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Artificial Intelligence (AI) Applications on the Tax System: Case Study of Egypt with Special Emphasis on Sustainable Development

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Abstract:

During the last 10 years, Egypt is recovering its economy over several sectors. The country managed to establish 30 new cities. The new cities utilize from 40 percent to 60 percent renewable energy over 3 10-year phases. These huge, and massive constructions were coupled by another construction of the infrastructure facilities all across the country to establish a modernized country and to reach all parts of the country.

The access of the students to all government services became via e-government platform. This also applied to investment. The advancement of the IT sector became one the priorities of Egypt's 2030 Sustainable Development Strategy. This is required to integrate high tech with government and banking applications.

The Electronic Invoice (EI) became a requirement by the Egyptian Tax Authority (ETA) to be used by medium-size and large corporations and stores for tax monitoring.

Purpose: This research paper attempts to study the relationship between AI and the tax collection to enhance the economic growth in Egypt, with special emphasis on the green economy.

Design/methodology/approach: This paper focuses on studying the impact of using the AI to enhance the tax collection and to avoid tax evasion. This will have a direct impact on the government revenues required to finance government spending on the development projects. This will boost the economic growth in Egypt.

Findings: the analysis and results underlined the followings:

1. The type of the relationship between AI and tax collection.
2. The main reasons for using the AI in the tax collection in Egypt.
3. The situation of tax collection in Egypt.
4. The relation between the tax revenues and the green economic growth in Egypt.

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The original/value of the chapter: It made recommendations and draw policies to promote the usage of the AI in the tax system in Egypt.

Keywords: Artificial Intelligence (AI); Machine Learning (ML); Optical Character Recognition (OCR; Natural Language Processing (NLP); tax evasion; tax collection; green economic growth; electronic invoices; and value added tax

1. Introduction

Taxes are considered to be an important source of income for the development plans in Egypt. There are several types of taxes that are collected by the Egyptian government, including profit tax, income tax, and value added tax (VAT).

This research paper encompasses several aspects of AI uses in payments, with special emphasis on tax collection. This new revolution in tax collection by using the AI diminish the tax evasion to a great extent, and provides speedy collection to support the government short term spending requirements.

This research aims to identify the impact of improving the tax collection technology on raising the tax revenues to drive green economic growth and development. This is done by formulating a relationship between the growth in tax collection and the growth in the Gross Domestic Product (GDP) in Egypt.

Egypt's Sustainable Development Strategy 2030 gives a special attention to the use of high tech to attain the green economy to support the renewable energy alternatives. The finance of such projects is depending on increasing the tax collection.

This paper will be divided as follows: Section one in which the introduction has been tackled. Section two includes literature review. Section three includes an overview of the AI uses in payments, especially in Egypt, as related to economic growth. Section four will tackle the econometric analysis of the relationship between AI and tax collection as related to the economic growth in Egypt by using a time series analysis. Section five includes the conclusion, the findings, and the recommendations.

2. Literature Review

Qiufan (2021) tested in Google China over several years various applications of the AI, and provided for future applications of the AI within the financial applications including tax applications. AI websites are used to provide integrated tax guidance for tax user and beneficiaries. The big problem of AI in tax usage is the contradiction in the implementation of the tax data by various analysts based on their needs and purposes.

The Granger Causality method to analyze data from 29 countries from the Caribbean and Latin American regions for the period 2000 to 2023. The study evaluated the impact of tax collection on growth. The study recorded evidence of a causal relationship between the variables in 18 countries. assessed the impact of financial obligation on financial development. The study found that the ratio of outside

