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Statistical Assessment of Financial Stress and Saudi Government Revenue

Abdallah Sayed Mossalem Ahmed Elshafei[1], *Sherif A. Kaamoosh*[2], *M. M. Abd El-Raouf*[3,*], *and M. A. El-Qurashi*[3]

[1]Department of Basic Sciences, Higher Institute for Administrative Sciences, Belbeis, AlSharkia, Egypt
[2]Department of Accounting, College of Business, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, 11432, Saudi Arabia
[3]Institute of Basic and Applied Science, College of Engineering and Technology, Arab Academy for Science, Technology and Maritime Transport, P.O. Box 1029, Abu Quir Campus, Alexandria, Egypt

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Abstract: This study examines the complex interplay between financial stress and Saudi Arabian government revenue from 2001 to 2023, considering the influence of key macroeconomic variables. Saudi Arabia's heavy reliance on oil exports makes its public finances vulnerable to global economic shocks and fluctuations in oil prices. Financial stress, as measured by a composite indicator that includes GDP per capita growth, inflation, broad money growth, oil prices, unemployment, and government revenue, is analyzed using a Vector Error Correction Model (VECM) to look at both short-term fluctuations and long-term equilibrium relationships. The results demonstrate a substantial correlation between government revenue and financial stress, with broad money growth and unemployment having negative effects, and oil price volatility, inflation, and GDP per capita growth all having positive effects. The variables are co-integrated, according to the VECM analysis, suggesting a stable long-term equilibrium. Diagnostic tests demonstrate the reliability of the model. In order to maximize government revenue in Saudi Arabia, the research highlights the need for proactive policies that promote economic diversification, control inflation, and maintain stable employment levels. It also emphasizes the importance of effective measures to manage oil price volatility and mitigate the effects of global financial stress.

Keywords: Financial Stress, Oil Prices, Macroeconomic Variables, Vector Error Correction Model, Cointegration, Fiscal Policy.

1 Introduction

A major participant in the world oil market, Saudi Arabia faces the constant difficulty of overseeing its public finances in the face of fluctuating oil prices and the global economy. Since oil exports account for the majority of the country's government revenue, they are extremely vulnerable to outside shocks that could interrupt this crucial source of income. Oil prices can drop significantly during times of increased financial stress, which are frequently brought on by global economic downturns, financial market volatility, or changes in financial markets. These events can have a direct impact on the government's revenue base. The significance of comprehending the complex relationship between financial stress and government revenue is highlighted by this connectivity. For Saudi Arabia, a thorough understanding of these dynamics is crucial for formulating effective fiscal policies. Effective fiscal policies that promote stability and ensure long-term fiscal sustainability are essential to secure the nation's economic future in an uncertain world.

Ref. [7] examined the impact of resource abundance on economic performance, highlighting the importance of strategic diversification to prevent overreliance on fluctuating resource markets. This research offers the groundwork for understanding the intricate relationships between natural resource abundance and long-term economic stability. Ref. [30] emphasized Russia's use of the Oil Stabilization Fund to handle oil income surges and maintain fiscal balance, thus preventing fiscal imbalances. This study demonstrates how oil-dependent economies can handle volatility in revenue. Ref. [23] studied the relationship between fiscal and monetary policy and economic growth in Iran, revealing the positive impact of government expenditure on GDP growth while emphasizing the negative impact of specific components of

* Corresponding author e-mail: m_abdelraouf85@aast.edu

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monetary policy. According to Ref. [6], fiscal multipliers vary depending on the economic cycle, indicating that government expenditure can affect the economy differently. This underlines the need for context while implementing fiscal policy. Ref. [12] proposes counter-cyclical policies. This work is expected to provide a theoretical framework for implementing countercyclical fiscal policies. Ref. [17] examined the impact of fiscal policy on Iran's economic growth, highlighting the role of the labor force, physical capital, and proactive fiscal measures. Ref. [18] analyzed the long-term and short-term effects of oil income on GDP, highlighting the need for diversification in oil-dependent economies. Using VAR models, see Ref. [27] shown that incorporating oil and non-oil revenue streams into fiscal policy can stabilize the economy and minimize reliance on oil. According to Ref. [29], oil price variations have a direct impact on the national budget of Saudi Arabia, leading to surpluses or deficits. Ref. [19] found a positive correlation between oil income and the production of the service sector in Sudan.

