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RESEARCH PAPER

The Profitability of Afghanistan's Coal Industry: An ARDL Analysis of the North Coal Enterprise

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Abstract

This study examines the determinants of profitability in the North Coal Enterprise (NCE), Afghanistan's only state-owned profit-generating company authorized to operate coal mines. Despite the partial privatization of several collieries, four major mines remain under NCE's management. Using annual data from 1989 to 2019 obtained from the Ministry of Industries and Mines and the Northern Coal Office, the study employs the ARDL model to estimate short- and long-term relationships between profitability (net profit-to-capital ratio), capital structure (debt-to-capital ratio), and liquidity (current ratio). The findings indicate that sales revenue has a positive long-term impact on profitability, while liquidity has a short-term positive influence. Conversely, capital structure shows a negative relationship with profitability. These results underscore the importance of sound financial management and effective liquidity control in maintaining NCE's profitability.

Keywords: ARDL, Coal Mining, Capital Structure, North Coal Enterprise, Profitability.
JEL Classification: C32, E22, G32, L32, L72, M11.

1. Introduction

The reports from the World Bank demonstrate that Coal mining, as an important production staple, is highly lucrative, whether for internal consumption or exports. As of 2017, 1.2 million tons were exported annually, and 2.2 million tons were produced for domestic use (DeWitt et al., 2021). However, coal production and consumption are being increased, especially in Asia, but overall, the world, hundreds of countries, cities, and businesses are trying to phase out of coal extraction or lending coal mining because of the decreasing coal-related impacts on health (Auger et al., 2021). For this purpose, as Ministry of Mining and Petroleum [MoMP] has provided some best international standards of

environmental policies that are based on NEPA[1] and ANSA[2] (McMahon and Tracy, 2011; MoMP, 2011).

The Ministry of Mines and Petroleum of Afghanistan has reported that there are 847 million tons of coal reserves among the 18 most important mines (Byrd and Noorani, 2017). According to a 2004 World Bank report, 6 out of 11 coal mines are the main coal sources in Afghanistan, located in Baghlan, Bamyan, and Nangarhar provinces (Evans, 2004).

According to the World Bank report, numerous companies with various organizations are putting efforts together to expand coal mining in Afghanistan, of which The North Coal Enterprise [NCE] is one of the largest scales (DeWitt et al., 2021). This enterprise is located beside the north-south highway in Baghalan province as a state-profit enterprise, established in 1971 by the name of "The Coal Mine Union" which included "Kargar and Dodkash" coal mines. Right after the Ashposhta and Dar-e-sof coal mines were discovered, the name was changed to The North Coal Enterprise (MoMP, 2019).

Since a political relation and a particular type of government ownership at the company are being considered as a competitive advantage as a political source, and its effect on the value of the company and profitability has always been shown by empirical research (Liu et al., 2018). Given that profit maximization is much complicated in governmental companies compared to private ones, the question is that does the profitability of a state-owned company whose product is made of perishable resources only depends on internal economic factors, or external economic variables should also be considered. A temporary stop or reduction in production because of structural change can be a strong reason for the high opportunity cost of mining production of the country (Shroder, 2019; Ludington et al., 2007). As well as the managerial and structural factors of the company, which can change profitability, should not be ignored. Hotelling's theory and its empirical research have greatly contributed to the exploitation and price[3] trends of perishable resources (Gaudet, 2007). The famous Hotelling law is the framework of the natural resources market and determines the path of the net price for finite resources, which can measure the current value of the capital according to the expected discount rate and as profit that can be obtained in the future according to

[1]. National Environmental Protection Agency

[2]. Afghanistan National Standards Authority

[3]. The coal supply of NCE is made according to the market demand, and the royalty rate is charged per ton of coal. The amount of royalties that have been paid to the government in the last four decades was 1,500 until 2017, and after this year, it was set at 2,500 Afghanis.

the market price of the resources (Ferreira da Cunha and Missemer, 2020). If the enterprise knows that the discount rate is higher than the net price in the future, it sees the profit in the sales of the mine as much as possible and continues mining until the final cost and the opportunity cost of mining are equal to the market price (Ali et al., 2012).

