Journal of Finance and Accounting
2016; 4(4): 179-187
http://www.sciencepublishinggroup.com/j/jfa
doi: 10.11648/j.jfa.20160404.13
ISSN: 2330-7331 (Print); ISSN: 2330-7323 (Online)

Case Report

Debating the 'Evolution of Accounting Equation': A Cross-Case Analysis Approach

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To cite this article:
Tibuhinda Ngonzi. Debating the 'Evolution of Accounting Equation': A Cross-Case Analysis Approach. *Journal of Finance and Accounting*. Vol. 4, No. 4, 2016, pp. 179-187. doi: 10.11648/j.jfa.20160404.13

Received: May 20, 2016; **Accepted**: May 30, 2016; **Published**: June 13, 2016

Abstract: This paper is an interrogation of the applicability of the recently introduced 'new form of accounting equation' and a 'dynamic approach to accounting for capital structure' (JFA 2013: 1(44) 55-63). It explicates the issues related to the methodological foundations at the base of the model specification and the estimated parameters. It goes on to conduct a cross-case analysis methodological approach to the same set of empirical data as a triangulation process. The outcomes confirm that the provided empirical evidence is not sufficient to demonstrate the pegging of the rate of change of equity and liabilities with respect to the change of assets to 36% and 64% values respectively. Rather this paper's findings indicate that in the long term companies have used retained earnings and reserves to expel debt as a strategy to keep their debt levels low, except for firms with accumulated losses or excessive deficit. This paper also finds that firms have maintained certain debt levels but not maintained the logic suggested by the pay-off theory, and that the perking order was demonstrated through long-term adjustment process. This paper concludes that the new form of accounting equation is not pragmatically viable. The paper proceeds to make a contribution by developing a predictive dynamic model for capital structure based on lagged variables.

Keywords: Accounting Equation, Cross-Case Analysis, Dynamic Model, Lagged Variables

1. Introduction

For accounting purposes assets should equate to the sum of financing resources viz. capital and liabilities. That is, A=C+L as a truism, an identity.

While it is true that the accounting equation shows the 'equality' between assets of a company and their financing, the accounting equation is a special function type, with only one degree of freedom. In this function, each variable on the RHS has a one-to-one (1:1) effect on the LHS. That is, a unit increase in the RHS array of variables will lead to the same unit increase in the LHS. That means, the coefficients of the variables on the RHS will always be unitary. This is explained by the fact that the equation is an expression of the recording of transactions evolving into balance sheet accounts [13]. It is a statement of the state of affairs as at a particular point in time.

The undergoing presentation demonstrates the immediate problem of the *'new form of accounting equation'* suggested in the Journal of Finance and Accounting (JFA 2013: 1(44)), which includes the error term for intangible resources. Given the importance of the practical implication of the accounting equation to accounting and financial reporting processes, this paper tasks itself to interrogating the applicability of the new proposed equation. It then proceeds to make a contribution by rigorously proposing a predictive model for capital structure decisions. There are two objectives to this: (1) to empirically test the validity of the regression generated parameters of the new form of accounting equation using a different methodological approach; and (2) to empirically test for the elements of pecking order and pay-off theories in corporate financing practices.

The rest of the paper proceeds as follows. Section 1.1 revisits the 'new form of accounting equation' to unveil the pertinent issues presented in Sub-Sections 1.1.1 to 4. Section 1.2 presents a methodological alternative to aggregations: cross-case analysis, followed by its description and approach to data treatment in Section 2. Section 3 is the findings and

discussion, while Sections 3.1 and 3.2 is a proposed approach to dynamic modelling. Section 4 concludes the study, pointing out the limitations to the study and the directions for future research.

1.1. The 'New Form of Accounting Equation' Re-visited

The paper 'Evolution of accounting equation: Evidence of Companies quoted on Dar es Salaam stock exchange' makes efforts to re-define the standard accounting equation A= C + L to a function of the form $A = \beta_0 + \beta_1 L + \beta_2 C + \varepsilon$ (here in after referred to as 'the new equation'), which the paper expresses as the *"new accounting equation* [12]*"*. In the new equation, β_0 is a constant term, β_1 is the rate of change of assets per unit change in liabilities and β_2 is the rate of change of assets per unit change in capital (or equity). The explanation given to the error term is that it takes care of the "many business activities, for example, type of business, type of assets, loan and capital location and human capital [12]". The attached significance of the error term is that "even when 'C' *and* 'L' are zero (before obtaining capital or loan) *an entrepreneur* may be having an idea, place to do business, skills and even how to get funds [12]".