According to Ref. [25], oil income and international oil companies contribute significantly to Nigeria's economic growth. In Ref. [33], the influence of deficits and surpluses in the public budget on actual economic development was investigated, underlining the importance of a balanced budget. According to Ref. [28], higher government spending has a favorable impact on economic activity and private consumption. The importance of counter-cyclical fiscal measures in preserving economic stability and promoting sustainable growth was emphasized in Ref. [13]. Ref. [22] promoted economic diversification by shedding light on the varying effects of oil and non-oil exports on Bahrain's economic growth. The necessity for diversification in oil-dependent countries was highlighted by Ref. [5], which illustrated the short- and long-term effects of oil income on GDP.

The importance of non-oil revenue growth as a stabilizing element for government consumption was emphasized in Ref. [5]. The sectoral structure of Iraq's GDP was analyzed by Ref. [3], which illustrated the relative importance of different economic sectors. Ref. [17] looked at the structural imbalances in the Iraqi economy, emphasizing the need for economic diversification and the country's dependence on the oil sector. Ref. [15] emphasized how important counter-cyclical fiscal measures are preserving economic stability and promoting long-term prosperity. The economic crisis in Venezuela was described in length in Ref. [31], which was made worse by budgetary mismanagement and an inability to diversify away from oil. According to Ref. [24], fiscal policy can be used in conjunction with monetary policy to stabilize macroeconomic conditions. The significance of creating fiscal policies with long-term sustainability in mind was emphasized by Ref. [26]. The impact of GDP and the general budget on economic activity was the main subject of study on structural imbalances in the Iraqi economy done by Ref. [20]. The relationship between general budget tools and GDP in Iraq, particularly in response to shocks to the oil price, was studied in Ref. [21]. The consequences of mining on Ghana's economy, including those on jobs, government revenue, economic growth, and the environment, were examined in Ref. [34]. The relationship between the expansion of Iraq's industrial sector and the country's overall economy was studied in Ref. [4]. The characteristics of the health sector and the relationship between government spending in this sector and the Saudi public budget were examined by Ref. [1]. Effective fiscal measures in Iran have been essential in reducing the effects of changes in the world oil price, as seen in Ref. [2]. For more details see [8,9,10,11].

2 Model Specification and Methodology

Public revenue, the lifeblood of government spending, is influenced by a complex interplay of macroeconomic forces. This analysis explores the intricate relationship between key macroeconomic variables and their impact on public revenue, with a particular emphasis on the role of financial stress. Financial stress, frequently triggered by global economic downturns, financial market instability, or unforeseen events, financial market instability, or unexpected events, can significantly impact public revenue through various channels: Impact on Economic Growth: Financial stress can lead to decreased investment, reduced consumer spending, and overall economic slowdown, negatively affecting tax revenue. Impact on Oil Prices: Global financial stress can affect commodity prices, including oil. For oil-exporting countries, this can directly impact government revenue. Increased Government Spending during periods of financial stress, governments may need to increase spending on social safety nets, bailouts, or other measures to stabilize the economy, putting pressure on public finances. Reduced Access to Financing: Financial stress can make it more difficult and expensive for governments to borrow money, limiting their ability to finance budget deficits.

This study uses annual time series data covering the period from 2001 to 2023 (as shown in Table 1). Financial stress is assessed using a composite index comprising GDP per capita growth, inflation rate, broad money growth, oil prices, and unemployment rate, including the following:

$$Ren = c + c_1 G_{ga} + c_2 I_{fl} + c_3 B_{om} + c_4 Oir + c_5 U_{em} + U$$

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Ren = government revenue.
Gro = production growth rate.
Ifl = inflation
Bom = broad money
Oir = oil price
Uem = Unemployment
c = intercept.
c_1, c_2, c_3, c_4, c_5 = The parameters
U = Random variables

Table 1: Study variables

Variable	Definition	Data Source	Variable Type
Ren	Government revenue	Statistic*	Independent
Gro	GDP per capita	World Bank	Dependent
Ifl	Inflation	World Bank	Dependent
Bom	Broad money annual growth	World Bank	Dependent
Oir	Oil price	Statistic	Dependent
Uem	Unemployment	World Bank	Dependent

*Account by researcher depend on data in this site.

