are assets, which would have been acquired over a longer time frame and carried at book value (Geringer et al. 1989; Sambharya 1995; Tallman and Li 1996).

So, this study conducts two types of statistical analysis. First, descriptive statistical analysis is used in order to decompose the shareholders profitability of banks in the sample to its main components. Second, correlation and regression analysis are used to determine the correlation between these variables and to measure the contribution of each variable respectively. The following regression models are estimated for the sample:

$$ROE_{(i,t)} = \beta_0 + + \beta_1 LASST_{it} + \beta_2 LAGE_{it} + \beta_3 TURN_{it} + + \beta_4 EQU_{it} + \beta_5 PM_{it} + \beta_6 ROE(-1)_{it} + \varepsilon_{it(4)}$$

$$ROA_{(i,t)} = \beta_0 + + \beta_1 LASST_{it} + \beta_2 LAGE_{it} + \beta_3 TURN_{it} + + \beta_4 EQU_{it} + \beta_5 PM_{it} + \beta_6 ROA(-1)_{it} + \varepsilon_{it\,5)}$$

$$PM_{(i,t)} = \beta_0 + + \beta_1 LASST_{it} + \beta_2 LAGE_{it} + \beta_3 TURN_{it} + + \beta_4 EQU_{it} + \varepsilon_{it\,(6)}$$

$$EQU_{(i,t)} = \beta_0 + + \beta_1 LASST_{it} + \beta_2 LAGE_{it} + \beta_3 TURN_{it} + \beta_4 PM_{it} + \varepsilon_{it\,(7)}$$

$$TURN_{(i,t)} = \beta_0 + + \beta_1 LASST_{it} + \beta_2 LAGE_{it} + \beta_3 EQU_{it} + \beta_4 PM_{it} + \varepsilon_{it\,(8)}$$

where;
ROE(-1)= ROE first lag
LASST = Log total assets
LAGE= log age of the bank
ROA(-1)= ROA first lag

And the other variables are as defined before.

**IV. Empirical Findings**

Table (2) shows the development of ROE, ROA, PM, TURN, and EQU of the banks under study, as of December of each year over the period 2005-2010. As may be seen from the data, return on equity is medium, on average, which indicates medium levels of efficiency in the usage of equity capital. Table (3-A), which shows the trend behavior of profitability measures; indicate that the last four years in the sample period had stable and rising return on equity, possibly reflecting increased efficiency in using capital. At the same time, the rate of return on assets is relatively low but it indicated average general profitability for the banking system. The net profit margin (PM) had increased over the period and tripled from the levels of 2005. The turnover ratio (TURN) was rather low due to the monetary nature of the bank's assets. The equity

multiplier, or leverage effect, has declined considerably since 2006 due to the capital adequacy and requirements by the central bank of Sudan. Overall, one can say that the shareholders profitability of Sudanese banks is derived mainly from the ability to generate operating profits, but this has been realized at low levels of turnover. The other impediment to shareholders' profitability is represented by the regulatory enforcements and push for capital increase by the Central bank of Sudan. Many Sudanese banks increased their capital considerably over the last years. Moreover, the relatively recently established banks have yet to draw depositors and investors funds at amounts that could boost their leverage levels.

On the other hand Table (3-B) shows the skewness and kurtosis coefficients for all the variables in our model. Overall the table shows that most of the ratios are normally distributed, evidenced by the relatively small skewness and kurtosis coefficients. There are some exceptions, however, as some ratios shows signs of non- normality in very few instances. The literature shows that financial ratios are mostly not normal. Many studies suggest different reasons for this non-normality, including accounting, economic and technical. Although, different treatments have been suggested including dropping outliers or transforming the ratios, warning is made regarding the theoretical rigor of ratio analysis if these adjustments are made. Furthermore, opinions have been made that normality will be restored if economy and industry –wide effect are controlled for (for extensive review on this see Salmi and Martikainen (1994)).

Table (2): Descriptive Statistics 2005-2010 (N=128)

| Variable | Mean | STD. DEV | Min | Max |
|---|---|---|---|---|
| ROE | .0958 | .378 | -3.85 | .44 |
| ROA | .0197 | .0213 | -.09 | .10 |
| PM | .2237 | .305 | -1.81 | .64 |
| TURN | .0778 | .0251 | .03 | .18 |
| EQU | 8.68 | 9.138 | .27 | 58.85 |
| LASST | 6.04 | 1.66 | -.22 | 10.98 |
| LAGE | 2.787 | 0.782 | 1.10 | 4.37 |

