Econometric Analysis On The Contribution Of Financial Structure To Value Creation In A Company: Case Of Portfolio Companies In The DRC From 2018 To 2023

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Abstract: This article discusses the impact of the financial structure of public enterprises in the Democratic Republic of Congo (DRC) on their ability to create value. According to Law No. 08/010 of July 7, 2008, which sets the rules for the organization and management of the State's portfolio, public enterprises are defined as any company in which the state or any public legal entity holds all or the majority of shares. These enterprises are essential for the country's economic development but face financial difficulties due to ineffective management and excessive debt, as demonstrated by the case of Gécamines.

The Congolese government has implemented reforms to improve governance and encourage recapitalization. The study aims to analyze how financing choices, whether internal or external, influence the strategic and operational decisions of public enterprises while identifying key factors in their financial structure that affect performance. By using a methodology that combines documentary analysis, surveys, and statistical analyses, the author seeks to provide practical recommendations for optimizing financial management and enhancing the contribution of public enterprises to the country's economic development.
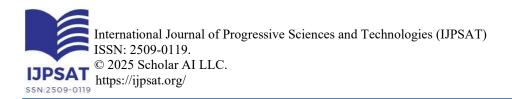
Keywords: Financial structure and value creation.

I.   Introduction

Under Law No. 08/010 of 7 July 2008 establishing the rules relating to the organisation and management of the State Portfolio, public enterprises are defined as any company in which the State or any legal entity under public law holds all or the absolute majority of the shares or corporate interests [1]. They play a crucial role in the country's development by providing essential services in sectors such as energy, mining, finance, transport and telecommunications.

However, a lot of them like GÉCAMINES, SNEL, RVA, etc. face serious difficulties because of ineffective management and high debt, which has had a detrimental financial impact. In response, the Congolese government has started reforms to promote

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[1] *Democratic Republic of Congo (2023). Ministry of Portfolio - Ministry of Budget: report on the consolidated financial situation of public enterprises, financial year 2021*

recapitalization and enhance governance, emphasizing the significance of a strong financial structure for these businesses' long-term viability and their role in the nation's economic growth[2].

How DRC public enterprises may efficiently fund their operations and investments to ensure their long-term existence is the primary focus of the study subject. These companies often lack the ability to fully rely on their own internal resources; therefore, they must seek outside capital from banks and financial markets[3].

Selecting the right financial structure is crucial since it can improve overall performance and profitability. This study looks at how internal and external funding decisions affect strategy choices while identifying the major elements that influence value generation and performance in publicly traded organizations[4].

According to the theories put forth, value creation is greatly influenced by a well-structured financial approach, with a focus on the advantages of self-financing as opposed to an over-reliance on debt. By tackling these problems, the study aims to offer useful suggestions for enhancing the financial administration of Congolese public businesses, enhancing their function as catalysts for social and economic transformation in the nation[5].

II. Literature review

II.1. Theoretical review

II.1.1. financial structure

II.1.1.1. Definitions

"The combination of net bank and financial debts and equity capital to which it resorts for its financing" is the definition of the company's capital structure, also known as its financial structure. According to Elie COHEN, the term "financial structure" is mainly used to describe the idea that a company's balance sheet is more than just a list of outstanding amounts or a contingent superposition of different parts. It consists of important connections and advantageous modifications between the asset's constituent parts[6].

II.1.1.2. Hypotheses of Modigliani and Miller (1958)

The first paper to discuss the theoretical analysis of capital structure was written by Modigliani and Miller in 1958. According to these two authors, it has been demonstrated that capital structure has no bearing on the firm's value, meaning that all financing options are equal in the scenario of ideal financial markets[7].

Their model makes the following assumptions: the financial market is perfect; bankruptcy costs do not exist; taxes are not considered; actors' information is symmetrical; loans and borrowings between economic actors are at a fixed and unlimited rate; and managers run businesses in the best interests of shareholders. But as these presumptions were gradually questioned, a number of elements affecting the financing structure were identified, allowing the notion that the capital structure was unimportant to be rejected.

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[2] Kabemba, C. (2019). Reforming State-Owned Enterprises in the DRC: Challenges and Opportunities. Journal of African Political Economy, 24(4), 410-425.
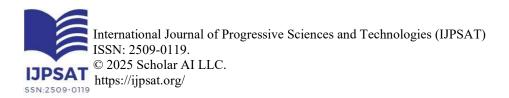
[3] Mugisha, J. (2018). Financial Structure and Performance of Public Enterprises in Developing Countries. Journal of African Business, 19(3), 345-360.

[4] Modigliani, F., & Miller, M.H. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. American Economic Review, 48(3), 261-297.

[5] Berger, A.N., & Udell, G.F. (1998). The Economics of Small Business Finance: The Roles of Private Equity and Debt Markets in the Financial Growth Cycle. Journal of Banking & Finance, 22(6-8), 613-673.