The financial stress index was constructed as an unweighted composite (or principal component) of the following variables: GDP per capita growth (Gro), inflation (Ifl), broad money growth (Bom), oil prices (Oir), and unemployment (Uem).

Table 2 provides descriptive statistics for six variables (REN, OIR, IFL, GRO, BOM, and UEM) over 23 observations, offering insights into their distributions. REN demonstrates the highest mean (774130.4) and standard deviation (331103.0), indicating substantial variability. OIR and GRO exhibit moderate means and standard deviations. IFL, BOM, and UEM have smaller means and standard deviations. The median values generally align with the means, suggesting relatively symmetrical distributions for some variables. However, discrepancies between mean and median indicate potential skewness in others. IFL shows positive skewness (0.778491), suggesting a right-tailed distribution. REN and OIR exhibit slight negative skewness. Kurtosis values vary across the variables. IFL and UEM display higher kurtosis, indicating heavier tails or potential outliers. REN, OIR, and BOM have kurtosis values closer to a normal distribution. The Jarque-Bera test for normality reveals that only UEM has a statistically significant deviation from a normal distribution ($p < 0.05$). While IFL shows some skewness and high kurtosis, its Jarque-Bera test suggests it follows a normal distribution. The ranges (difference between maximum and minimum) highlight the variability within each variable. REN has the largest range, further supporting its high standard deviation. UEM has the smallest range, reflecting its low standard deviation. In conclusion, the descriptive statistics show that the six variables differ in terms of distribution shape, dispersion, and central tendency. UEM has a non-normal distribution and low variability, whereas REN has significant variability. IFL and BOM display some skewness and high kurtosis, needing further investigation. Further analyses, such as correlation or regression, are recommended to explore relationships among these variables. The potential impact of outliers, especially in IFL and UEM, should be considered in subsequent analyses.

3 Unit Roots Test

The Dickey-Fuller test was used to determine the stationarity of six variables: Ren, Gro, Ifl, Bom, Oir, and Uem. Table 3 displays the test findings, including t-statistics and p-values for the level and first-difference forms. At the level form, none of the variables are stationary at conventional significance levels (1, 5, or 10 percent). The t-statistics for all variables surpass the critical values, and the accompanying p-values are more than 0.05, indicating that the null hypothesis of a unit root was not rejected. Uem is the closest variable to stationarity at the level form, with a t-statistic of -3.4 and a p-value of 0.02, which is marginally significant at the 5-percent level. However, following the initial discrepancy, all variables become stationary. The t-statistics for the first-differences series are much lower than the crucial levels, and all p-values are less than 0.05, conclusively rejecting the null hypothesis. This shows that the variables are integrated of order one, I(1), implying that they are non-stationary in levels but become stationary after the first differencing. The findings indicate that additional econometric research, such as cointegration tests, may be required if these variables are employed in long-run

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Table 2: Descriptive data

	REN	OIR	IFL	GRO	BOM	UEM
Mean	774130.4	68.3	2.4	51974.41	9.3	5.6
Median	742000.0	70.8	2.3	51997.34	8.8	5.6
Maximum	1270000.0	111.6	9.8	57351.87	20.4	7.6
Minimum	213000.0	23.1	-2.0	46435.48	0.1	4.0
Std. Dev.	331103.0	28.3	2.6	2942.02	6.5	0.6
Skewness	-0.10	-0.02	0.7	0.029451	0.1	0.3
Kurtosis	1.8	1.9	4.2	2.131287	1.8	5.7
Jarque-Bera	1.2	1.14	3.7	0.726543	1.3	7.6
Probability	0.542119	0.5	0.1	0.695398	0.5	0.02
Sum	17805000	1572.5	55.9	1195411.0	216.1	130.8
Sum Sq. Dev.	2.41	17630.6	149.1	1.90E+08	944.5	10.1
Observations	23	23	23	23	23	23

modeling. The non-stationarity at level form implies that using these variables in their raw form could lead to spurious regressions, emphasizing the importance of transforming them appropriately before conducting further analysis