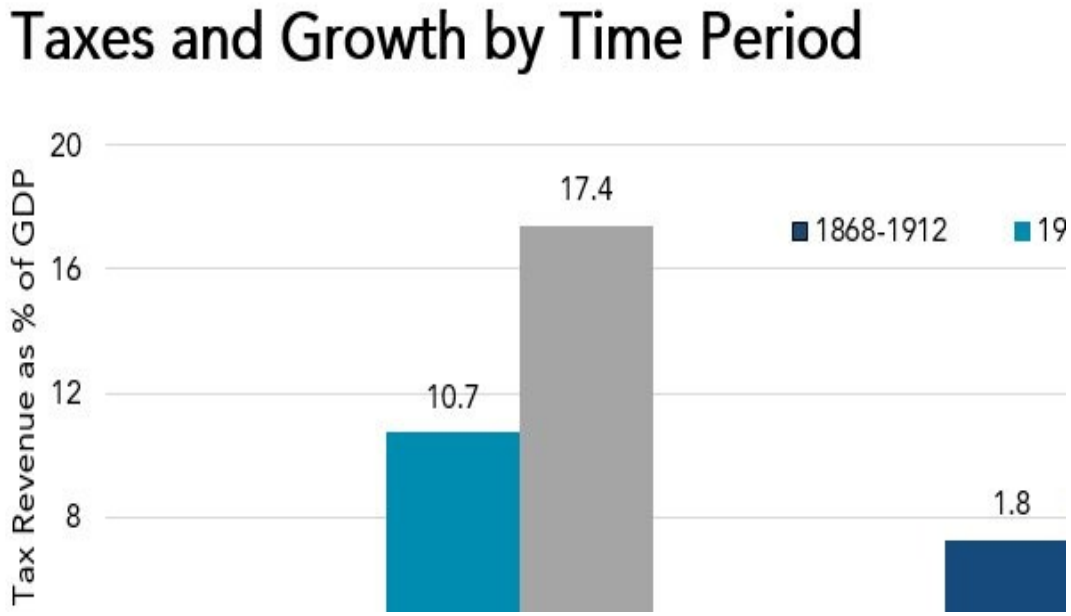
obligations to GDP positively influenced monetary growth. (Zouhaier and Fatma, 2023)

J. Open Innov (2021), used the fixed and arbitrary impact models and data from Nigeria, and Rwanda to examine the impact of tax evasion on monetary development for the period 2001 to 2020. In that study, he proved that tax evasion adversely impacted the financial growth of the countries under consideration.

Chowdhury (2023) defined "tax evasion" as a situation in which the expected payment falls short of the expected government expected revenues required for the development plans. This situation occurs when a country's tax level falls short of its ability to finalize the pending development projects.

It is argued that tax evasion depresses investment and growth by increasing uncertainty about the government actions. As a result, there might be expectations that the government will resort to distortionary measures to levy additional taxes in order to cover this deficit to meet its obligations (Lénor, 2023).

From a neo-Keynesian perspective, there is a positive effects of tax collection on economic growth, there are broad theoretical explanations on economic growth by using the "Harrod-Domar model". Tax reduction encourages savings investment that has a positive effect on economic growth. This perspective is also supported by the Romer-Lucas-inspired endogenous growth models that encompass a number of determinants of economic growth including tax collection. (Vermeend, 2024).



OECD (2024) concluded a negative relationship between tax evasion and the economic growth including in a study of middle income developing countries over 20 years and found out that the this hindered the GDP growth rate and

abstracted the sustainable development plans by using annual time series data. GDP is the dependent variable and Investment, and growth in tax collection are independent variables. They run the data to arrive at serial auto correlation between these variables. They ended up with results of interconnection between the growth in tax collection and the achievements of the required growth rate in GDP and in green GDP as a reflection of achieving the sustainable development goals as part of the required economic growth.

Also, this conclusion was supported by many recent studies. Engen (2023) connected the tax collection and economic growth by using high tech in several developed countries by using Co-integration and VECM.

Deloitte (2019) verified that the AI is incomparable by being much better than the human ability to match data to figure out fraud in tax reporting. AI can also deal with huge data in much shorter time with very high level of accuracy. Deloitte as one of the big five auditing and consulting firm worldwide has proved these facts with several clients in several countries. Finally, Deloitte recommended to several governments to expand on the application of the AI in tax collection and tax reporting.