This study will assess the trend and effective factors of profitability during the four recent years for North Coal Enterprise. Given that different factors can contribute to increasing or decreasing the profitability of a state-owned company, considering the different leverages such as capital structure, liability, and annual sales, are aligned together to form the profitability function. To do so, a short introduction to the North Coal Enterprise, related literature reviews, the ARDL model, and findings are discussed, respectively, in this paper.

Profitability is the mirror and the final results of decisions and policies made in a company, which is calculated by two different methods, namely its sales (marginal gross profit) and capital. The second method can be measured by asset returns and stock returns (Aadel et al., 2012; Fajri and Surjandari, 2016; Hirdinis, 2019). A study defines profitability as the ability of a company to generate profit and design efficient actions in terms of using assets. On the other hand, Darabi and Baygi believe that companies can accelerate their expansion path by calculating profitability and providing strategic information (Baygi and Darabi, 2016).

Figure 1 shows the gross profit of the North Coal Enterprise for forty years. As can be seen, the 90s show a high growth rate compared to its previous decades. Historically, the exploitation of Afghanistan's mineral reserves in all these periods has faced two types of invasions, namely by the Soviet Union and the Taliban (Sheraz, 2014). Again, the prosperity and progress of resource processing are attributed to the attention and concentrated efforts of the United States (Shroder, 2019). In the early 60s and 70s, this administration realized with huge losses that, due to the lack of personnel and sufficient tact, it was also possible to compensate. It was not possible during that period. The trend of gross profit until the beginning of the 80s was very little, and sometimes was followed by negative growth. As it can be clearly seen, at the beginning of the republican period and the democratic system in the 80s, North Coal Company had a steep slope of marginal profit, and the most ups and downs period began with the transition to the 90s. Although the 90s do not have the upward trend of the 80s, there is an incomparable amount of opinion compared to other periods. If the maximum profit in 2013 was 201,025,865,1 Afghanis, but unfortunately, this figure reached 362,331,880 by

2018. The reason for the 80% decrease in the growth rate is due to the recent insecurity in the mining areas.

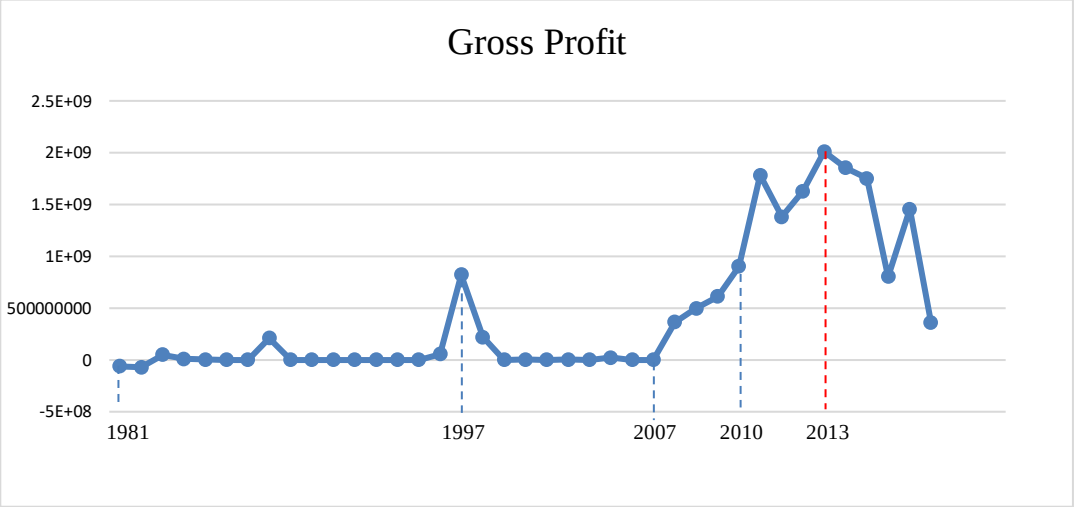

Figure 1. Gross Profit of NCE
Source: Research finding.