Table 3: Dickey–Fuller test results

Variable	Level		1st	
	t-statistics	Prob.	t-statistics	Prob.
R_{en}	-1.90	0.29	-5.01	0.0007
G_{ro}	-1.70	0.39	-5.89	0.0000
I_{fl}	-2.80	0.06	-7.40	0.0000
B_{om}	-2.10	0.20	-6.60	0.0006
O_{ir}	-2.20	0.19	-4.45	0.0023
U_{em}	-3.40	0.02	—	—

4 Co-integration Test

Cointegration test findings in Table 4 show long-term linkages between variables. The null hypothesis of no cointegration is rejected (p = 0.0000), indicating at least one long-run relationship, and the null hypothesis of only one cointegrating vector is also rejected (p = 0.0003), implying a second long-run relationship. However, the null hypothesis of at most two cointegrating associations is not rejected (p = 0.1435), indicating that there are no more long-run linkages. These findings indicate that the variables move together over time, despite short-term variations, which supports the employment of a Vector Error Correction Model (VECM) to examine short-term adjustments while retaining long-run equilibrium. The presence of cointegration indicates that any deviations from equilibrium are just transitory and will self-correct with time. This emphasizes the significance of accounting for long-term linkages when modeling economic or financial time series to prevent drawing false conclusions.

Table 4: Cointegration Test Results

Hypothesized	Eigenvalue	Statistic	Critical Value	Prob.	Result
None *	0.949172	155.2606	95.75366	0.0000	Long-run relationship
At most 1 *	0.908111	92.69497	69.81889	0.0003	Long-run relationship
At most 2	0.547282	42.56434	47.85613	0.1435	—

Rejection of the hypothesis at the 0.05 level

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5 Estimating Model

Table 5 presents the ECM regression results, showing that the model explains 94.23% of the variation in REN (R-squared = 0.9423), with a strong overall fit and statistical significance (Prob(F-statistic) = 0.0000). The Durbin-Watson statistic (1.8158) suggests minimal autocorrelation. Among the independent variables, OIR (6365.98), IFL (21), and GRO (53.86) have positive effects on REN, indicating that increases in these factors contribute to its growth. Conversely, ECM (-29118.6), BOM (-875.35), and UEM (-17008.85) negatively impact REN, with ECM's large negative coefficient confirming an error correction mechanism, ensuring adjustments toward long-run equilibrium. The strong explanatory power of the model and the significant coefficients suggest that it is suitable for further economic analysis and forecasting.

Table 5: ECM Regression Model

Equation	$REN = C(1) + C(2) \cdot OIR + C(3) \cdot IFL + C(4) \cdot GRO + C(5) \cdot ECM + C(6) \cdot BOM + C(7) \cdot UEM$
R-squared	0.942279
Adjusted R-squared	0.920634
Durbin–Watson stat	1.815834
Prob(F-statistic)	0.000000
Substituted Coefficients	$REN = -23 + 6365.98 \cdot OIR + 21 \cdot IFL + 53.86 \cdot GRO - 29118.6 \cdot ECM - 875.35 \cdot BOM - 17008.85 \cdot UEM$

The relationships between government revenue (Ren) and the dependent variables align with economic theory. GDP per capita (Gro) has a positive impact on revenue, as higher economic growth expands the tax base and increases income and corporate tax collections, consistent with Keynesian and classical growth models. Inflation (Ifl) also positively affects revenue since rising prices lead to higher nominal tax revenues, aligning with the Tanzi-Oliveira effect, though excessive inflation may erode real tax earnings. Oil prices (Oir) positively influence revenue, particularly in oil-exporting economies, as higher prices increase tax receipts and royalties, supporting resource dependence theory. Conversely, broad money growth (Bom) negatively affects revenue since excessive money supply can drive inflation and reduce economic stability, in line with monetarist theory. Similarly, unemployment (Uem) negatively impacts revenue, as fewer workers mean lower income tax collection and increased social spending, consistent with Okun's Law. These findings suggest that sustainable growth, controlled inflation, and employment stability are essential for optimizing government revenue. Comparing these findings with neighboring Gulf Cooperation Council (GCC) countries, which share similar oil-dependent economic structures, could provide further insight. Future research could undertake a comparative analysis across the region. Table 6 shows the relationship between Variables.