Table (3-A): Yearly Descriptive Statistics (MEAN-STD) 2005-2010

| | 2005 | | 2006 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variable** | Mean | STDEV | Mean | STDEV | Mean | STDEV | Mean | STDEV | Mean | STDEV | MEAN | STDEV |
| ROE | .1154 | .285 | -.1213 | 1.038 | .1311 | .097 | .1161 | .139 | .1077 | .092 | .154 | .105 |
| ROA | .0126 | .0229 | .0152 | .0337 | .0214 | .0151 | .021 | .023 | .0194 | .0169 | .0242 | .0179 |
| PM | .101 | .422 | .1169 | .566 | .2763 | .179 | .225 | .275 | .241 | .223 | .2945 | .1515 |
| TURN | .0758 | .0215 | .0776 | .0198 | .0756 | .0181 | .0771 | .0259 | .0763 | .0277 | .0796 | .0339 |
| EQU | 14.44 | 14.78 | 11.93 | 14.68 | 8.197 | 8.535 | 7.92 | 8.12 | 6.45 | 3.38 | 6.89 | 3.28 |
| LASST | 6.139 | 2.02 | 5.94 | 1.41 | 5.94 | 1.16 | 5.97 | 1.62 | 6.03 | 1.86 | 6.25 | 2.00 |
| LAGE | 2.95 | .544 | 3.07 | .535 | 2.83 | .775 | 2.73 | .82 | 2.63 | .887 | 2.69 | .887 |
| N | 14 | | 15 | | 24 | | 27 | | 26 | | 22 | |

Table (3-B): Yearly Descriptive Statistics (Skewness- Kurtosis) 2005-2010

| | 2005 | | 2006 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variable** | Skewness | Kurtosis | Skewness | Kurtosis | Skewness | Kurtosis | Skewness | Kurtosis | Skewness | Kurtosis | Skewness | Kurtosis |
| ROE | -2.39<br>(.597) | 7.555<br>(1.15) | -3.768<br>(.580) | 14.428<br>(1.12) | .642<br>(.472) | -.864<br>(.918) | .068<br>(.448) | -.199<br>(.872) | .523<br>(.456) | 3.01<br>(.887) | .949<br>(.491) | .235<br>(.953) |
| ROA | -.828<br>(.597) | 1.171<br>(1.15) | -2.242<br>(.580) | 6.75<br>(1.12) | .350<br>(.472) | -1.172<br>(.918) | 1.109<br>(.448) | 3.399<br>(.872) | .467<br>(.456) | 1.449<br>(.887) | 1.709<br>(.491) | 4.258<br>(.953) |
| PM | -2.324<br>(.597) | 6.058<br>(1.15) | -3.141<br>(.580) | 11.09<br>(1.12) | .293<br>(.472) | -.933<br>(.918) | -.961<br>(.448) | 1.151<br>(.872) | -.972<br>(.456) | 3.411<br>(.887) | .159<br>(.491) | -1.056<br>(.953) |
| TURN | -1.055<br>(.597) | .359<br>(1.15) | -.320<br>(.580) | -.876<br>(1.12) | -.597<br>(.472) | .689<br>(.918) | .532<br>(.448) | 2.19<br>(.872) | .465<br>(.456) | 1.763<br>(.887) | 1.287<br>(.491) | 2.376<br>(.953) |
| EQU | 2.335<br>(.597) | 6.336<br>(1.15) | 2.198<br>(.580) | 3.996<br>(1.12) | 2.583<br>(.472) | 6.628<br>(.918) | 2.558<br>(.448) | 6.789<br>(.872) | .387<br>(.456) | -.654<br>(.887) | .094<br>(.491) | -1.239<br>(.953) |
| LASST | .379<br>(.597) | 3.099<br>(1.15) | -1.211<br>(.580) | 5.43<br>(1.12) | -708<br>(.472) | 2.34<br>(.918) | -1.948<br>(.448) | 6.136<br>(.872) | -1.933<br>(.456) | 4.877<br>(.887) | -2.018<br>(.491) | 5.04<br>(.953) |
| LAGE | -1.465<br>(.597) | 1.775<br>(1.15) | -2.084<br>(.580) | 3.688<br>(1.12) | -.576<br>(.472) | -.317<br>(.918) | -.419<br>(.448) | -.771<br>(.872) | -.311<br>(.456) | -1.035<br>(.887) | -.344<br>(.491) | -1.045<br>(.953) |
| N | 14 | | 15 | | 24 | | 27 | | 26 | | 22 | |

Note: Standard errors between parentheses.

To identify the relationship between the profitability variables in question Pearson correlation coefficients have been identified, as in Table (4). Analyzing the correlation between the ROE, ROA and PM indicate that a high level of profit leads to high levels of shareholders profitability ratios. Correlations between these variables are very high and highly significant, indicating that companies with high levels of profit often have higher profitability ratios. This confirms our hypothesis according to which firms with high profits don't have in general high ratios of profitability, because they have high values both at the denominator (the total assets, the stockholder's equity and the sales) and at the numerator.