[6] Elie COHEN.; "Financial Analysis", Edition Economica; 6th edition Paris; 2006, P.203

[7] Modigliani and Miller (1958) ont publié leur théorie dans The Cost of Capital, Corporation Finance and the Theory of Investment (American Economic Review)

II.1.1.3. The Trade Off Theory

Two opposing ideas that can be balanced form the foundation of the optimal debt theory. The tax advantages of debt are one side of the issue. Moreover, there are the expenses related to bankruptcy and agency charges, which are conflicts of interest between economic agencies. To achieve the optimal ratio, the company adjusts its current debt level. When a new unit of debt's marginal benefit equals its marginal cost, this level is reached[8].

i.   The influence of taxation

The impact of debt on taxes is the subject of the first hypothesis. Modigliani and Miller (1963) demonstrated that interest costs on debt are tax deductible, enabling a company with debt to be worth as much as a company without debt as long as it makes a profit. This implies that a capital structure with a large amount of debt would be preferable. But Miller (1977)[9] contested this tax benefit, claiming that the capital structure became neutral with the introduction of income tax.

Graham (2000) estimated that the average value of this tax benefit was 9.7% before personal income tax and 4.5% after. Moreover, De Angelo and Masulis (1980) [10]indicated that non-debt tax deductions, such as depreciation, can offset the tax benefits of debt, thus decreasing its attractiveness. Studies by Ozkan (2001) [11], Huang and Song (2006) [12], and Fattouh et al. (2008) [13]also show that these non-debt tax deductions have a negative impact on firms' debt levels.

ii.   Cost of bankruptcy

While having debt gives you the chance to save money by deducting interest from your taxes, having too much debt causes expenses because it may make things more difficult financially and even lead to bankruptcy. As stated by Malécot (1984)[14], Bankruptcy results in both direct costs (court administration, liquidation, and social costs) and indirect costs (disadvantages, loss of clients and confidence).

According to Warner (1977)[15], Compared to small businesses, large corporations seem to be less affected by the direct expenses of bankruptcy. However, both small and large businesses must consider indirect costs. Philippon and Almeida (2007)[16]estimated the value of bankruptcy costs at 4.5%. According to this viewpoint, the ideal capital structure is reached when the present value of the expenses associated with financial troubles equals the tax savings. As a result, the company can no longer take out as much debt as it once could in order to take advantage of the tax advantages.

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[8]*Mazen Kebewar. Capital structure and its impact on profitability and labor demand: theoretical and empirical analyses on French panel data. Economics and Finance. University of Orléans, 2012 .*

[9] [9]*MILLER, Merton H. Debt and taxes. the Journal of Finance, 1977, vol. 32, no. 2, p. 261-275.*

[10] *DE ANGELO, Harry. masulis, R. W. (1980). Optimal capital structure under corporate and personal taxation. journal of financial economics , vol. 8, p. 3-29.*

[11] *OZKAN, Aydin. Determinants of capital structure and adjustment to long run target: evidence from UK company panel data. Journal of business finance & accounting , 2001, vol. 28, no. 1-2, p. 175-198.*
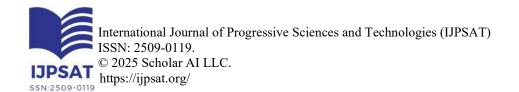
[12] *Huang, G. and Song, FM (2006) The Determinants of Capital Structure: Evidence from China. China Economic Review, 17, 14-36.*

[13] *FATTOUH, Bassam, HARRIS, Laurence, and SCARAMOZZINO, Pasquale. Non-linearity in the determinants of capital structure: evidence from UK firms. Empirical Economics, 2008, vol. 34, p. 417-438.*

[14]*MALECOT, Jean-François. Financial Theory and Bankruptcy Costs. 1984. Doctoral Thesis. State Doctoral Thesis, University of Rennes I.*

[15]*WARNER, Richard. The relationship between language and disease concepts. The International Journal of Psychiatry in Medicine , 1977, vol. 7, no. 1, p. 57-68.*

[16]*ALMEIDA, Heitor and PHILIPPON, Thomas. The risk-adjusted cost of financial distress. The Journal of Finance, 2007, vol. 62, no. 6, p. 2557-2586.*

II.1.1.4. Determinants of the financial structure

The financial structure of your business should be tracked using a number of indicators. These include all of the data from an income statement or balance sheet. Among these indications are :

- *THE working capital requirement (WCR)*

A business must pay for commodities, salaries, and other expenses in order to generate. Only once the customer has made the payment will it get the money. The WCR is the amount of the difference between operating cash inflows and outflows[17]. This is the sum that a business must use to cover its costs in the event that its clients have not yet paid. Its formula is provided by :

$$BFR = Stocks + en-cours + comptes\ clients - d\hat{u}\ aux\ fournisseurs - acomptes\ clients$$

- *THE global net working capital (GNWC)*

Working capital (WC) or net working capital (NTWC) is a key variable that highlights a company's financing policy. It helps to verify the balance of its financial structure [18]. It is the amount that the company has to finance its employees, suppliers and expenses while waiting for payment from its customers. It is calculated as follows:

$$Fonds\ de\ roulement\ (FRNG) = Actifs\ \grave{a}\ court\ terme - Passifs\ \grave{a}\ court\ terme$$

Positive working capital occurs when stable resources outweigh sustainable uses. Working capital is zero when sustainable uses and stable resources are equal. The company's most concerning condition is negative working capital, which occurs when sustainable investments are not entirely funded by comparable resources.