Table 6: Relationship between Variables

Independent Variables	Relationship with Dependent Variable (Ren)
Gro	Positive
Ifl	Positive
Bom	Negative
Oir	Positive
Uem	Negative

6 Model Quality

Figure 1 displays a histogram of the residuals from the regression model, showing a near-normal distribution from a regression model. Shape: The histogram is somewhat symmetrical with a slight negative skew, suggesting minor deviations from normality. Mean and Median: The mean The residual analysis indicates that the regression model satisfies the normality assumption, as evidenced by the Jarque-Bera test (1.323) with a p-value of 0.5161, which fails to reject the null hypothesis of normality. The residuals are centered around zero (mean = 5.73e-10, median = -12,407.01), showing an unbiased model. The standard deviation (79,547.84) highlights variability, while skewness (0.5419) suggests a slight rightward asymmetry, and kurtosis (2.54) indicates a near-normal distribution. The histogram supports approximate normality, though some dispersion and extreme values exist. Overall, the results validate the model's

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reliability for hypothesis testing, but further checks, such as heteroscedasticity tests, may be necessary to confirm robustness.

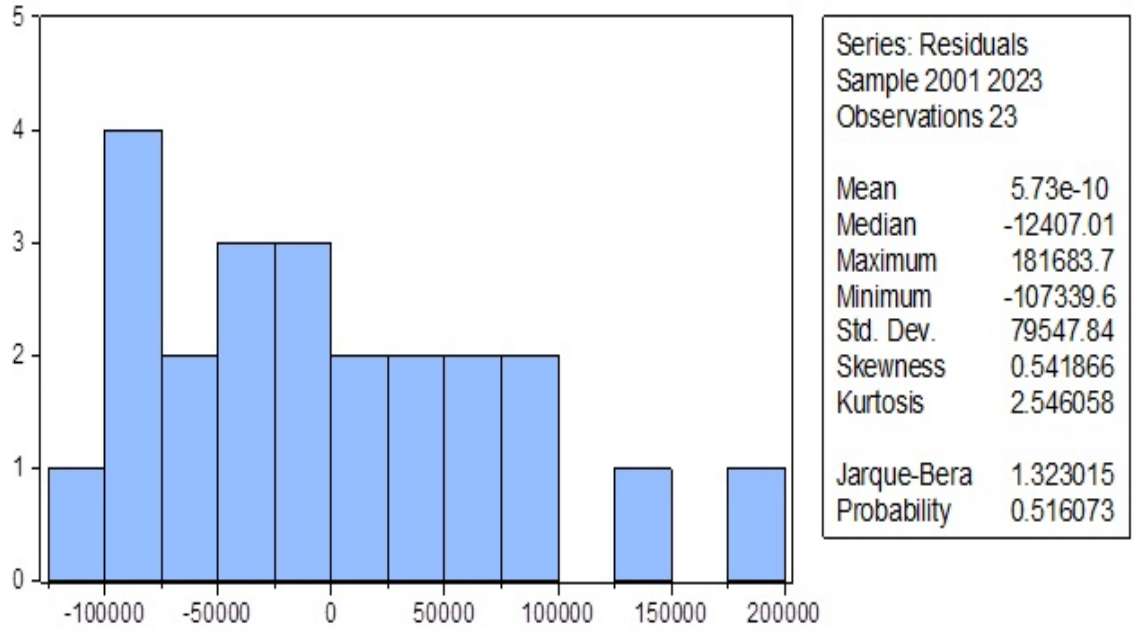

Fig. 1: Jarque-Bera test.