The positing means, according to the author, the standard accounting equation leaves out such important components of assets.

In the discussion, the paper describes the results of the regression analysis of 15 companies data listed on the Dar es Salaam Stock Exchange (DSE) for the period 2005 to 2008 as conclusively providing an answer to the question involving the 'acceptable proportions of equity and debt' as 36% and 64% respectively. The test results also indicate that the specified model is also estimated as A=4408+1.1L+0.147C

By implication, the y-intercept value may change, but the L and C coefficients estimates indicate that, as a norm, assets change at the rate of 1.1 units for each unit change in liability and at 0.147 for every unit change in owners' equity to prove the dominance of the tradeoff theory that companies have a target debt ratio to which they tend to adjust to over time. In the end, the paper concludes that the "accounting equation *changes* over time from its traditional form to the new form where it is no longer A=C+L but $A = \beta_0 + \beta_1 L + \beta_2 C + \varepsilon$, [12, p. 58].

1.1.1. The Issues

The effort towards an attempt to express the relative rate of change of the proportions of C and L in the Assets composition in the long term is commended. Using the DSE listed companies' data, the author of the new accounting equation finds that the proportion of liabilities changes at the rate of 64%, while the proportion of owners' equity changes at the rate of 36%. However, three fundamental problems are raised in this paper: 1) the likely distortions in the statement of assets due to the induction of the 'error term' in the standard accounting equation; 2) the applicability of the new accounting equation in practice; and 3) the implication of the pegged values of the liabilities and equity in the capital structure.

1.1.2. Problem One

The first observed problem with the *new accounting equation* is the claim attached to the error term. This claim forgets that the standard accounting equation is an identity in the first place, and that the proper accounting practices have to capitalize relevant components of assets where it is applicable. Internationally accepted reporting standards such as the IFRS may not reasonably accommodate behavioural factors in the reporting for assets or the capital structure.

1.1.3. Problem Two

The second observed problem with the *new accounting equation* is in its generalizability and applicability. This emanates from the structure of the equation. The specified equation does not amount to a practical equation to be used for accounting purposes, or as a substitute to the standard accounting equation as the paper claims. The proposition is misleading in general, for the inclusion of an error term distorts the standard equation from its principal identity function. In its new form, the RHS is not necessarily equal to the LHS, generating an inequality of the form $A \geq C+L$. By implication, there is a portion of assets which cannot be certainly accounted for.

1.1.4. Problem Three

The third problem is an issue for proof. There are empirically supported indications that determinants of capital structure influence the companies' level of debt differently. For instance, profitable firms have been confirmed to have relatively less debt in relation to their equity market value [10], [16], [17]. Young firms have been empirically observed to be more leveraged than old ones (Wapper et al., 2002 & Joe veer, 2006 cited in [12]). Corporate performance has a bearing in the determination of capital structure (Chen, 2004). Firms' leverage is significantly influenced by a range of firm specific factors [1], [4], [6]. And that the tradeoff, pecking order are conditional theories of capital structure cash flow theories simply emphasize certain costs and benefits at times and may not be mutually exclusive [10]. With the undergoing argument in mind, the deliverables of aggregate data in regression analysis are highly likely to lead to misleading conclusions.

1.2. An Alternative to Aggregations: Cross-Case Analysis Approach

The composite of the three problems above forms the agenda for the study reported in this paper. A multiple case study methodological approach is used to test for the validity of the new accounting equation. Data analysis is implemented on the DSE listed companies' data individually to allow for observations of un-distorted patterns of capital structure and incremental assets financing behaviour before generalizations are made on the basis of the patterns rather than aggregate data. This

approach facilitates the continuous comparison of data and underlying theories, specifically the evidences for the trade-off and the pecking order theories. The advantage of this approach is that typological patterns are allowed to emerge from evidence with only moderate manipulations of data [2], [5], [18]. Observations are made on the patterns of leverage and financing choices for additional asset requirements for established companies.

2. Methodology

This study exploits the content of empirical reality with minimal mathematical manipulations. This approach is chosen as a way to reduce the effect of evidence distortion where care is not enough to maintain the reality context. Interpretive research procedures are implemented by clearly documenting the data analysis processes and the extracted observations. In terms of methodology, it should be noted that interpretive research does not work on predefined dependent or independent variables [15].