- *There net cash flow (NC)*

The quantity of money that the business has on hand in the near future is referred to as the "cash on hand" balance. Since it shows a company's capacity to pay short-term debts, it is one of the financial indicators of its health[19]. It is expressed by :

$$Tr\acute{e}sorerie\ nette = FRNG - BFR$$

If your net cash flow is more than zero, your financial status is deemed "healthy." If your net cash flow is negative, it means that your company does not have enough funds to run efficiently in the near future. When your net cash flow is zero, any unexpected event like an unpaid invoice, for instance can lead to financial difficulties for your company.

- *THE break-even point (BTP)*

The amount of income needed by a business to pay all of its costs and turn a profit is known as the break-even point (BTP). The margin that was acquired is used to compute it. To pay for a company's fixed expenditures, this process entails subtracting the volume of sales and the resulting expenses from the revenue[20]. It is stated as :

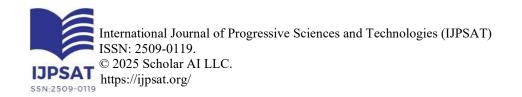$$SR = \frac{CF^{[21]}}{\textbf{Taux de marge sur co\^uts variables}}$$

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[17] https://www.egee.asso.fr/IMG/pdf/L_Interpretation_d_un_bilan_-_M-Coignard_02-06-2015.pdf , *consulted on 11/13/2024.*

[18]*Thibaut Clermont (2016). Total net working capital (TNWC): definition, calculation and interest*

[19]*Marion Gobourg (2024). Net cash flow: definition, calculation and interpretation.*

[20] Horngren, C. T., Datar, S. M., & Rajan, M. V. (2015). Comptabilité de gestion (14e éd.). Pearson.

[21] *Fixed charges*

- *There commercial margin*

The company's performance in trade, which serves as the primary source of funding for circulation costs, is indicated by the commercial margin, which also shows how efficiently operations are carried out. Utilizing the "direct-costing" method in economic-financial analysis allows the commercial margin to have an impact on the economic-financial balance[22]" approach. This is how it is computed :

$$Marge\ commerciale\ =\ chiffre\ d'affaires\ HT\ -\ achats\ HT\ consommés$$

- *surplus (EBE)*

This is the capacity of a business to produce financial resources. Before accounting for financial and exceptional outcomes, depreciation, amortization, provisions, and taxes, EBITDA evaluates the economic performance of the business. It is provided by :

$$EBE = Chiffre\ d'affaires\ -\ Achats\ consommés\ -\ Consommations\ en\ provenance\ de\ tiers$$
$$+\ Subventions\ d'exploitation\ -\ Charges\ de\ personnel\ -\ Impôts\ et\ Taxes$$

- *Self-financing capacity (CAF)*

As its name suggests, it is the set of resources generated by the company that will allow it to ensure its financing independently. Self-financing capacity (SFC) defines the potential of a company to generate resources through its activity. It is an internal resource that the company can use to finance new investments or to distribute dividends to its shareholders[23]. It is calculated as follows :

$$Capacité\ d'autofinancement\ (CAF)\ =\ produits\ encaissables\ -\ charges\ décaissables$$

These indicators allow you to create a database that can be used to assess the health of your business. They facilitate the evaluation of a company's growth capabilities and provide a means of detecting any type of dysfunction.

II.1.2. Theoretical approach to value creation

II.1.2.1. Definitions

Value creation, according to Félix Bogliolo (2001) in his book La création de valeur, is a thorough process that includes all of a company's stakeholders. He asserts that value creation includes not only financial prosperity but also investor communication, staff engagement, and customer happiness. In order to promote unity among various stakeholders, he highlights the significance of having a consistent vocabulary around value creation[24].

Jeremy Talon provides a useful approach to evaluating and assessing a business's products in his book Value Creation: A User's Guide. He highlights that maximizing performance requires finding all potential for value creation and that value creation must be at the core of corporate strategies. Additionally, Talon presents the DISECT paradigm, which aids in organizing value thinking in the creation of goods and services[25].

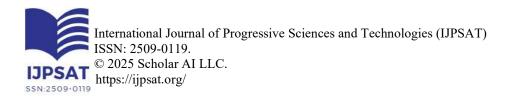[22]*The "direct-costing" method is the continuation of the formation of the result of the company's operation in commerce by the correlation that there is between the circulation expenses highlighted by the variable and fixed expenses and of course the turnover. It is the calculation of the difference between the amount of sales of goods and their purchase cost. These margins are calculated excluding taxes.*
[23]*GUEUTIN, Claire-Agnès. Fact Sheet 10. Self-financing capacity. Fact Sheets, 2022, vol. 3, pp. 77-81.*
[24]*Bogliolo, F. (2001). The creation of value. Éditions Eyrolles.*
[25]*Talon, J. (2020). Value Creation: How to Use It. Pearson.*

II.1.2.1. Measures of value creation in a company

Value creation refers to the increase in a company's value over time, resulting from its operational activities and strategic decisions. It can be measured through various financial and non-financial indicators.

Financial indicators

- *Economic value added (NPV)*

Formally, EVA is deduced from the following equation:

$$EVA = (ROIC - CMPC) \times CI,$$

Or :

- ROIC, is the operating return on invested capital,
- CMPC, the weighted average cost of debt and equity and where
- CI are the investments made [26].