Table 7 presents the heteroskedasticity test results, indicating that the model does not suffer from heteroskedasticity, meaning the variance of residuals is constant. The F-statistic (0.9252) with a p-value of 0.5030 and the Obs*R-squared statistic (5.9243) with a p-value of 0.4317 both fail to reject the null hypothesis of homoskedasticity at any conventional significance level. Additionally, the scaled explained sum of squares (2.2163) with a p-value of 0.8988 further confirms the absence of heteroskedasticity. Since all p-values are greater than 0.05, the assumption of constant variance holds, validating the reliability of the regression model for inference and hypothesis testing without the need for heteroskedasticity-robust standard errors

Table 7: Heteroskedasticity Test Results

Test Statistic	Value	Probability
F-statistic	0.925192	0.5030 (F(6,16))
Obs*R-squared	5.924345	0.4317 (Chi-Square(6))
Scaled explained SS	2.216259	0.8988 (Chi-Square(6))

7 Conclusion

This study looked at the dynamic relationship between financial stress and Saudi government revenue from 2001 to 2023, taking into account the influence of important macroeconomic variables. The investigation used a Vector Error Correction Model (VECM) to account for both short-term volatility and long-term equilibrium relationships. The findings show a substantial relationship between financial stress, as measured by a variety of macroeconomic indices, and government revenue. In particular, oil price changes, inflation, and GDP per capita growth had a positive impact on government revenue, whereas broad money growth and unemployment had a negative effect. These results align with

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established economic theories, including resource dependence theory, the Tanzi-Oliveira effect, Keynesian and classical growth models, monetarist theory, and Okun's Law.The VECM analysis confirmed the presence of cointegration among the variables, indicating a stable long-run relationship. The estimated model had a strong fit, explaining a significant percentage of the volatility in government revenue. Diagnostic testing revealed that the model residuals were roughly normally distributed and lacked considerable heteroskedasticity, bolstering the model's trustworthiness. The ECM term was statistically significant and negative, indicating the presence of an error correcting process that restores the system to long-run equilibrium after short-term shocks. These findings have substantial consequences for Saudi officials. Given the country's heavy reliance on oil revenue, understanding the interplay between financial stress and government income is crucial for effective fiscal management. The results underscore the importance of policies that promote economic diversification, control inflation, and maintain stable employment levels. Furthermore, the study highlights the need for robust mechanisms to manage oil price volatility and mitigate the impact of global financial stress on the Saudi economy. Counter-cyclical fiscal policies, such as building up reserves during periods of high oil prices and utilizing them during downturns, are essential for ensuring long-term fiscal sustainability. While this study provides valuable insights, it also acknowledges certain limitations. The use of a composite financial stress indicator, while capturing multiple dimensions of stress, may not fully capture all relevant factors. Future research could explore the use of more granular financial stress measures, such as sovereign credit ratings or specific market volatility indices. Additionally, the analysis could be extended to incorporate other relevant variables, such as external debt levels, interest rates, or geopolitical risks. Furthermore, future research should focus on the exact routes through which financial stress affects Saudi government revenue. Despite these limitations, this analysis adds to the current literature by providing empirical evidence for the dynamic relationship between financial stress and government revenue in a large oil-exporting economy. The findings provide vital information to Saudi officials as they work to successfully manage public finances and preserve long-term economic stability. Future research could explore more granular measures of financial stress, such as sovereign credit spreads or banking sector volatility indices, and extend the analysis to a comparative framework with other oil-dependent economies. Additionally, incorporating variables like external debt or geopolitical risk indicators could provide a more comprehensive understanding.