A multiple case study approach is used, where a cross-case analysis is conducted on the behaviour of debt ratio and the equity and debt variables changes with respect to changes in net assets. There are two approaches to cross-case analysis viz. case oriented and variable oriented analysis [8]. Case centred analysis seeks to explain the differentiating factors of cases, while variable centred analysis seeks to discover the features in which cases look alike. The aggregation of variables across cases is avoided. There is a problem with working with aggregates for matters needing to expose the agency of decision making at the firm-level. While the decision making behaviour is discretely important, aggregations do not have capacity to expose the pertinent factors in collectivity.

In the analysis, we test for the dominantly prevalent debt levels for the aim of unveiling the presence or absence of the tendency to appropriate the tax advantage of debt by firms. This is observed via firm-level debt ratios.

The second test involves unveiling the patterns in the dominant options for financing additional investments. This is tested by looking at the change in the net assets and the respective weightage of additional equity and additional leverage in the financing of additional assets. The results are expected to reveal the evidences for the support or refutation of the dominance of any of the trade-off and pecking order theories in the choice for capital structure in corporate finance research.

2.1. Data

The data used were extracted from the DSE listed companies' published annual financial reports. Commercial banks and Insurance companies were not included in the analysis because their treatment of interest earned and payable, contributions etc. in financial reporting is incomparable to non-financial firms. This leaving us with a total of twelve other companies as indicated in Table 1.

Table 1. *Cases included in the analysis.*

Company	Industry Affiliation
Swissport Tanzania Ltd. (SWISS), Kenya Airways, Precession Air (3)	Airports handling of passengers and cargo.
TOL Gases Ltd. (TOL) (1)	Production and distribution of industrial gases, welding equipment, medical gases, etc.
Tanzania Breweries Ltd.(TBL), East Africa Breweries (2)	Manufactures, sells and distributes beer
Tatepa Company Ltd. (TATEPA) (1)	Growing, processing, blending, marketing and distribution of tea and instant
ACACIA (1)	Mineral Exploration and extraction
Tanga Cement, Twiga Cement (2)	Production, sale and marketing of cement.
Tanzania Cigarette Co (1)	Production, sale and marketing of cigarettes
Nation Media Group (NMG) (1)	Media
Total (12)	8

2.2. Data Analysis and Observations

A simplified visual aided approach to data analysis was applied. Data were tabulated from the most recent to the oldest in the format and order they appear in the companies' reports. The variables for analysis were computed as follows:

Net Assets = Non-current assets + (Current Assets-Current liabilities)

Equity = Σ (Paid-up capital, retained earnings, reserves, proposed dividends)

$\Delta V = (Vt - Vt\text{-}1)$ that is,

The change in the corresponding variable, being the year's value (Vt) less its preceding year's value (Vt-1)

Debt ratio = Long term debt/ Net assets

Panel 'A' in Table 2 is a display of the debt ratio histograms labelled in percentages of the corresponding net assets as base. The net assets are labelled on the x-axis.

Panel 'B' is a display of the change in equity (diamond data points) and change in debt (square data points) trends versus change in assets on the y-axis.

