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Investigating the Nonlinear Causal Relationship between Government Revenues and Expenditures in Iran: Markov Switching Nonlinear Causal Method[1]

Hamid Reza Panahi[1],Zahra Karimi Tekanloo[2*],Mohaamad Mahdi Barghi Oskoie [2]
1. PhD student in Economic Sciences, Aras international campus, University of Tabriz, Tabriz, Iran
2. Professor, Department of Economics, Faculty of Economics and Management, University of Tabriz, Tabriz, Iran

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Abstract

Background and Objective: Examining the relationship between government expenditures and revenues is crucial for economic growth and development. Understanding the causal relationship between government income and expenditures can significantly aid in formulating an important budgetary plan to achieve economic prosperity in a country. The relationship between government income and expenditures can indicate the level of government investment in key sectors of the economy (such as education, health, and infrastructure). Increased investment in these sectors leads to long-term economic growth.

Methodology: Given the importance of investigating the relationship between government spending and revenues, this study has examined this relationship and identified the cause-and-effect relationship using the Markov Switching method. The present study has applied the Markov Switching causality method to data from the period 1973-2022.

Results and Findings: The results indicate that in a state where both government revenues and expenditures are high, causality runs from government revenues (both other revenues and oil revenues) to construction and current expenditures. In contrast, in a state of low revenue and expenditure, oil revenue only leads to a change in development costs, and other revenues lead to a change in current costs. Examining the results from the expenditure side to government revenues separately for the two investigated regimes shows that during the zero regime (high revenues and expenditures), no causality is observed from development and current costs to revenue. Conversely, when the income and expenditure situation is low, only development costs can lead to a change in other revenues, and no causality is observed from current costs to government revenues.

Keywords: Budget deficit,current expenditure,development expenditure , tax revenue, nonlinear causal relationship.

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[*] **Correspong Author Email:** z.karimi@tabrizu.ac.ir

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EXTENDED ABSTRACT

Introduction

When it comes to the relationship between income and government spending, it is very important to be symmetrical or asymmetric. In most empirical studies in this field, the asymmetric connection of cost and income has not received much attention. If the budget adjustment process is asymmetric, ignoring it will lead to misleading results. Also, determining the relationship between government revenues and expenses can help policymakers identify the reasons for budget deficits as well as design appropriate correction programs. Asymmetric adjustment indicates that the system's response to positive and negative deviations from the long -term balance level is not the same. In other words, if the process of asymmetric adjustment is asymmetric, the response variables will vary in the amount and speed of adjustment compared to the same positive and negative deviations from the equilibrium level. The intensity of adjustment may vary. On the other hand, there is a great deal of evidence that indicates asymmetric behavior in the budget adjustment process. Statistical evidence of government revenues and expenses in Iran shows that there has been a budget deficit problem for most years.

Methodology

The Markov Switching Vector Auto regression (MS-VAR) model is a statistical approach used to analyze time series data that exhibit regime changes or structural breaks. This method allows researchers to capture changes in the relationship between variables over different states or regimes, which can be particularly useful in economic contexts where relationships may vary during periods of growth and recession, or in response to external shocks. Key Components of the MS-VAR Model:

Markov Switching: The model assumes that the data can switch between different regimes (states) according to a Markov process. Each regime has its own parameters, allowing for different dynamics in each state. Vector Auto regression (VAR): The VAR component captures the linear interdependencies among multiple time series variables. In a VAR model, each variable is regressed on its own lagged values and the lagged values of all other variables in the system. Causal Relationships: To analyze causal relationships using an MS-VAR model, you can examine how changes in one variable affect others across different regimes. Steps to Implement an MS-VAR Model: Data Preparation: Collect and preprocess the time series data. Ensure that the data is stationary or apply transformations (e.g., differencing) to achieve stationarity. Determine Regimes: Specify the number of regimes you believe exist in your data. This can be based on prior knowledge, visual inspection, or statistical tests. Estimation: Estimate the MS-VAR model parameters using maximum likelihood estimation (MLE) or Bayesian methods. This involves estimating both the VAR parameters for each regime and the transition probabilities between regimes. Model Diagnostics: Check the model fit using statistical tests and diagnostics.

Results and Findings

It is estimated that oil revenues, current costs, tax revenue have no significant effect on oil revenues. The reason is that the government's oil revenues are determined by oil prices and oil

sales. Estimation of the equation shows that when the current costs of the government are high, all government costs and incomes affect government spending. According to the estimated equation in the zero regime, with the increase in oil revenues, the amount of government costs decreases. Also, the amount of construction and other revenues increases, the current cost decreases. In contrast, in the regime only other revenues lead to increased current costs. Estimates for construction costs indicate that in the zero regime indicates that all research variables affect it. When the cost of construction is high, the current government's current cost has a positive impact on oil revenues and the combination of other income. However, in a regime one, which is low, the cost of construction has only increased oil revenue. According to the estimated results, only in the regime, an increase in current cost has a significant positive impact on other revenues. It is clear that when there is oil revenues, bonds, tax revenues and government property sales will not be a priority, so other revenues will not have an impact on oil revenues. In contrast, the high current cost of the government increases the need for the sale of government property, bonds and taxation. Accordingly, as current costs increase, the combination of other government revenues also increases.

Investigating the cause and cause of this variable with other costs and revenues in the regime indicates that only the cost of construction has a significant impact on it. The first interruption coefficient of construction costs indicates that when the amount of other government revenues is low, construction costs lead to reduced other revenues. The results of the estimates are as follows:

The causal relationship between income and the cost of the Government

REGIME 0				
	OIL R	OTHER R	Current cost	**Cost of construction**
OIL R	✓	×	✓	✓
OTHER R	×	×	✓	✓
Current cost	×	✓	✓	✓
Cost of construction	×	×	✓	✓
REGIME 1				
	OIL R	OTHER R	Current cost	**Cost of construction**
OIL R	×	×	×	✓
OTHER R	×	✓	✓	×
Current cost	×	×	✓	×
Cost of construction	×	✓	×	×

Conclusion

The results of this study show that the relationship and causality between government revenues and expenditures can change under different conditions. Estimates indicate that if the oil revenue situation is high, the government’s development and current expenditure will be changed by oil revenue. This is true only for development expenditure during the period of low oil revenue, and oil revenue has no significant relationship with the government’s current expenditure. A very

important point about oil revenue is that this part of government revenue has no cause and effect with other government revenues. Since government expenditures have been covered by oil revenue for most of the years, the government's attention and focus has likely been based more on oil revenues and other sectors that could be considered government resources have been neglected. The results of the study for other revenues show that when the government's expenditure situation is in the zero regime; other revenues lead to changes in current and development expenditure. This is while if the income and expenditure situation is in the one regime; It only leads to a change in current expenditure and cannot affect the development expenditure situation.

The results of the cause-and-effect relationship from the expenditure to income side are that current expenditure in neither regime zero nor one has been able to change government revenues. In contrast, development expenditure in regime one leads to a change in other revenues, but in regime zero it cannot lead to a change in other revenues. This estimate shows that the increase in oil revenues leads to neglect of economic development and economic prosperity, and therefore development expenditure cannot lead to a change in other revenues. This is while in conditions of low revenues and expenditure, most development expenditure is used to solve the economic problem, and this makes development expenditure the cause of other revenues during regime one.

Declarations

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Authors' Contribution
Authors contributed equally to the conceptualization and writing of the article. All of the authors approved the content of the manuscript and agreed on all aspects of the work declaration of competing interest none.

Conflict of Interest
The authors declare no conflict of interest.

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