3. Overview of the AI uses in payments, especially in Egypt, as related to economic growth

The type of the relationship between AI and tax collection

AI is used to automate reedited payments processes. AI also optimize workflows of huge volumes of transactions. AI is using integrated Optical Character Recognition (OCR) and Natural Language Processing (NLP) that can extract key fields from invoices automatically.

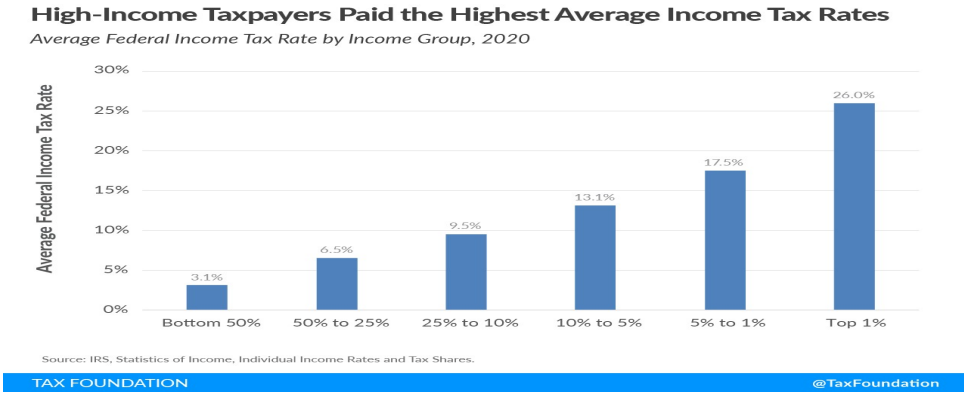
This process can help in the accuracy of the data extracted for tax calculations, and to verify the validity of the tax information submitted to the tax authority.

Nevertheless, there are some successful long tracked experiences in some developed countries. In the USA, the Federal taxes are calculated via AI.

The US Electronic Federal Tax Payment System (EFTPS) is a free-of-charge tax payment service system run by the US Department of the Treasury. The system is fully automated by using AI, and simple for users. It is considered to be user friendly system with open 24/7 access. The system is supported by AI services that monitor all entries, and provide for periodical checks and verifications. The AI services developed the system to be accessible via 24/7 mobile application. The system is still accessible via the Internal Revenue Service (IRS) provided by the US government via AI services. The IRS Form 5472, and Form 1120 together with tax file are provided for tax payers through both the IRS government website, and the AI mobile application IRS2Go. Then data are transferred via AI to EFTPS for verifications and to process payments. After payments, all transactions, new information, and payments are automatically updated on the system and enter electronically to the tax file of the tax payer via AI services. By using the AI, new services were added including the Tax wallet, and the simple