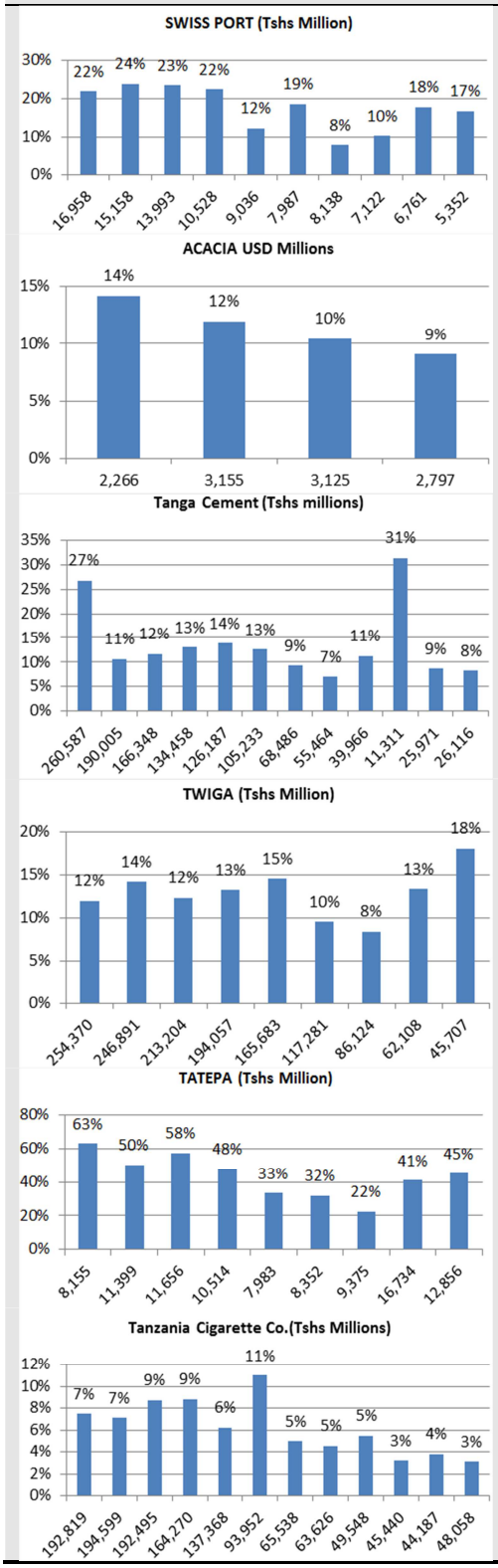
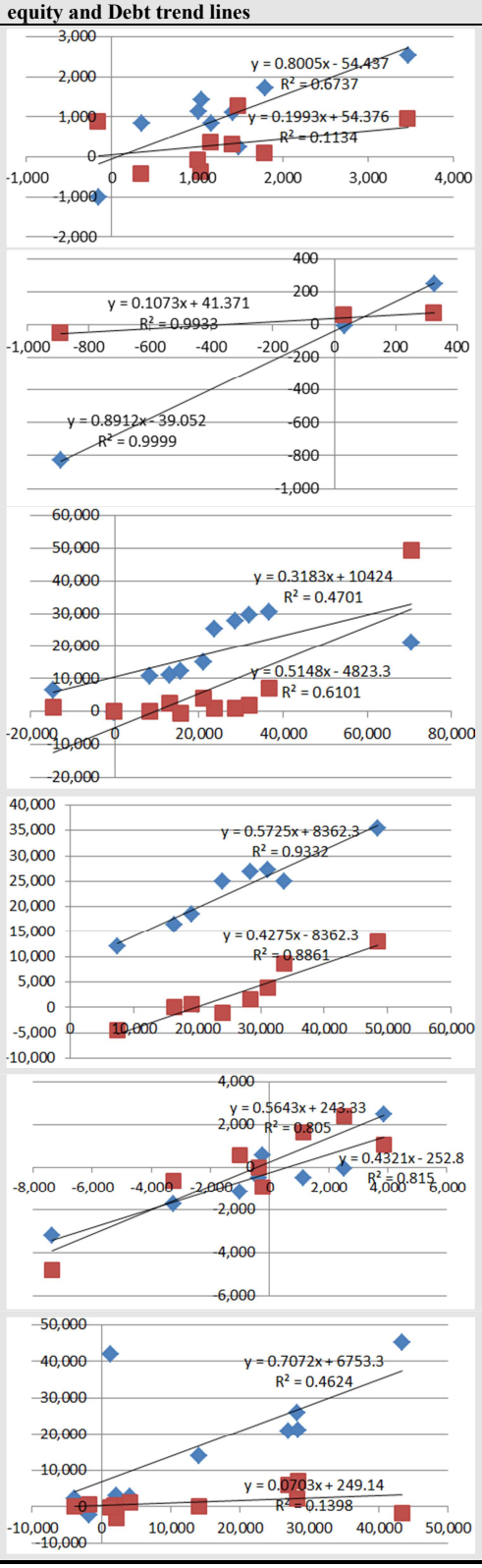
Table 3 is a supplement to Table 2 Panel A. It shows the data coverage range in years. For instance, the data available and used for the firm SWISS is for the years 2013 to 2004 and so on. The number of years included is as per case published reports. Each firm is a case.