Operating profitability surpasses the cost of the capital supplied when EVA is positive, meaning the business generates wealth for its lenders. A negative EVA means that the company destroys value at the expense of more profitable strategic or operational decisions, and the performance is below market expectations for the risk class the company is in. There is neither value creation nor destruction in the extremely rare instance of a zero EVA; profitability is only sufficient to satisfy the demands of the fund lenders. Every one of the three EVA concepts merits explanations and arguments.

- *Return on Equity (ROE)*

ROE measures the return on equity invested by shareholders. It is calculated as follows:

$$ROE = \frac{R\acute{e}sultat\ net}{Capitaux\ propres} * 100$$

A high ROE indicates that the company is using shareholders' funds efficiently to generate profits[27].

Market Indicators

- *Enterprise Market Value (EMV)*

MVE represents a company's market capitalization, calculated as the share price multiplied by the number of shares outstanding. A growing MVE is often an indicator of value creation.

- *Price/Earnings Ratio (P/E)*

The P/E ratio compares a company's stock price to its earnings per share. A high P/E may indicate that the market anticipates strong future growth, signaling expected value creation.

Non-Financial Indicators

- *Customer Satisfaction*

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[26]DENGLOS, Gregory. The "EVA-MVA" Value Creation Model: Presentation, Adjustments, and Reformulations. La Revue des Sciences de Gestion, 2005, no. 3, pp. 43-60.
[27]Ross, S.A., Westerfield, R.W., & Jaffe, J. (2016). Corporate Finance. McGraw-Hill Education.

Customer satisfaction can be measured through surveys and feedback. Satisfied customers often lead to loyalty and referrals, contributing to long-term value creation.

- *Innovation and Sustainable Development*

Value creation can also be indicated by investments in sustainable practices and innovation. A business can improve its market position and draw clients by innovating and implementing sustainable activities. It is crucial to evaluate these indicators holistically, accounting for the company's values, strategic goals, and economic environment, for a thorough study. This assessment can also be supplemented with tools like SWOT analysis (strengths, weaknesses, opportunities, and threats[28]).

II.2. Empirical review

Mupier (2024)[29] identified a deficit in the strategic planning of public enterprises, affecting their resource management. He recommends a restructuring of governance to improve resource allocation. Ikoko Mbuta (2012)[30] also highlights the importance of transparent governance to foster the development of public enterprises. Lavaud (2020)[31] conducted a financial analysis of the National Electricity Company (SNEL), revealing a deficient financial structure that impacts its profitability, and calls for financial restructuring to ensure its viability.

Other studies, such as Bokanga (2021)[32], show that firms with a balanced financial structure perform better, while Ngoy and Kambale (2023)[33] highlight that poor financial management and lack of investment are major problems for state-owned enterprises. Mokolo and Ngoy (2019)[34] highlight that SMEs that diversify their sources of financing are more successful in creating value. Finally, Kakule and Tshibanda (2020)[35] identify lack of access to credit as a major challenge for state-owned enterprises, while Tshibanda and Ngoy (2022)[36] confirm that effective financial management is correlated with better economic performance.

III. Research methodology

III.1. Description of variables

This study will be carried out using annual data gathered from the financial statements of various organizations (REGIDESO, SNEL, COHYDRO, GECAMINES, SOSIDER, and RVA) between 2018 and 2023. Additionally, it should be mentioned that the

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[28] Barney, J. B., & Hesterly, W. S. (2019). Strategic Management and Competitive Advantage: Concepts and Cases (6th ed.). Pearson.

[29] Mupier, J. (2024). Déficit dans la planification stratégique des entreprises publiques et ses effets sur la gestion des ressources. Revue Congolaise de Gestion Publique, 12(1), 45-62.

[30] Ikoko Mbuta, P. (2012). La gouvernance transparente comme levier de développement des entreprises publiques en RDC. Mémoire de Master, Université de Kinshasa.

[31] Lavaud, F. (2020). Analyse financière de la Société Nationale d'Électricité (SNEL) : structure financière et rentabilité. Rapport de recherche, Institut Supérieur de Commerce de Kinshasa.

[32] Bokanga, M. (2021). Impact de la structure financière équilibrée sur la performance des entreprises publiques en Afrique centrale. Journal Africain de Finance et Management, 8(3), 120-138.

[33] Ngoy, T., & Kambale, L. (2023). Gestion financière et investissement dans les entreprises publiques congolaises : enjeux et perspectives. Revue de l'Économie Congolaise, 15(2), 78-95.

[34] Mokolo, J., & Ngoy, T. (2019). Diversification des sources de financement et création de valeur dans les PME en RDC. Cahiers de l'Entrepreneuriat Africain, 5(1), 33-50.

[35] Kakule, R., & Tshibanda, M. (2020). L'accès au crédit : un défi majeur pour les entreprises publiques en RDC. Études Économiques Congolaises, 11(4), 101-118.

[36] Tshibanda, M., & Ngoy, T. (2022). Gestion financière efficace et performance économique des entreprises publiques : étude empirique en RDC. Revue de Gestion et Développement, 9(2), 56-72.

variables are assessed in US dollars when expressed in absolute terms. It is helpful to remember that our variables are divided into two groups : control variables and variables of interest.