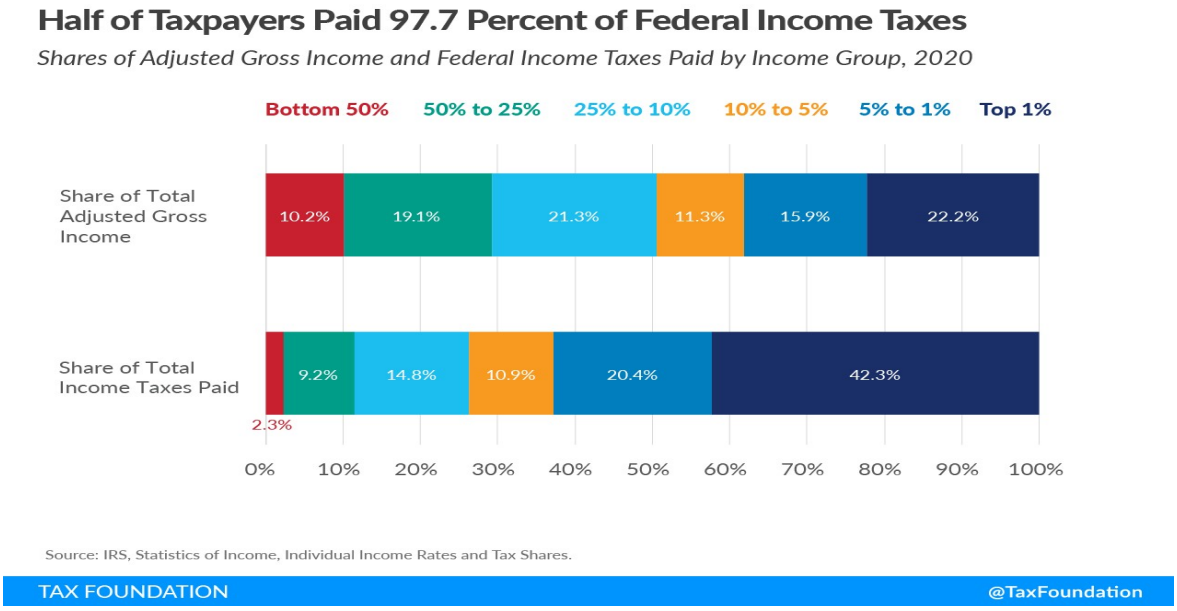
tax filling. A recent AI development is the IRS Electronic Fund Withdrawal (EFW) that facelifted tax payment through direct e-payment or through e-checks. This new e-pay method was recently offered the IRS e-filing program as part of the tax e-files preparation automated online government program. Such AI enhancement resulted in time saving matched with high accuracy. The system diminished most of the fraud transactions because the AI automated verifications goes across different data for verifications. (US Department of Treasury, 2024).

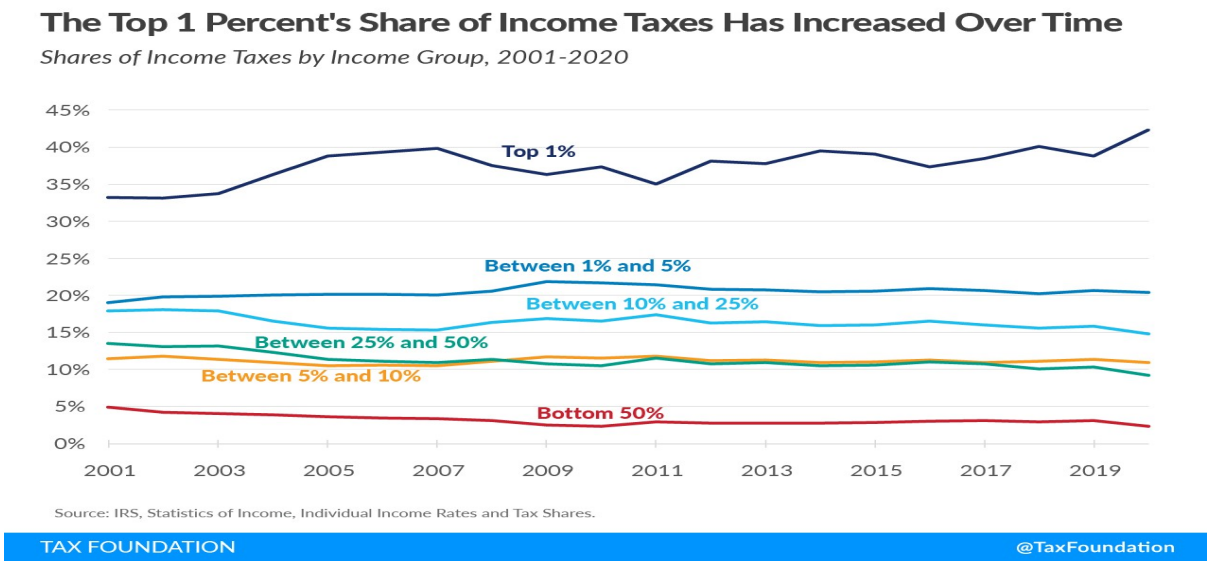
US Tax Brackets (Taxes Due by using the AI)