Table 4 is the distribution of debt ratios in ranges of 5%

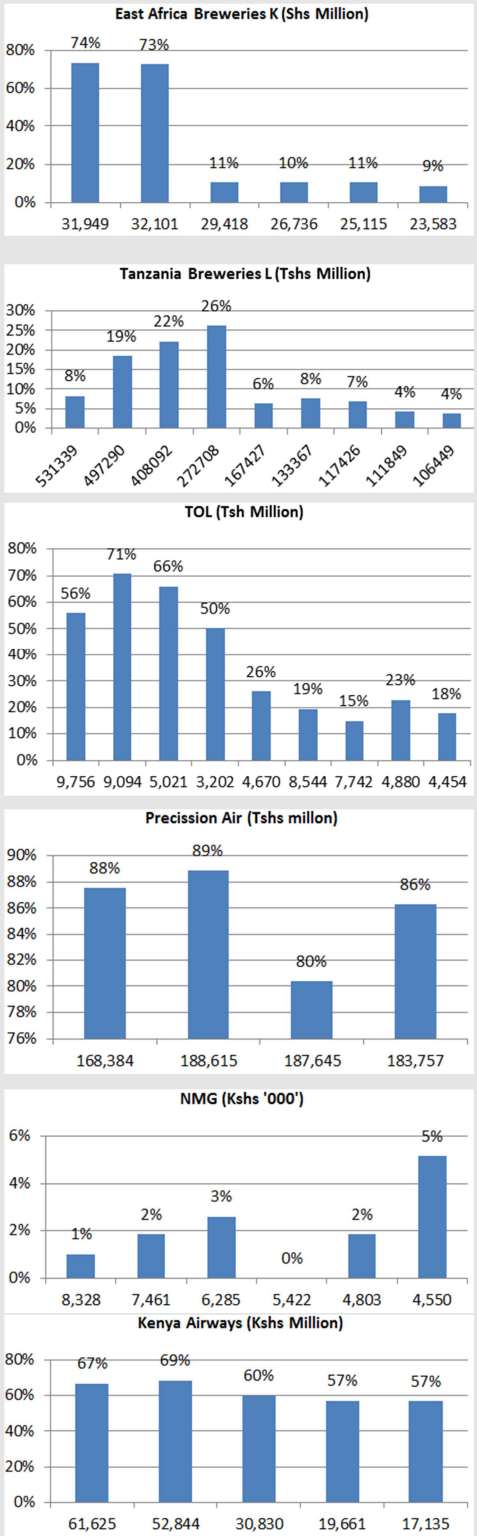
interval. This intends to show the persistent proportions of debt in asset financing. It can be seen in this table that, 66 of 99 observations (67%) are in the 0-20% debt ratio range, while 76 (77%) of all observations have 30% or less debt ratio.

Table 5 presents the firm debt ratio averages, where 7 of the 12 firms (58%) listed on DSE have an average debt ratio below 20%. Only four (33%) firms have their averages above 35%.

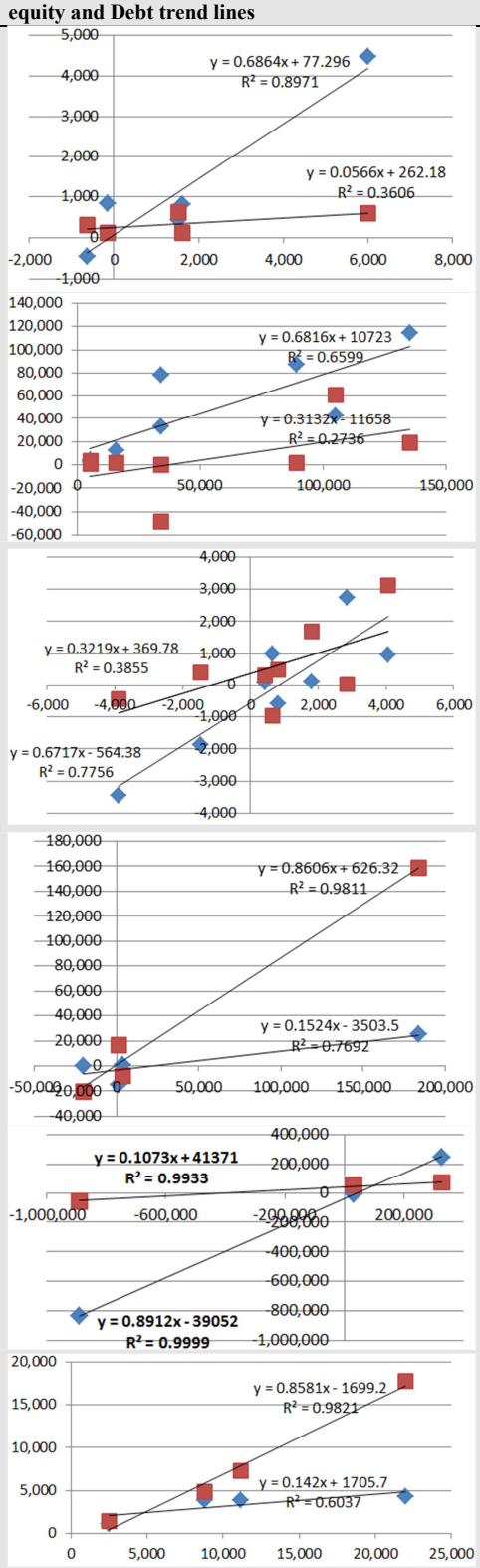
Table. 2. *Distribution of Debt Ratios.*