The capital structure and property of NCE are fully state-owned, which, as a government financial fund, can play a significant role in the economic growth of the country (Mohajerani et al., 2019). The third band of law of Afghanistan state-owned companies clearly states that state-owned companies are dependent on the stockholders, in which the government should have a share of at least 25 percent. In terms of institutional arrangements and order, the Ministry of Finance is the largest stockholder of state-owned companies (Law of State-Owned Companies, 2018). The NCE was under the control of the Ministry of Mines and Industries, but in the year 2016, this company was merged with the National Development Authority and came under the control of the presidency office (Renaud, 2020).

The theory of capital structure refers to estimating the combination and traits of capital used by a company (Brav, 2009). The capital structure is known as an important estimator of profitability in the world, and extensive studies are done in this field. Miller, he founder of financial leverage, with research and reforms on the causality of capital structure, stated that the tax savings can affect the value and function of a company due to the existence of interest rate (Miller, 1988). With increasing attention to this issue, the scientists realized that debt not only reduces the value of a company but also increases its costs of bankruptcy (Scott, 1976). Even so, some studies demonstrated that profitability is highly related to debt. This

means that reaching a higher profitability is possible through higher debts (Adel et al., 2012).

Myers developed the Pecking Order theory by prioritizing financial resources from profit accumulation to debt and stock. Based on the symmetric information pattern, he believes that profitability of a company related to the debt financial pyramid negatively debt financial pyramid is negatively related to profitability of a company (Myers, 1984; Shaba et al., 2016) . With the existence of strong and rational theories in this field, Agency Theory, Asymmetric Information Theory, Signaling Theory, Stakeholders Theory, and Pecking Order Theory still hold complicated and weak observational data (Feld et al., 2013).

Barton, in his study of 1986, stated that there is no satisfying theory or study to show that capital structure and how it affects a company's performance has on profitability. In his next study in 1988 pointed out that the understanding and management of capital composition requires a managerial behavior theory and strategy. While senior managers at big companies prefer internal resources compared to external, including debt and stock, considering that the limitations of management authority in debt are greater than stock (Barton and Gordon, 1988).

Overall, public companies have greater resources and expenses compared to private companies, which this advantage led them to be a vital source of health and energy. However, in the context of agency theory, the conflict between economic and political goals is one of the challenges that increases the complexity of activities (Mohajerani et al., 2019). According to the agency theory, the managers, as the representatives of the owners, do not necessarily act in the interest of the owners (Bakhshi et al., 2019).

The management and ownership structure is more separated in state-owned companies compared to private companies. The managers at such companies are looking to increase stock values to reduce the control of stockholders over the company; this will eventually lead to lower conflict of interest, but instead, the higher stock value leads to a lower demand for stocks (Brav, 2009). Another study believes that centralized management and ownership are related to the level of control, which directly affects the dividend (Lemmon and Lins, 2003).

The debt share due to its high expenses is limited in both private and public domestic companies. Our interview and documents show that the NCE, as a state-owned enterprise, does not use any of the internal and external income sources of the government merely its current debts are due to the advances' accounts and some other debt items that form the capital structure of the enterprise (NCE, 2021). Given that research by Kieschnick and Moussawi (2018) found that the traits and

size of a company can be effective on its capital structure. In general, public companies have different financial policies compared to private companies; as such, the degree of financial leverage in public companies is 50 percent lower, while the level of stocks is higher. However, Modigliani and Miller believe that the optimum capital is structured by debt, rather than stocks (Miller, 1988). As more debt in the company requires liquidity management, otherwise the risk of bankruptcy will increase. As a result, to identify the important and effective factors and the correct financial management of this company, the relationship between capital structure, liquidity, and profitability has been investigated.