III.1.1. *Variables of interest*

According to Bawawana (2021), the variable of interest is one that is the subject of a study. It has to do with FRNG, RE, ROE, VA, and ROA. We have selected VA as a financial structure proxy variable, ROA, ROE, FRNG, and RE as value creation proxy variables for this purpose.

- ❖ *ROA* **:** This indicator assesses how efficiently a company uses its assets to generate profits ;
- ❖ *GO* **:** Value added measures the wealth created by the company during its activity. It is calculated as the difference between turnover and intermediate consumption ;
- ❖ *Return on Equity (ROE)* : Measures the return on equity invested by shareholders. This indicator is essential for assessing a company's profitability in relation to its equity .
- ❖ *FRNG* (Total Net Working Capital): This is a crucial financial indicator that measures a company's liquidity, reflecting its ability to cover its short-term obligations with its short-term assets.
- ❖ *ER* (Debt Ratio): This is a financial indicator that measures the proportion of a company's debt to its equity or total assets. It is used to assess a company's level of financial risk, indicating the extent to which it relies on borrowing to finance its operations and growth.

III.1.2. *Control variables*

Control variables are those that have no direct bearing on value production or financial structure. Their sole purpose is to enhance the panel VAR model's capacity to describe economic activity. They were chosen using the body of empirical research as a guide.

- ❖ *Cash Flow* : calculates the amount of money the business makes after operating costs are covered. When evaluating a company's capacity to fund expansion, pay off debt, and pay dividends, free cash flow is essential.
- ❖ *Total Shareholder Return (TSR)* : assesses the overall return to shareholders, taking into account both dividends and share price growth. It is a crucial sign of how well a business is doing on the stock market.

The following table summarizes the variables used in the panel VAR model, giving a brief description of each and the source from which the data were drawn.

Table 3.1: Variables of econometric models

Variables	Description	Sources
ROA	Retour sur actif	états financiers
ROE	Return on equity	états financiers
VA	Valeurs ajoutée	états financiers
FRNG	Fond de roulement net global	états financiers
RE	Ration d'endettement	états financiers
CF	Cash Flow	états financiers
TSR	Total Shareholder Return	états financiers

Source : the author, using the results collected from the investigations.

3.1.2. Econometric model

3.1.2.1. *VAR panel modeling: theoretical element*[37]

3.1.2.1.1. *Mathematical form*

Let's consider a VAR(p) on a bivariate case (2 variables: y and x)

$$\begin{cases} Y_{ti} = \Pi_1 + \Phi_{111}Y_{ti-1} + \Phi_{112}X_{ti-1} + \Phi_{211}Y_{ti-2} + \Phi_{212}X_{ti-2} + \ldots + \Phi_{p11}Y_{ti-p} + \Phi_{p12}X_{ti-p} + \varepsilon_{1ti} \\ X_{ti} = \Pi_2 + \Phi_{121}Y_{ti-1} + \Phi_{122}X_{ti-1} + \Phi_{221}Y_{ti-2} + \Phi_{222}X_{ti-2} + \ldots + \Phi_{p21}Y_{ti-p} + \Phi_{p22}X_{ti-p} + \varepsilon_{2ti} \end{cases}$$
… **[1]**

Φ_{pij} : p (shift), i (differentiates the coefficients of variables between equations) and j (differentiates the coefficients between variables in the same equation).

If we pose:

$\mathbf{Y_t} = \begin{pmatrix} Y_t \\ X_t \end{pmatrix}, \Pi = \begin{pmatrix} \Pi_1 \\ \Pi_2 \end{pmatrix}, \Phi_p = \begin{bmatrix} \Phi_{p11} & \Phi_{p12} \\ \Phi_{p21} & \Phi_{p22} \end{bmatrix}$ and $\varepsilon_t = \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix}$; then, we can write the VAR(p) model (Cfr system [1]) in its general form as follows:

$$Y_t = \Pi + \sum_{i=1}^{p} \Phi_i Y_{t-i} + BM_t + \varepsilon_t \ldots [2]$$

Or

$Y_t = (Y_{1t,\ldots,}Y_{kt})$: Vector of "k" endogenous variables, where each variable constitutes an equation or variable whose value is given (found) by the system. This system [1] is called autoregressive because each variable depends on its own lagged values (Y_{t-i}), in addition to those of the others, whose optimal lag "p" (for all variables) constitutes the order of the var model studied. Certain criteria are used to determine the optimal lag of the var (aic, sic, hannan-quin, etc.).

$\Pi = (\Pi_{1,\ldots,}\Pi_k)$: Vectors of "k" constant terms of the system.

$\Phi = (\Phi_{11,\ldots,}\Phi_{kk})$: Square matrix of order "kxk" of coefficients.

B: Vectors of coefficients associated with any exogenous variables (M_t) that we insert into the model.