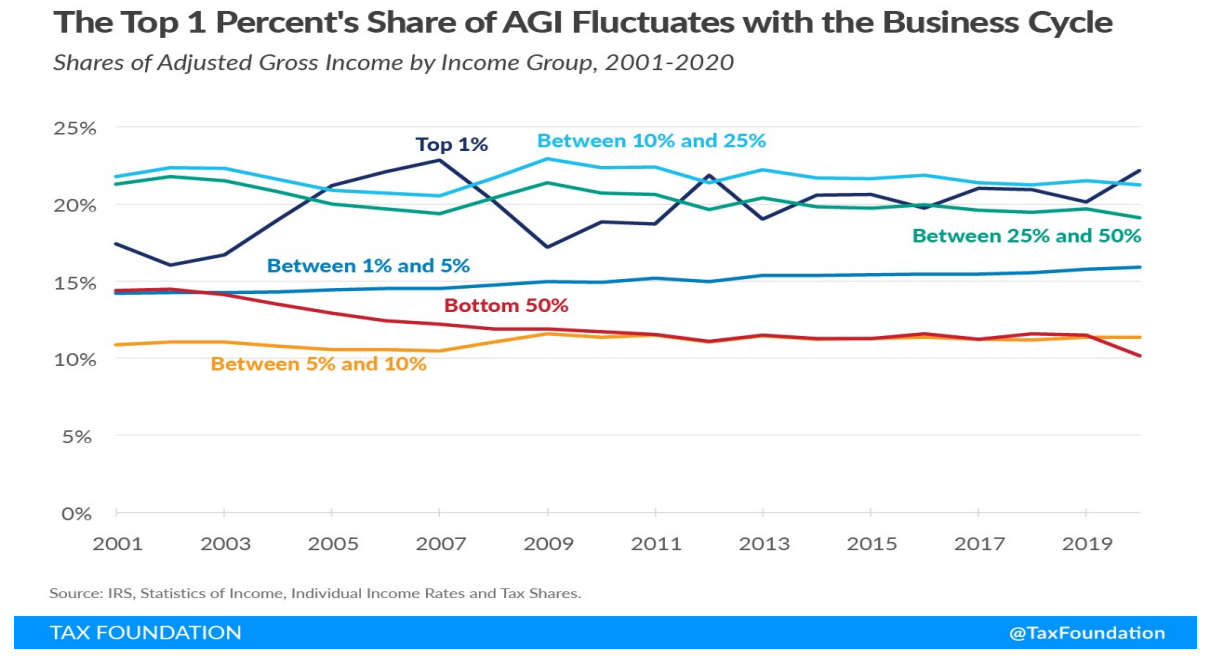


Source: IRS.gov

US Tax Statistics Using AI







Source: IRS.gov

Overview of the AI Uses in Payments, especially in Egypt, as related to Economic Growth