2. Methods and Materials

Profitability is the most important index of financial decision-making in manufacturing companies, which determines the permanency trend and closing points (The Law of State-owned Companies, 2018). Without loss of generality, it is accepted that the capital structure, level of expenses, sales revenue, and management system are the effective factors of profitability (Brav, 2009). Taking advantage of the function modeled by Amarjit Gill (2011) and Nur Aqilah (2014). This research is looking for the answer to whether financial leverage, sales, and liquidity can affect the profitability of the enterprise or not.

The function for short is:

$$\overbrace{\widetilde{Roi}}^{\text{dependent variable}} = \overbrace{\widetilde{Cs, Cr, Lsale}}^{Explanatory\ variables} \quad (1)$$

where Roi, Cs, Cr, and Lsale stand for Profitability, Capital Structure, Level of Liquidity, and Sales Revenue, respectively. Roi, the return on investment, is a dependent variable that is the outcome of gross profit over total capital. It indicates the amount of annual gross profit of the enterprise. We used gross profit variable (without tax expense) because we believe that the level of taxes is not related to capital expenses or the interest rate. Cs shows the effect of financial leverage on the capital structures of the enterprise. We considered the current debts or advance payments registered in the balance sheet because no external debt has been used by the enterprise so far. Truly, the financial leverage of the enterprise is the ratio of debt to total assets. Liquidity is the current ratio, which comes from the ratio of current assets to current debt. Lsale is the log point of the annual Sales Revenue, as an independent variable included in logarithmic order. Our statistical model is designed as follows:

$$\mathrm{Roi}_t = \beta_0 + \beta_1 cs_t + \beta_2 \mathrm{Cr}_t + \beta_4 lnsale_t + u_t$$

where u_t is error, t stands for time, and *ln* is the natural logarithm. Logarithm is

considered for heteroscedasticity and reduces the gap among variables (Frimpong and Marbuah, 2010). β_i is the coefficient of parameters that shows the constant tensions.

3. Results and Discussion

This study aims to evaluate the 38 years' experience of the NCE from 1981 to 2019 using Eviews. Since the statistical information of manufacturing and service companies, including North Coal Enterprises in Afghanistan, is not available to the public, therefore, it was possible to use the data through administrative and official correspondence. Therefore, the estimated statistics have been collected from the Directorate of Tenure of the Ministry of Mines and Industries. According to the time series data available in this tenure. We applied the ARDL[1] econometric model to find and analyze the dynamic effect of each factor on the dependent variable. This model is developed by Psarian et al. (Sari et al., 2008), which can help us find the Co-integration and the long-term and short-term relationship between variables. This estimation model is applied in three stages, namely the Unit Root Test, Optimal lag distribution, and Co-integration Test to determine the relationships, and applying the Bound, ECM, or VECM[2] Testing methods to adjust and correct the errors. All stages are discussed in detail as follows.

3.1 Unit Root Test

We use this test to make sure that the ARDL model works best when the dependent variable does not possess a unit root (Suri, 2012). Unit Root Test in the ARDL model can find the relationship among different variables in I(0), I(1), or a combination of both levels. However, this way, the Co-integration test comes to a questionable end. Looking at Table 1, we realize that the null hypothesis of the ADF test statistic demonstrates that the dependent variable and Cr have a unit root, and capital structure and Lsale are stationary.

[1]. Autoregressive Distributed Lag

[2]. Error Correction Model and Vector-autoregressive Error Correction Model stand for one and more than one endogenous variable respectively.

Table 1. The Result of the Unit Root Test (ADF***)

Variable	At Level*	I(First difference)*
Roi**	-0.515130	-3.503408
Cs**	-3.707799	-
Cr**	-1.227253	-4.885652
Lsale**	-2.840325	-

Source: Research finding.

Note: *Indicates (5%) level of Significance, respectively, ** Roi for Profitability, CS for capital structure, Cr for current ratio, Lsale for log sales revenue. *** ADF for Augmented Dicky-Fuller.