Also notice that between ROA and PM there is the strongest correlation (0.886), which was expected taking into account ROE is influenced by ROA on one hand and equity multiplier on the other hand. The high Correlation between ROA and ROE (ROE is a function of ROA) reveals that ROA follows ROE in its correlation with other profitability indicators. The size is negatively related to turnover, which makes sense since small banks have lower asset bases but it also indicate that they are more efficient in using their assets. However, size is positively related to equity multiplier (EQU) which makes sense since large banks have the large assets, and the equity ratio is similar between banks with low standard deviation, due to regulatory requirement.

Size is also positively and significantly related to age, indicating that older banks accumulate assets over time more than the newer banks.

Table (4)
Pearson Correlation between variables

| | ROE | ROA | PM | TURN | EQU | LASST | lAGE | ROA(-)l |
|---|---|---|---|---|---|---|---|---|
| ROE | 1 | | | | | | | |
| ROA | .649* | 1 | | | | | | |
| PM | .746* | .886* | 1 | | | | | |
| TURN | .230* | .607* | .323* | 1 | | | | |
| EQU | -.295* | -.388* | -.348* | -.138 | 1 | | | |
| lASST | .045 | -.113 | .125 | -.382* | .248* | 1 | | |
| lAGE | .02 | -.074 | -.002 | -.063 | .218** | .515* | 1 | |
| ROA(-1) | -.117 | .111 | .031 | .163*** | -.009 | -.05 | -.10 | 1 |

(*) Significant at 1% level of significance
(**) Significant at 5% level of significance
(***) Significant at 10% level of significance

Table (5) provides the results using the ordinary least squares regression. The table presents the results for ROE, as the primary performance measure of interest, and for each of its components. The regressors include lagged ROA, size (Log assets), business experience (log age of the bank), equity multiplier, and net profit margin. The results for the five regressions variables are shown in the columns of the table. As can be seen from Table (5), ROE is mainly affected by net profit margin in a positive and significant manner. The effect is almost one to one. This indicates that shareholders profitability, as measured by ROE, is positively influenced, as expected by the profitability of the bank. However, the other variables, including the DuPont components are not significant in their relationship with ROE. Although some of these variables have significant correlations with ROE, these pure effects are not reflected when the variables entered together in the regression model.
ROA, on the other hand is significantly and positively affected, as expected by its two main components, assets turnover and net profit margin. In addition, the size of the bank, as measured by the log of banks assets, is significant and positively influence return on assets. The $R^2$ is very high, reflecting the overall explanation of variability of ROA. Beside the expected effect of assets turnover, as expected, net profit margin is influenced by equity multiplier, and the size of the bank. The equity multiplier in turn is affected by the profitability of the bank together with its size. Finally, turnover is negatively influenced by the bank size but is the only variable that is affected by the bank's business experience, as that may lead to accumulation of management and operational experience with respect to assets utilization and ability to form marketable portfolios.

Overall, the two control variables (size and age) do not seem to have significant effect on bank's profitability as measured by ROE. However, size seems to affect profit margins, assets turnover and leverage.

Table (5): Regression Estimation

$ROE_{(i,t)} = \beta_0 + + \beta_1 LASST_{it} + \beta_2 LAGE_{it} + \beta_3 TURN_{it} + + \beta_4 EQU_{it} + \beta_5 PM_{it} + \beta_6 ROE(-1)_{it} + \varepsilon_{it(1)}$

$ROA_{(i,t)} = \beta_0 + + \beta_1 LASST_{it} + \beta_2 LAGE_{it} + \beta_3 TURN_{it} + + \beta_4 EQU_{it} + \beta_5 PM_{it} + \beta_6 ROA(-1)_{it} + \varepsilon_{it\ 2)}$

$PM_{(i,t)} = \beta_0 + + \beta_1 LASST_{it} + \beta_2 LAGE_{it} + \beta_3 TURN_{it} + + \beta_4 EQU_{it} + \varepsilon_{it\ (3)}$

$EQU_{(i,t)} = \beta_0 + + \beta_1 LASST_{it} + \beta_2 LAGE_{it} + \beta_3 TURN_{it} + \beta_4 PM_{it} + \varepsilon_{it\ (4)}$