Let us note: $\Phi = \sum_{i=1}^{p} \Phi_i$; $L^i = Y_{t-i}$, the expression **[2]** is written: $(1 - \Phi)(1 - L^i)Y_t = \Pi + BM_t + \varepsilon_t$. If we also pose:

$$\Phi(L) = (1 - \Phi)(1 - L^i)$$

and that we admit that: $\Phi(L) = l_k - \Phi_1 - \Phi_2 - \cdots - \Phi_p$, the expression **[2]** also becomes:

$$\Phi(L)Y_t = \Pi + BM_t + \varepsilon_t \ldots [3a]$$

Which corresponds to:

$$Y_t = \left(\Phi(L)\right)^{-1}\Pi + \left(\Phi(L)\right)^{-1}BM_t + \left(\Phi(L)\right)^{-1}\varepsilon_t \ldots [3b]$$

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[37]*Jonas, K., (2018), The Structural VAR Model: Elements of Theory and Practice on Software. DEA-PTC Economics/Unikin in progress, CREQ*

Expression **[3b]** above is a moving average representation of the VAR(p) to infinite order $(MA(\infty))$. The estimated parameters of the VAR(p) are:

$\text{E}(Y_t) = (\Phi(L))^{-1}\Pi + (\Phi(L))^{-1}BE(M_t)$: In case the exogenous variables are incorporated;

$\text{E}(Y_t) = (\Phi(L))^{-1}\text{Pi}$: In case the exogenous variables are not included in the model.

Note that $\text{E}(Y_t)\exists$iff $(\Phi(L))^{-1}\exists$; and for $(\Phi(L))^{-1}\exists$, the stationarity conditions must be respected.

The parameters of the reduced VAR(p) (see expression [3b]) can be estimated by Ordinary Least Squares/OLS (or Ordinary Least Square/LS or OLS), provided that the hypotheses underlying the use of this estimation method are validated (the residuals must be stationary: normality, absence of autocorrelation, homoscedasticity).

In the case of autocorrelation of errors (since the equations are linked together by the errors: we will see this below), we can use the robust procedure (it corrects the autocorrelation and heteroscedasticity) or the SUR (Seemingly Unrelated Regression) method.

To better understand the identification question and the operating mode of the VAR (interdependence between variables), consider a VAR (1) constructed with two variables "y and x" as follows (we are talking about the primitive form):

$$\begin{cases} Y_t = b_{10} + b_{11}X_t + b_{11}Y_{t-1} + u_t \\ X_t = b_{20} + b_{21}X_t + b_{22}X_{t-1} + v_t \end{cases} \dots [4], \text{ avec } u_t \sim iid\,(0, \sigma_u^2)\ et\ vt \sim iid\,(0, \sigma_v^2)$$

Expression **[4]** as written assumes the existence of simultaneous effects between variables, captured by the structural coefficients "b_{11} and b_{21}" introduced in the model. Also, we can verify that these equations are correctly identified, which will allow us to find or estimate the parameters of the reduced form of var (1) above. To find this reduced form, let us start by expressing the structural equations of relation [4] in matrix form as follows:

$$\begin{pmatrix} Y_t \\ X_t \end{pmatrix} = \begin{pmatrix} b_{10} \\ b_{20} \end{pmatrix} + \begin{vmatrix} 0 & b_{11} \\ b_{21} & 0 \end{vmatrix}\begin{pmatrix} Y_t \\ X_t \end{pmatrix} + \begin{vmatrix} 0 & b_{12} \\ b_{22} & 0 \end{vmatrix}\begin{pmatrix} Y_{t-1} \\ X_{t-1} \end{pmatrix} + \begin{pmatrix} u_t \\ v_t \end{pmatrix} \dots [5a]$$

After grouping or rearrangement, we can write:

$$\begin{vmatrix} 1 & -b_{11} \\ -b_{21} & 1 \end{vmatrix}\begin{pmatrix} Y_t \\ X_t \end{pmatrix} = \begin{pmatrix} b_{10} \\ b_{20} \end{pmatrix} + \begin{vmatrix} 0 & b_{12} \\ b_{22} & 0 \end{vmatrix}\begin{pmatrix} Y_{t-1} \\ X_{t-1} \end{pmatrix} + \begin{pmatrix} u_t \\ v_t \end{pmatrix} \dots [5b]$$

If we set: $A = \begin{vmatrix} 1 & -b_{11} \\ -b_{21} & 1 \end{vmatrix}$, $Y_t = \begin{pmatrix} Y_t \\ X_t \end{pmatrix}$, $\lambda = \begin{pmatrix} b_{10} \\ b_{20} \end{pmatrix}$, $B = \begin{vmatrix} 0 & b_{12} \\ b_{22} & 0 \end{vmatrix}$ and $u_t = \begin{pmatrix} u_t \\ v_t \end{pmatrix}$, the expression **[5b]** will be written (this is the "primitive" form):

$$\text{HAS}\, Y_t = \lambda + \sum_{i=0}^{p} B_i Y_{t-1} + u_t \dots [5c]$$

And we obtain the reduced form if we multiply the two members by "A^{-1}" (with A: square matrix, and therefore invertible), which gives:

$$Y_t = A^{-1}\lambda + \sum_{i=0}^{p} B_i Y_{t-1} + A^{-1}u_t \dots [5d]$$

Otherwise :

$$\begin{pmatrix} Y_t \\ X_t \end{pmatrix} = \begin{vmatrix} 1 & -b_{11} \\ -b_{21} & 1 \end{vmatrix}^{-1} \begin{pmatrix} b_{10} \\ b_{20} \end{pmatrix} + \begin{vmatrix} 1 & -b_{11} \\ -b_{21} & 1 \end{vmatrix}^{-1} \begin{vmatrix} 0 & b_{12} \\ b_{22} & 0 \end{vmatrix} \begin{pmatrix} Y_{t-1} \\ X_{t-1} \end{pmatrix} + \begin{vmatrix} 1 & -b_{11} \\ -b_{21} & 1 \end{vmatrix}^{-1} \begin{pmatrix} u_t \\ v_t \end{pmatrix} \dots [5b]$$