Thus, the nonstationary variables integrated at their first difference, it is possible to use the ARDL model by considering the above. ARDL dynamic model with Schwartz criterion and automatic optimal lag length, as Table 2 shows that the dependent variable of the model (profitability) and capital structure with one lag, liquidity current ratio with two lags, and the logarithm of sales are as holding size at the level. From the estimation of the model, it can be explained that all the variables of the dynamic model, except the capital structure at the level, are all significant.

Table 2. The Dynamic Result of ARDL (1,1,2,0)

Regressor	Coefficient	Std. Error	t- Statistic
C(intercept)	-0.119567	0.101262	-1.180760
Roi(-1)	0.730166	0.139553	5.232164
Cs	-0.084434	0.119996	-0.703641
Cs(-1)	-0.185265	0.090775	-2.040919
Cr	-0.022125	0.004245	-5.212542
Cr(-1)	0.030056	0.005836	5.150325
Cr(-2)	-0.023236	0.004101	-5.665792
LSale	0.018866	0.007927	2.379768

Source: Research finding.

Note: * Indicates (5%) level of Significance, respectively.

The estimation results show that the amount of profitability with a period of interruption and the sales-income of the enterprise at the level can have a direct impact on the profitability process. Also, liquidity with two lag periods can affect

profitability. Based on the dynamic model of the variables, the relationship of the equation can be written as follows:

$$Roi = \propto_0 + \sum_{i=1}^{p} \beta_i Roi_{t-i} + \sum_{j=0}^{q} \gamma_i Cs_{j-1} + \sum_{k=0}^{\mathrm{h}} \varphi_i \mathrm{Cr}_{k-1} + \delta_3 lnsale_t + u_t \qquad (3)$$

In the above equation, p, q, and h are the optimal lag lengths of profitability, capital structure, and liquidity variables, respectively. On the other hand, Table 3 tests of autocorrelation, variance, heterogeneity, and normality of the dynamic model, which in fact have provided and established the classical assumptions. By rejecting the existence of collinearity and variance of heterogeneity and, of course, the existence of normality of disturbance components, it can be clearly stated that the short-term model can correctly address the research question.

Table 3. Diagnostic Tests (Classic Assumptions)

Result	F test	Test
No homogenous variance	0.1087	Heteroskedasticity (ARCH)
No collinearity	0.8835	Autocorrelation (LM test)
Existence of normality	1.585915	Normality Test

Source: Research finding.

3.2 Co-integration Test

Based on Table 1, the unit root test, some of the variables are not stationary. Therefore, the linear regression of variables with different roots will lead to an error (Gujarati, 2022). The co-integration test is used to determine the long-term relationship. The estimated regression will be real and accurate if the test can confirm the coherence of all variables. This study, instead of Banerji, Donald, and Mister Test, uses the Bound Test.

Given that the ARDL model, conditional error correction regression includes the long-term and equilibrium relationships, therefore, our statistical model is designed to determine the relationship. Given that the F statistic in this test is 4.18, which is greater than the critical value I(1), so, the null hypothesis, which indicates no long-term relationship, is rejected with a 90% confidence level. Therefore, the lack of co-integration is rejected, meaning that there is a relationship between profitability and the expository factors.

Table 4. The Result of the ARDL *F*-Bounds Test for Cointegration

	Test Statistic	Value	K	Signif	I(0)	I(1)
F-Bounds Test	*F*-statistic	4.187912	3	10%	2.618	3.532
				5%	3.164	4.194
				1%	4.428	5.816

Source: Research finding.