PANEL A Debt Ratios	**PANEL B Change in Assets (Y-axis) with corresponding change in equity and Debt trend lines**
	

PANEL A Debt Ratios



PANEL B Change in Assets (Y-axis) with corresponding change in equity and Debt trend lines



Data source: http://www.dse.co.tz/content/company-announcements

Table 3. *Data Ranges.*

Company	SWISS	ACACIA	TOL	NMG	EABL	TATEPA	K/AIR WAYS	TWIGA Cement	TBL	TANGA Cement	TCC	PW
Most recent yrs data	2013 - 2004	2013-2003	2013 - 2005	2013 - 2003	2013 - 2008	2013 - 2005	2007 - 2003	2013 - 2005	2013 - 2005	2014 - 2003	2014 - 2003	2014 - 2011

Table 4. *Distribution of debt ratios.*

Debt ratio Range (%)	0 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 50	51 - 55	56 - 60	61 - 65	66 - 70	71 - 75	76 - 80	81 - 85	86 - 90
Frequency	15	21	20	10	7	3	3	0	2	3	1	5	3	3	0	1	3

Table 5. *Firms debt ratio averages.*

Company	Swiss	Kairways	Tanga	Twiga	Tatepa	Tcc	Eabl	Tbl	Acacia	Tol	Pw	Nmg
Average debt ratio (%)	18	62	14	13	44	6	31	12	11	38	86	2

Observed together, Tables 2, 4 and 6 show that there is a tendency for firms to operate with certain debt levels for a long time. In cases of sharp financing demands, the levels tend to rise sharply as well, but quickly followed by declines. By explanation, the rises are a temporary phenomenon in companies who prefer operating with low levels, thus triggering backward adjustments when conditions are favourable.

Table 6 is extracted from Panel B of Table 2. It shows the relative weights of equity and debt in the financing for additional assets. The totals column is a control. It stipulates that assets are solely financed by equity and debt, to disagree with the explanation given to the 'error' term in OLS based research (see for instance Ntui, 2013). The implication here is that the value of the assets is data driven for accounting purposes, rather than being variable driven.

Table 6. *Trend coefficients of Equity and Debt in financing additional assets.*

Regression Coefficients					
Company	**ΔEquity**	**R^2**	**ΔL**	**R^2**	**Total ΔEquity and ΔDebt**
TOL	0.6717	0.7756	0.3219	0.3853	0.9936
ACACIA	0.8912	0.9999	0.1073	0.9933	0.9985
National Media G	0.8994	0.9026	0.1831	0.2887	1.0825
SWISS Port	0.8005	0.6737	0.1993	0.1134	0.9998
Tanga Cement	0.3183	0.4701	0.5148	0.6101	0.8331
Twiga Cement	0.5725	0.9332	0.4275	0.8861	1
EABL	0.6864	0.8971	0.0566	0.3626	0.743
TATEPA	0.4321	0.815	0.5643	0.805	0.9964
Tanzania Cigarrete Co.	0.7072	0.4624	0.0703	0.1398	0.7775
TBL	0.6816	0.6599	0.3132	0.2736	0.9948
Precission Air	0.1524	0.7692	0.8606	0.9811	1.013
K/Air Ways	0.142	0.6037	0.8581	0.9821	1.0001

Table 7. *Dividend Payment in the last Five Years.*

Company	2013	2012	2011	2010	2009
TOL	-	-	-	-	-
ACACIA	-	-	-	-	-
National Media G	v	v	v	v	v
SWISS Port	-	-	-	-	-
Tanga Cement	-	-	-	-	-
Twiga Cement	-	-	-	-	-
EABL	-	-	-	v	v
TATEPA	-	v	-	-	-
Tanzania Cigarette Co.	-	-	-	-	-
TBL	-	-	-	-	-
Precision Air*	-	-	-	-	-
K/Air Ways[!]	2007-	2006-	2005v	2004v	2003v

*Display accumulated losses.
!Data available for the period 2003-2007.