We will check, without much effort, that:

$$\begin{vmatrix} 1 & -b_{11} \\ -b_{21} & 1 \end{vmatrix}^{-1} = \frac{1}{1 - b_{11}b_{21}} \begin{vmatrix} 1 & b_{11} \\ b_{21} & 1 \end{vmatrix} = \begin{vmatrix} \dfrac{1}{1 - b_{11}b_{21}} & \dfrac{b_{11}}{1 - b_{11}b_{21}} \\ \dfrac{b_{21}}{1 - b_{11}b_{21}} & \dfrac{1}{1 - b_{11}b_{21}} \end{vmatrix}$$

Therefore, the "reduced form" is given by the following system:

$$\begin{cases} Y_t = \Pi_1 + \Phi_{11} Y_{t-1} + \Phi_{12} X_{t-1} + r_{1t} \\ X_t = \Pi_2 + \Phi_{21} Y_{t-1} + \Phi_{22} X_{t-1} + r_{2t} \end{cases} \dots [6]$$

With :

$$\Pi_1 = \frac{b_{10}b_{11}b_{20}}{1 - b_{11}b_{21}}, \quad \Pi_2 = \frac{b_{20}b_{21}b_{10}}{1 - b_{11}b_{21}}, \quad \Phi_{11} = \frac{b_{12}}{1 - b_{11}b_{21}}, \quad \Phi_{12} = \frac{b_{11}b_{12}}{1 - b_{11}b_{21}}, \quad \Phi_{21} = \frac{b_{21}b_{12}}{1 - b_{11}b_{21}},$$

$$\Phi_{22} = \frac{b_{22}}{1 - b_{11}b_{21}}, \quad r_{1t} = \frac{u_t + b_{11}v_t}{1 - b_{11}b_{21}}, \quad r_{2t} = \frac{v_t + b_{21}u_t}{1 - b_{11}b_{21}}$$

As can be seen, the estimated residuals are correlated $\left(r_{1t} = f(u_t, v_t) \ et \ r_{2t} = f(u_t, v_t) \right)$ and the var equations are interrelated, meaning that a shock to one variable affects other variables in the model, and vice versa. Impulse Response Functions (IRFs) are used to analyze the effects between variables. Considering the var under study, the IFRs associated with "Y_t" and "X_t" are given as follows:

For "Y_t", $\dfrac{\partial Y_t}{\partial r_{1t-i}}; \dfrac{\partial Y_t}{\partial r_{2t-i}} \dots i = 1 \dots, T$ and for "X_t", $\dfrac{\partial X_t}{\partial r_{1t-i}}; \dfrac{\partial X_t}{\partial r_{2t-i}}$

We can thus see how a variable reacts to its own shocks or innovations (its own error term) and those of the other variables in the model (error terms of other equations).

IV. Presentation of results and discussions

a) Exploratory analysis

Table 1: Descriptive statistics

Id	GO	FNRG	D	ROE	ROA
GECAMINES	5.31E+07	-1.43E+08	18,43931	-0.0586493	-0.0129309
	6.57E+07	3.93E+08	11,32324	0.0634423	0.0326707
	4392675	-4.95E+08	2,332606	-0.0941929	-0.0415756
	1.83E+08	5.80E+08	27,65886	0.0696146	0.0382054
REGIDESO	1.44E+11	7.11E+10	0.9791304	-0.0182485	-0.0131045
	2.39E+10	3.03E+10	0.0922002	0.0137541	0.0101499
	1.22E+11	4.38E+10	0.8379803	-0.0337217	-0.0246394
	1.87E+11	1.25E+11	1,086388	0.0038104	0.0030573

RVA	7.49E+10	-1.14E+11	3,310583	-0.0536223	-0.0425051
	4.51E+10	1.62E+11	1,750826	0.0287747	0.0226334
	1.98E+10	-3.74E+11	1,063997	-0.0927969	-0.0701007
	1.34E+11	6.16E+10	4,754369	-0.0113592	-0.0087156

Id	GO	FNRG	D	ROE	ROA
SNEL	8.48E+11	5.69E+12	32,8574	-0.0105501	-0.007313
	4.07E+11	1.06E+13	6,952929	0.0054176	0.0037889
	5.38E+11	4.16E+11	27,41124	-0.0146791	-0.0103252
	1.62E+12	2.73E+13	46,67413	0.0002499	0.0001894
SONAHYDROC	5.66E+09	-4.01E+10	14,02516	-0.200377	-0.062837
	4.89E+09	4.56E+09	14,1446	0.188031	0.044445
	8.33E+08	-4.72E+10	1,373708	-0.5373735	-0.141203
	1.39E+10	-3.55E+10	30,75744	-0.0281307	-0.0116126
SOSIDER	1.44E+09	-1.18E+10	-16.76674	0.0702913	-0.1687037
	1.50E+09	5.21E+08	1,571479	0.08251	0.1492988
	2.36E+08	-1.27E+10	-18.40304	0.0284683	-0.4582122
	4.14E+09	-1.11E+10	-14.58908	0.2383654	-0.0436521

Source : Author, from STATA 17 software

GECAMINES reported an average value addition of more than 53.1 million Congolese francs between 2018 and 2023, which is significantly less than that of other businesses in the industry, such SONAHYDROC (566 million), RVA (74.9 billion), SNEL (848 billion), and REGIDESO (144 billion). These findings demonstrate the serious financial difficulties GECAMINES encounters in a cutthroat mining sector.