References

[1] Kh. A. Abouelnour, University of Sharjah Journal of Humanities and Social Sciences **20**(3), 182-213 (2023).
[2] H. Aghilifar, H. Zare, K. Piraei, and M. Ebrahimi, International Journal of Nonlinear Analysis and Applications **14**(4), 139-150 (2023).
[3] M. I. Ahmed, Scientific Journal of Ceyhan - Sulaymaniyah University **4**(2), 216-239 (2020).
[4] M. S. Al-Hayaly, Journal of Economics and Administrative Sciences **28**(132), 45-61 (2022).
[5] N. Aslam and S. Shastri, International Journal of Economics and Financial Issues **9**(6), 195 (2019).
[6] A. J. Auerbach and Y. Gorodnichenko, American Economic Journal: Economic Policy **4**(2), 1-27 (2012).
[7] R. M. Auty, *Resource Abundance and Economic Development*, Oxford University Press (2001). Available at: https://www.ageconsearch.umn.edu/record/295339/files/rfa44.pdf
[8] C. K. Onyekwere, C. K. Nwankwo, J. Abonongo, E. C. Asogwa and A. Shafiq, Innovation in Computer and Data Sciences **1**(1), 19–31 (2025).
[9] E. C. Asogwa, M. P. Nwankwo, E. E. Oguadimma, C. P. Okechukwu and A. A. Suleiman, Innovation in Computer and Data Sciences **1**(1), 32–50 (2025). https://doi.org/10.64389/icds.2025.01126
[10] Y. Jaffar, M. E. A. Allatif and I. Y. Ahmed, J. Bus. Environ. Sci. **3**(1), 94–111 (2024). doi:10.21608/jcese.2024.254571.1048
[11] A. Z. Albaja, J. Bus. Environ. Sci. **2**(2), 192–209 (2023). doi:10.21608/jcese.2023.202942.1015
[12] O. Blanchard and D. Leigh, VoxEU.org **3**, (2013).
[13] A. Bongers and C. Díaz-Roldán, Sustainability **11**(1), 205 (2019).
[14] M. Bronić, B. Stanić, and S. Prijaković, South East European Journal of Economics and Business **17**(1), 111-124 (2022).
[15] I. Buendía-Martínez, A. Álvarez-Herranz, and M. Moreira Menéndez, Sustainability **12**(13), 5485 (2020).
[16] A. A. Bukhari, A. A. Halwani, and N. A. Bajaber, Journal of Economic, Administrative and Legal Sciences **6**(22), 93-113 (2022).
[17] J. Byiabani and R. Mohseni, Kuwait Chapter of Arabian Journal of Business and Management Review **4**(1), 48-57 (2014).
[18] H. Hamdi and R. Sbia, Economic Modelling **35**, 118-125 (2013).
[19] K. Hassan and A. Abdullah, Procedia-Social and Behavioral Sciences **172**, 223-229 (2015).
[20] A. Kh. N. Hussein and R. H. A. Al-Musawi, Kut University College Journal for Humanitarian Science **3**(1), 109-121 (2022).
[21] H. T. Jawad, Tikrit Journal of Administration and Economics Sciences **18**(57-2), 457-470 (2022).
[22] A. Khayati, International Journal of Energy Economics and Policy **9**(3), 160 (2019).
[23] A. Khosravi and M. S. Karimi, American Journal of Applied Sciences **7**(3), 415 (2010).
[24] Z. Luan, X. Man, and X. Zhou, Journal of Risk and Financial Management **14**(9), 416 (2021).
[25] M. O. E. Nwoba and E. O. Abah, Journal of Humanities and Social Science **7**(22), 5-99 (2017).
[26] G. Piroli and C. Calderón, Sustainability **13**(7), 3942 (2021).

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[27] K. Schmidt-Hebbel and F. Marshall, [Details Missing] (2007).
[28] R. Shaheen, Economies **7**(2), 57 (2019).
[29] S. A. Slama, International Journal of Research in Business and Management **2**(5), 7-23 (2015).
[30] A. Spilimbergo, Emerging Markets Finance and Trade **43**(6), 25-44 (2007).
[31] C. W. Su, K. Khan, R. Tao, and M. Umar, Energy **204**, 117925 (2020).
[32] S. K. Thakur, Region et Développement **33**, 9-38 (2011).
[33] D. Todorova, Journal of International Scientific Publications **13**(9), 1689-1699 (2019).
[34] S. Yeboah and B. James Nyarkoh, The Impact of Mining on the Ghanaian Economy: A Comprehensive Review (1992-2020) (2022).

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