Table 6 presents the proportions of the use of equity and debt in the financing for additional assets. Except for four companies, Tanga Cement, Tatepa, Precission Air and Kenya Airways, the rest demonstrate more reliance on equity than debt to finance additional assets. In conjunction with Tables 2 and 5, the same companies show that they are highly leveraged throughout. They have an average of debt ratio well above the weighted average of 23%, which explains why they should rely on debt for additional assets. Tanga Cement however stands out. At an average debt ratio of 14% (Table 5), the company was quick to revert to her preferred low leverage even after seeking external financing in two occasions (Table 2 Panel A).

Table 7 is a display of the dividends payment pattern of the DSE listed companies.

The following observations are made from the raw data supported by the Tables 2 and 7 evidence.

TOL and TATEPA both have high debt ratios (Table 2 Panel A), they have no history of paying dividends (Table 7), and they have depleted retained earnings in addition to debt. There is no available information on what came first: the use of retained earnings then debt or vice versa.

For Tanzania Breweries, the company depleted retained earnings and other reserves in the subsequent years after borrowing to reduce debt.

The story for Tanga Cement is such that the debt ratio in 2005 shot up to 31% not due to increased borrowing, but a decrease in retained earnings, therefore net assets. The second sharp rise was due to an increase in debt. The company financed its assets with debt while retained earnings continued to soar up. Given the data before, the attained level of 27% is predictably temporary.

Precision Air suffered losses and has a heavy dependence on debt.

Common to all with the exception of NMG is that paying dividends is not a compelling issue to the companies. This is

not explained from the data.

From the Companies' statements, TATEPA and East Africa breweries had acquired non debt means of financing which the companies reduced before paying off debt.

3. Findings and Discussion

The findings of the study are aligned along the three main problems identified in Sections 1.1.2 to 1.1.4. The first problem addressed is the introduction of the error term in the new equation. The findings from Table 6 show that a valid model specification should lead to the balancing of the volume of additional assets in relation to the aggregate volume of financing sources. This is proved by the control column where the sum of the proportions of ΔEquity and ΔDebt in the added assets is near 1.

The finding in relation to the second problem follows immediately after the first finding that, the *new accounting equation* has no practical validity, after it has been seen from Table 6 again that the volume of assets is data driven and not variable driven. That being the case, the coefficients of C and L in the standard accounting equation is always 1. That is, A= C + L prevails.

The findings pertinent to the third problem are in agreement with empirical literature reports of other places in many aspects. Firms listed on DSE prefer internal to external financing. No evidence of convergence to moderate debt ratios as reported elsewhere in empirical literature such as Myers [10], but observed was a tendency of inertia. Firms tend to adjust back to low debt ratios when temporarily moved away upward. This supports the trade-off theory simplistically observed in practice as the existence of a target low leverage level. There is no evidence of striving to take advantage of tax shield as the logic of the trade-off theory according to Modigliani [11] would suggest. This keeps open the question on what determines optimality in the target capital structures adopted by firms. Neither has this study been able to address that question until the other work in progress by this same researcher, where the spirit underlying the decisions is allowed to surface.

In relation to the pecking order theory, the findings of this study project an interesting scenario in that, firms fulfilled their additional assets financing needs from borrowing, then afterward using retained earnings and other reserves to reduce the debt to the levels they were comfortable with. The finding here is such that retained earnings and reserves are used to adjust for the desired equilibrium state of the debt ratio. That means, the short term pecking order is different from the long-term pecking order which emerges out of the adjustment process. Where the reserves are not enough to expel the whole lot of undesired debt, the remaining debt factor should be thought of as the next in the perking order. It is therefore retained earnings, then borrowing. The issue of new equity was not observed at all. This is a non-viable option since the respective firms have no record of paying out dividend.

In the end it is observed that the use of OLS methodology will not work because the decision to borrow or not is not driven by time series or growth of assets. It is an instance dependent on the circumstances prevailing at the time, thus data driven rather than variable driven. A modification to OLS is suggested to yield a dynamic predictive model for asset financing decisions, where lagged variables are considered as further elaborated below.

3.1. The Proposed Dynamic Modelling Approach

This paper suggests for the distinction between accounting for capital, and capital structure decision, thus proceeding to suggest for a rigorous dynamic model that has predictive capabilities.

To accommodate the dynamics perspectives in the capital structure of firms, the models that deploy regression analysis work better with lagged explanatory variables. The variables allow for the transmission time of current states into decisions for future capital structure. This is supposed to capture the dynamism in the firms' decision on capital structure as also observed by Qian, Tian and Wirjanto [14].