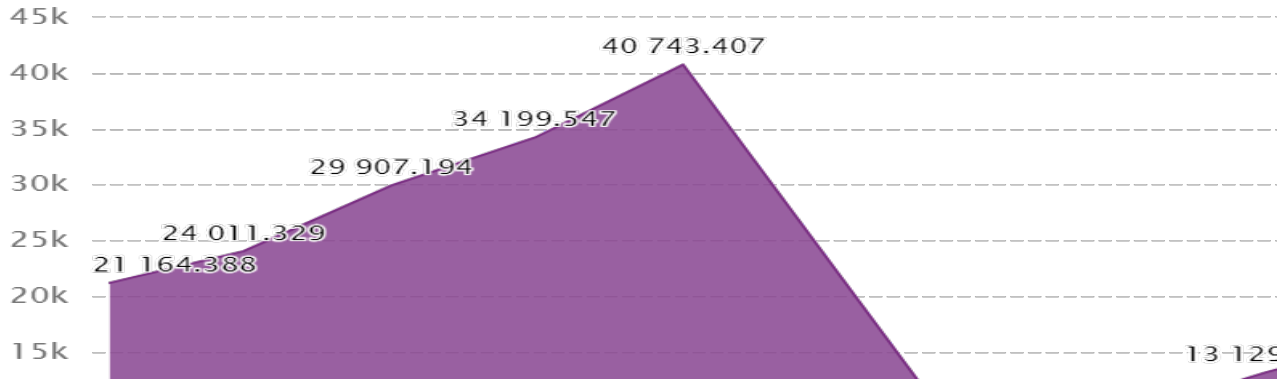
Egypt issued "Egypt National AI Strategy" to govern all AI uses and development by all users and developers from both the technical and ethical conduct requirements. This underlined the technical codes of conduct as well as the ethical codes of conduct. The "Egypt National AI Strategy" is compulsory for all parties and protected by the governing Egyptian laws. This newly introduced strategy considered all surrounding economic and social aspects within an integrated framework.

The "Egypt National AI Strategy" is governing all AI technologies ranging from machine learning algorithms to advanced data analytics paving the road for efficiency and innovation in Egypt with a regional development arm.

The AI tax applications in Egypt benefited from 2 basic developments. First, the Financial Inclusion Strategy (2022-2025) issued by the Central Bank of Egypt (CBE) as part of the Egypt's Sustainable Development Strategy "Egypt Vision 2030" provided for all salaries (including government employees) and pensions to be paid electronically. Also, all government fees and taxes are to be paid only electronically. Second, the Egyptian Tax Authority turned all transactions to be electronically only. Also, the Egyptian Tax Authority necessitated that merchandisers are only allowed to use the electronic invoice solely, and made the paper invoices totally illegal even at shops.

All these electronic payments are reflected through the applications of the AI in the Egyptian Tax Authority records. Submission of tax files became also electronically done. This provided for high degree of accuracy and for speedy transactions. This also helped the Egyptian Tax Authority to avoid all types of tax evasion, and fraud by applying the AI thorough wide verifications.

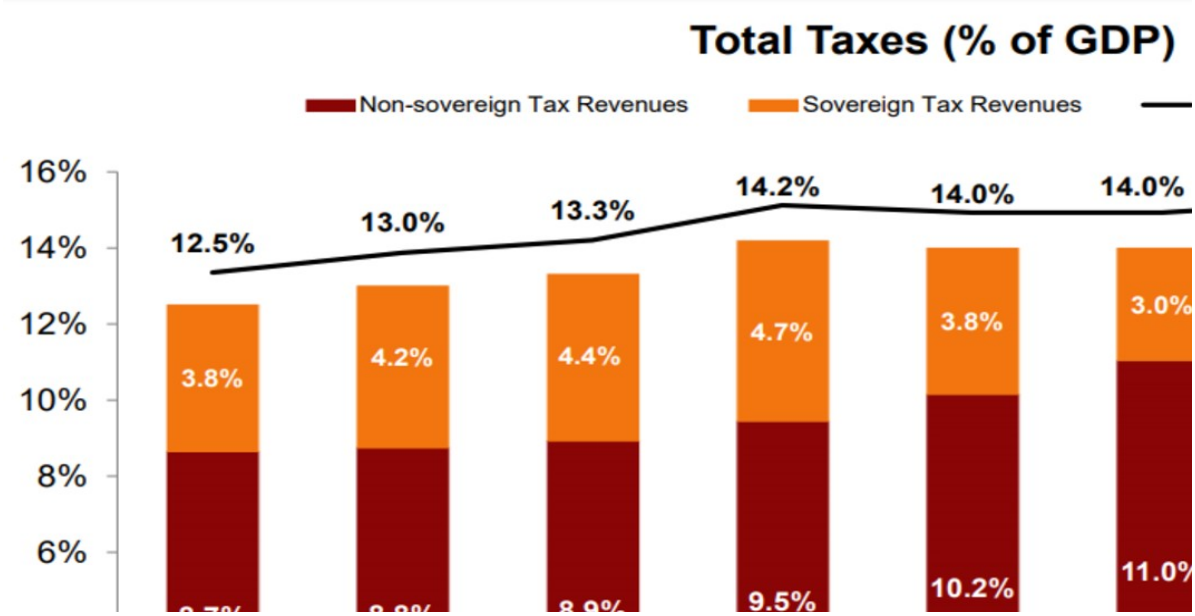
Egypt's Tax Revenue from Jan 2005 to Feb 2024