$TURN_{(i,t)} = \beta_0 + + \beta_1 LASST_{it} + \beta_2 LAGE_{it} + \beta_3 EQU_{it} + \beta_4 PM_{it} + \varepsilon_{it\ (5)}$

| | ROE | ROA | PM | EQU | TURN |
|---|---|---|---|---|---|
| C | -.0001<br>(005) | -.007***<br>(1.84) | -.435*<br>(3.10) | -4.54<br>(.97) | 0.10*<br>(12.58) |
| LASST | .025<br>(1.04) | .0001<br>(1.93) | .082*<br>(4.70) | 1.75*<br>(2.98) | -.009*<br>(6.36) |
| LAGE | .037<br>(1.05) | -.00035<br>(.04) | -.049<br>(1.14) | .700<br>(.63) | .007*<br>(2.40) |
| TURN | -.083<br>(.76) | .268*<br>(9.38) | 5.28*<br>(5.35) | 46.13<br>(1.32) | |
| EQU | .0001<br>(1.58) | .0001***<br>(1.86) | -.012*<br>(4.84) | | 0.0001<br>(1.31) |
| PM | .94<br>(10.31)* | .0540*<br>(23.30) | -------- | -12.86*<br>(4.84) | .036*<br>(5.35) |
| ROE(-1) | .0.006<br>(1.04) | | | | |
| ROA(-1) | | .031<br>(1.18) | | | |
| F statistic | 26.75 *<br>(.000) | 205.54 *<br>(.000) | 14.93*<br>(.000) | 8.90*<br>(.000) | 15.12*<br>(.000) |
| $R^2$ | .569 | .91 | .327 | .224 | .330 |
| Adj. $R^2$ | .547 | .906 | .307 | .20 | .308 |

(*) Significant at 1% level of significance
(**) Significant at 5% level of significance
(***) Significant at 10% level of significance

As the regressors used in this study carry with them the potential of the existence of multicollinaerity, it became necessary to run multi- collinearity diagnosis. Table 6 reports the results of multicollinearity tests represented by the variance inflation factor (VIF) and Tolerance statistics. The table clearly indicates that no symptom of multicollinearirty exists for none of the variables used across all regression formulations. The low VIFs close to 1 and the high tolerance statistics clearly reject the presence of any multicollinearity between the variables

Table (6)
Variance Inflation Factor (VIFs) and Tolerance Statistics of the Regression Models

| | ROE | | ROA | | PM | | EQU | | TURN | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Toler | VIF | Toler | VIF | Toler | VIF | Toler | VIF | Toler | VIF |
| LASST | .51 | 1.962 | .508 | 1.970 | .603 | 1.659 | .548 | 1.825 | .679 | 1.472 |
| LAGE | .691 | 1.458 | .682 | 1.466 | .704 | 1.421 | .695 | 1.440 | .725 | 1.380 |
| TURN | .669 | 1.495 | .65 | 1.539 | .826 | 1.210 | | | | |
| EQU | .742 | 1.47 | .776 | 1.289 | .923 | 1.083 | .680 | 1.471 | .786 | 1.271 |
| PM | .659 | 1.517 | .672 | 1.488 | | | .801 | 1.248 | | |
| ROE(-1) | .896 | 1.116 | | | | | | | .830 | 1.205 |
| ROA(-1) | | | .958 | 1.044 | | | | | | |

(*) Toler is the tolerance statistics and it is just the reciprocal of VIF statistic
(**) VIF is the variance inflation factor

## V. Conclusions

This study used a rather simple but overlooked approach in the academic literature to analyze and decompose the profitability of Sudanese banks over the period 2005 to 2010 by employing the DuPont analysis in examining and decomposing profitability.

The findings can be summarized as follows: Firstly, from the average financial performance comparison over the 6-year period from 2005 to 2010, DuPont analysis indicates that net profit margin (PM) was the major source of banks' shareholders profitability, while efficiency as reflected in assets turnover, contribution to profitability is not significant contribution and so is equity multiplier, which is subject to central bank regulation.

Regression analysis, examining the relationship between ROE and its components as dependent variables, shows that ROE is influenced only by net profit margin (PM) in a significant way, while ROA is influenced by net profit margin, and turnover, as expected, and to lesser extent by size as represented by the log of the banks 'assets. Also, net profit margin (PM) and turnover are positively and significantly related to each other. Control variables of size (log of assets) and business experience (age of the bank) are found to affect ROA, PM, and EQU positively and in significant manner, while affect turnover (TURN) in a negative and significant way. However, business experience, as proxied by the age of the bank, has no influence on the variables except turnover (efficiency) where age has shown a clear significance.

The findings of this study clearly point to the low levels of efficiency of utilizing banks assets in Sudan, and the room for improvement and value creation for shareholders and owners by increasing the rate of assets utilization. However, the results also point out that shareholder profitability depends to a large extent on profit margin creation, which is an external factor and may well be affected by any increase in competition which is evidenced by the results. The increasingly low levels of standard deviations, skewness and kurtosis indicate probable increase in competition. Under such circumstances, profit margin are expected to go down, forcing banks to look for more efficiency in utilizing their resources and more efficient allocation of their loan and investment portfolios. Also, the results may point to the importance of encouraging mergers of banks by regulators in order to form larger entities, since size is shown to positively and significantly influencing profitability measures. Many regulators of the banking sector around

the globe use size as a risk indicator, and this can be taken in the case of our study to show how this surrogate measure is related to profitability.

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