For accounting purposes assets should equate to the sum of financing resources. That is, A=C+L is an identity. What does this tell us? Simply stated, assets will increase (decrease) by the same measure as the aggregated increase (decrease) in capital and liabilities. If liabilities and capital increase by $1 in aggregate, assets will also increase by $1 and so on.

In decision making processes, historical and forecast factors have to be considered. That then leads to the model specification that is a proxy for capital composition, in which case, considering decisions for one period ahead, the financing decision function would be specified as: (*lagged variables are to be considered*)

$$A_t = f\ (C_{t-1},\ L_{t-1},\ \text{other factors}) \qquad (1)$$

Where: A_t refers to the level of assets in period t

C_{t-1} refers to capital invested in the period precedent to t

L_{t-1} refers to liabilities in the period precedent to t; and

Other factors imply the factors determined by investment opportunities such as economic conditions, interest rates etc.

3.2. The Approach

If a company foresees an investment opportunity of the magnitude θ, let ΔA_t be the additional asset level required to exploit that opportunity. Then the company has to decide on the financing for the additional assets on the basis of available options and prevailing conditions deriving from antecedent factors.

Making assumptions on the financing for additional assets, using retained earnings or reserves will be simply transforming the form of assets. Thus ΔC_t is here used to depict the transformed assets and not added capital, where $\Delta C_t = f(\delta C_{t-1})$. The other option is borrowing, where additional borrowing is $\Delta L_t = f\ (\delta L_{t-1})$. The assumption on ΔC_t and ΔL_t is that the two variables are dependent on the scenario factors antecedent to time *t* expressed as δC_{t-1} and δL_{t-1} respectively. The factors are stated as the proportions of equity and debt in the assets, or the prevalent capital structure.

Therefore,

$$\Delta A_t = f(\delta C_{t-1}| + \delta L_{t-1}|), \quad (2)$$

where δC_{t-1} and δL_{t-1} are derivative functions conditional to the debt ratioin period *t-1* ie.

Thus the specified function *(2)* uses lagged variables of C and L. The conditionals are designed to capture antecedent factors, assumed to be captured in the inertia debt ratio of equation (2).

Therefore, regression can be applied on these lagged variables as follows

$$\Delta A_t = \alpha C_{t-1} + \beta L_{t-1} + \varepsilon \quad (3)$$

Where the error term ε is used to capture financing based on the issue of stock as the last option in the row.

In essence, the prediction on the proportions of capital and liabilities in the additional assets is better served by the conditional coefficients of lagged variables in OLS as opposed to using panel data magnitudes. It is equally important to take note that the analysis should be case based, because different conditions exist for each case. This deifies the use of aggregates.

4. Conclusions

The principal argument of this paper was focussed in three dimensions: (1) to interrogate the applicability of the new *form of accounting equation*; (2) to test the validity of the estimated parameters for capital and liabilities in the model; and (3) to test for the evidence of the trade-off and pecking order theories of corporate finance. Appended to the argument was a task to suggested and specify a predictive model for added-assets financing decisions.

The conducted test revealed that the new accounting equation is not pragmatically viable, and that the regression analysis based estimates for capital and liabilities suffer problems of aggregation. A dynamic model based on lagged variables was specified to operationalize dynamics in the capital structure decisions. It was demonstrated in the model that conditional coefficients of lagged variables in OLS should account for antecedent factors information using the stable debt ratio as its proxy.

Finally, the trade-off and pecking order theories are not mutually exclusive, and can be demonstrated to exist in the long-run analysis of data. The trade-off characteristics were exhibited between borrowing and equity, where equity was persistently used to reduce borrowing to certain desired low levels, but not to capture tax-shield benefits. This leaves a research gap for investigating why is tax exemption not an incentive for borrowing in the cases involved. The pecking order characteristics were exhibited in the long term adjustments, where retained earnings and reserves were seen to be preferred in financing for additional assets followed by debt in cases of deficiency.

The depth of the observations made is limited by the fact that there is a lack of company intensity by industry on the listing of DSE, which makes it impossible to obtain industry characteristics affecting asset financing decisions. On the other hand, DSE is an emerging market, which provides a very shallow duration of companies and time series data. This limits the observations and conclusions for long term characteristics that are very important for theorizing fundamentals.

In addition to investigating for lack of motive to exploit tax exemption on borrowing, there is a need to research on empirical support for the specified dynamic model and developing others for predictive purposes.

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