Source: Egyptian Ministry of Finance

The Relation Between the Tax Revenues and the Green Economic Growth in Egypt

The green economy became one of the requirements of the growth in the Egyptian economy according to Egypt's Sustainable Development Strategy "Egypt Vision 2030". Therefore, all expected economic growth, which is planned to be within the green economy practices, will provide for the growth in the tax revenues. The following chart exhibits the expectations of the Egyptian Tax authority as related to the green economic growth in Egypt that started to be supported by the AI applications:



Source: Egyptian Ministry of Finance

Data Analysis

Data collected dealt with economic growth given by GDP growth, against tax collection.

$Y = \beta° + \beta 1\ TC + \mu$

The annual GDP growth is the dependent variable while the rest of the variables are explanatory variables. The main explanatory variable is tax collection (revenue) and other variables are used as stochastic error.

Y	GDP growth (Annual %)
TC	Tax collection amount annually

The relations are tested by Auto-Regressive Distributive Lag model.

- **Unit root test**

Before running the model, Unit root test is applied to ensure that all the variables are either I(0) and I(1) in order to avoid spurious regression.

Variable	Prob.*	
	At level	1st difference
GDP growth	0.004	0.0000
TC	0.617	0.0000

ARDL Model

Included observations: 45 after adjustments
Maximum dependent lags: 3(Automatic selection)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GDP GROWTH(-1)	0.005265	0.213245	0.031667	0.6872
TC	0.002634	0.005180	0.658794	0.5316
R-squared	0.365427	Mean dependent var		3.195401

Test Statistic	Value	k
F-statistic	0.368594	2.7

This is a case of positive correlation. In the long run tax revenues has significantly positive impact on economic growth in Egypt matching with the economic theory

that tax revenues fund the government spending that stimulate economic Growth.

4. Conclusion, Findings, and Recommendations

AI is using integrated Optical Character Recognition (OCR) and Natural Language Processing (NLP) that can extract key fields from invoices automatically.

This study aimed at analyzing the impact of tax revenues on economic growth in Egypt using ARDL model. The result indicates a positive significant impact of tax revenues on economic growth in the long run.

This study focused on the use of AI in tax collection and in the avoidance of tax evasion.

The US Electronic Federal Tax Payment System (EFTPS) is a free-of-charge tax payment service system run by the US Department of the Treasury. The system is fully automated by using AI, and simple for users.

The AI tax applications in Egypt benefited from 2 basic developments including the Financial Inclusion Strategy (2022-2025) and the fact that the Egyptian Tax Authority turned all transactions to be electronically only. Also, the Egyptian Tax Authority necessitated that merchandisers are only allowed to use the electronic invoice solely.

The followings are few recommendations made to Egypt to heavily utilize the AI in the tax system:

1- To include AI tax applications in the education, especially in the university education in the faculties of computer science and artificial intelligence.
2- To launch awareness campaigns to enhance the importance of regularity in paying taxes.
3- To ensure incentives to facilitate online payments, and the use of electronic invoices.
4- To provide tax incentives and custom duties exemptions for the importation of computers and mobile phones as well as expanding producing them locally to support the use of AI in tax applications.
5- To benefit from the machine learning techniques to develop the AI tax applications in Egypt.

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