3.3 Long-run and Short-run Estimation

According to Table 4a, the long-term relationship between dependent and independent variables has been confirmed, so we will estimate the long-term model and the error correction model reflected in Table 5:

Table 5. Long-run and Short-run Results of the ARDL Approach

A: long-run estimation				
Regressor	**Coefficient**	**Std. Error**	**t- Statistic**	**Prob**
C(intercept)	-0.443111*	0.349775	-1.266845	0.2164
Cs	-0.999500	0.317045	-3.152551	0.0041
Cr	-0.056721	0.031081	-1.824959**	0.0795
Lsale	0.069915	0.023590	2.963808	0.0064
B: Short-run estimation				
ECM_{t-131}*	“	“31”	-4.915387	0.0000
Cs	-0.084434	0.086033	-0.981415	0.3354
D(Cr)	-0.022125	0.003359	-6.58769	0.0000
D(Cr(-1))	0.023236	0.003452	6.731802	0.0000

Source: Research finding.

Note: *, ** indicates (5%) & (10%) level of Significance, respectively.

Table 5 demonstrates the long-term relationship or the equilibrium function of profitability. The first part of this table indicates the significance of all the estimated coefficients with a confidence level of 90%, but if we analyze the variable with a probability of 5%, then the variables of the capital structure and sales revenue of the enterprise can be considered to affect the dependent variable of the enterprise. As is evident, the results of the data are completely in accordance

with the empirical and theoretical literature. The capital structure, as a financial leverage of the enterprise through increasing the share of debt, can have a negative effect on the profitability process, as it is evident that by changing (increasing) one unit of the capital structure, the profitability can decrease by 0.99 units in the long term. This type of finding can also be seen in research (Pham et al., 2022; Shubita and Alsawalhah, 2012). Sales revenue also has a direct effect, with an increase in revenue of one percent, profitability also increases by 0.0699 percent. This finding precisely conveys the concept that strengthening and specializing mining production and its optimal extraction through more use of technology and reducing expenses to increase sales income can be a significant contribution to the development of the usefulness and profitability of the enterprise (Bahman and Tehmineh; Fajri and Surjandari, 2016). The findings with a weak confidence level have shown that the reverse effect of liquidity is also predictable in such a way that an increase of one unit of liquidity can reduce 0.05 units of profitability. This result can also be found in similar results (Pham et al., 2022; Shubita and Alsawalhah, 2012).

Table 4 identifies the errors that deviated from the long-term trend in the short run. These errors are being fixed based on their coefficients with negative signs. As can be seen, the residual of the long-term regression with an interval has a negative coefficient and is quite significant, and it shows that the short-term model exponentially fills this gap with a value of 26% in each period and will be infinitely close to the long-term model. The short-run estimate reflects the important role of liquidity, which, after a period, can be recognized as the only effective factor that increases profitability. If an increase of one unit can have a positive effect of 0.02 units, but before this period, the current variable of liquidity has a negative effect on profitability.

4. Conclusion

Investigating the financial situation (profitability) of Afghanistan North Coal Company (the largest and only state-owned company in Afghanistan) is the aim of this research. The hypothesis of the research was that the capital structure, cash flows, and annual sales revenue have a positive relationship with the profitability of the enterprise. The estimation and analysis of the annual data for this company were done through the ARDL model and using Eviews software. The obtained results and estimates are in accordance with the theory, if in the short term there is no confirmed relationship between profitability and capital structure, and in the long term, it is in the opposite direction and reducing profitability. Liquidity also

has different reactions in different periods of time. If the reported results show that the current ratio will have a negative effect in the current state and a positive effect in the previous period, and an opposite effect in the long term. This finding clearly shows that the cash flow of the enterprise cannot be the answer to the existing debts. At the same time, positive sales growth has been reported in different time periods. Due to the existing estimated gap and help to adjust it and still increase the profitability of some cases, it is recommended. Since profitability is also affected by the previous year's profitability, it is necessary to prevent losses and emphasize maintaining and strengthening the company's profitability as a financial basis. On the other hand, the proper capital structure in the enterprise is considered a necessity of financing to avoid possible deficits. This study is limited to only one state-owned company, although with a long tradition, but an inappropriate capital structure. Of course, many public and private companies with similar financial leverage characteristics will have almost the same results, and this research can be easily extended to them, but it is better to compare public and private companies in the form of a panel. It should be examined more closely.

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