Only REGIDESO and SNEL have positive averages for overall net working capital (71.1 billion and 5,690 billion, respectively), suggesting that they can finance their day-to-day operations without significant issues. Other businesses may experience liquidity issues.

With an average debt-to-equity ratio of 32%, SNEL has the highest ratio, indicating a greater reliance on outside funding, according to the report. If this scenario is not supported by strict management and a well-defined plan to increase profitability and lower debt, it may result in long-term financial difficulties. These findings highlight how crucial a sound financial structure is to public companies long-term viability and capacity to generate value in a difficult economic climate.

b) Model estimation and diagnosis

❖ Model estimation

Dynamic panel-data estimation, one-step system GMM						

Group variable: Id	Number of obs = 30
Time variable : Années	Number of groups = 6
Number of instruments = 10	Obs per group: min = 5
Wald chi2(5) = 5735,31	avg = 5,00
Prob > chi2 = 0,000	max = 5

lva	Coefficient	std, err,	z	P>z	[95% conf, interval]	
			Robust			
lva L1,	0,348593	0,3176336	1,1	0,272	-,2739574	,9711434
lfrng	1,00897	0,3132161	3,22	0,001	,3950779	1,622862
RE	-0,0365855	0,0114871	-3,18	0,001	-,0590998	-,0140713
ROE	-4,944812	1,529301	-3,23	0,001	-7,942187	-1,947436
ROA	8,808498	3,419171	2,58	0,01	2,107046	15,50995
_cons	-3,758877	1,287895	-2,92	0,004	-6,283106	-1,234649

Source: Author, from STATA 17 software

The analysis's findings demonstrate that, while some have a negative effect, all of the chosen variables have a major impact on how value is created within businesses. A 1% increase in working capital (WC) results in a 1.00897% rise in added value, demonstrating the positive relationship between WC and ROA and the significance of proper liquidity management for both everyday operations and investments. An intensification of returns on assets leads to a rise of 8.8 units in added value, according to the semi-elastic relationship for ROA.

On the other hand, value added is negatively impacted by the debt ratio and Return on Equity (ROE). Increased usage of debt can hinder value development, as seen by the correlation between a 1% rise in debt and a decrease in value contributed. In a similar vein, when ROE rises, value added falls, frequently as a result of bad borrowing decisions. These findings emphasize how crucial it is for managers to thoroughly consider their debt and investment choices in order to maximize value generation inside businesses.

❖ Model diagnosis

Test	statistics	P-value	
Arellano-Bond test for AR(1) in first differences:	z = -1.38	Pr > z =	0.1680
Arellano-Bond test for AR(2) in first differences:	z = -1.43	Pr > z =	0.1540
Sargan test of overid, restrictions:	chi2(4) = 1.59	Prob > chi2 =	0.8110
Hansen test of overid, restrictions:	chi2(4) = 0.00	Prob > chi2 =	1,0000
Hansen test excluding group:	chi2(3) = 0.00	Prob > chi2 =	1,0000

Source: Author, from STATA 17 software

Important details on the reliability of the employed econometric model are revealed by analyzing the statistical test results. There is no significant evidence of autocorrelation in the residuals, according to the Arellano-Bond test for first-order autocorrelation

(AR(1)), which meets the requirements for the GMM technique with a z-statistic of -1.38 and a p-value of 0.1680. The lack of substantial serial autocorrelation is further supported by the second-order autocorrelation test (AR(2)), which yields a z-statistic of -1.43 and a p-value of 0.1540.

With a chi2(4) statistic of 1.59 and a p-value of 0.8110 for Sargan and a chi2(4) statistic of 0.00 and a p-value of 1.0000 for Hansen, the Sargan and Hansen tests demonstrate extremely high p-values with respect to the validity of the instruments. These findings imply that the identification limitations are legitimate and that the instruments employed are suitable. Lastly, with a chi2(3) statistic of 0.00 and a p-value of 1.0000, the Hansen test that eliminates one group likewise validates the validity of the remaining instruments. All things considered, these findings show that the model is adequately described and that the tools available for parameter estimate are sufficient.

Conclusion

This study examined how financial structure affects a company's ability to create value in the cases of REGIDESO, SNEL, SOSIDER, COHYDRO, RVA, and GECAMINES. According to the report, one of the most important factors influencing wealth generation in Congolese public enterprises is financial structure. The findings indicate that businesses with a healthy debt-to-equity ratio are more likely to see profitable returns.

Additionally, it was discovered that internal financing options outperform excessive debt in terms of economic performance. These results emphasize how crucial it is to manage financial resources strategically and pro-actively in order to guarantee public companies' economic sustainability as well as their ability to contribute to the advancement of the country.

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