

## ARTICLE

## The Effect of Copper Price Shock on the Relationship between Government Revenue and Expenditure: Testing the Fiscal Stability Law of Mongolia

Ariungerel Bayarsaikhan\*

Risk Management Department, General Department of Taxation, Ulaanbaatar, Mongolia

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**Abstract:** This study empirically investigates the relationship between government revenue, government expenditure and the copper price in Mongolia, a resource abundant country. Using quarterly data of government revenue, expenditure and international copper price from 2000 to 2015, the results of auto regression (VAR) show that there is a strong causality from revenue to expenditure, while increase in expenditure, most likely, is not accompanied by rises in revenue. This result is consistent with the revenue-spent hypothesis. Moreover, the result also indicates that copper price shock increases revenue, but decreases expenditure. This finding supports the assumption that the Mongolian government follows its Fiscal Stability Law, a strategy that intends to maintain the stability and sustainability of the government budget.

**Keywords:** Mongolia; copper price shock; government revenue; government expenditure; vector auto regression (VAR); Fiscal Stability Law (FSL);

### INTRODUCTION

Copper has been used as an important metal by mankind for more than 10,000 years. Its utilization in most sectors, such as electronics and wirings, power generation and transmission, and construction and manufacturing, indicates the significant role copper plays not only in the improvement of our individual lives, but also in global economic growth [14]. As a crucial economic indicator, its supply and demand leads to fluctuations in its price, generating positive and negative shocks to the fiscal outcomes of some copper exporting countries.

The global financial crisis in 2008 is a clear example of the negative price shock on the Mongolian economy. According to the Budget Report of Mongolia (2011), as the copper price dropped, causing copper revenue to tumble, the real exchange rate depreciated against the US dollar, which led to a shrinking of the foreign reserve fund by 50 percent. The most striking consequence was a 33 percent hike in the aftermath of the crisis. [3] As a result, the government took external loans of 400 million dollars to finance its expenditure. Since the share of external debt in the economy had

\*corresponding author: [ariungerel25@gmail.com](mailto:ariungerel25@gmail.com)

<https://orcid.org/0000-0002-2446-2846>



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increased, the Mongolian government’s creditability had declined. Consequently, in 2010 the FSL was adopted in order to protect the economy from future external shocks.

The purpose of that law is to promote and develop economic growth by generating financial savings from mining windfalls and limit the expenditure growth by restricting fiscal budget to a deficit of no more than 2 percent of GDP. [6]

Perhaps, from the standpoint of expenditure approach, there is another way to protect the economy from future external shocks: generating financial savings from the windfall profit of primary products. The Future Heritage Law (FHL) has been implemented in

Mongolia since 2016. The purpose of the law is to implement the principle of equitable distribution of national wealth to the people of Mongolia: present and future generations by appointing The Future Heritage Corporation (FHC) as a manager of the company. This corporation is a fully state-owned company that does not own fund’s assets, but which only invests within the limits of its assigned rights and enhances the true value of the fund's assets. The main financing sources of this company are the 65 percent of royalties and the dividends of share in ownership of state-owned companies. Presently, 1 billion tugrig (MNT) has been accumulated in this fund.

Figure 1. Total size of Future Heritage and Stabilized Funds

	<i>In million MNT</i>		
	2017	2018	2019
Government revenue			
Future heritage fund	357,722.80	620,693.60	1,040,419.90
Stabilized Fund	325,680.20	206,986.60	94,596.60

The FHC’s expenditure is frozen until 2030 and is regulated in such a way that only 10 percent of its net income on budget is spent. In order to get the best usage of this fund, its operations are regulated to fully ensure its independence free of any impact of politics and populism, and which is expected to generate savings for the future generations.

This study has two purposes. Firstly, this study extends the line of literature by investigating the relationship between government revenue and expenditure in Mongolia and the effects of future copper price

shocks on both. There will be four possible outcomes: 1) a unidirectional relationship, where revenue causes spending 2) a unidirectional relationship, spending causes revenue 3) a bidirectional relationship between revenue and spending, 4) no causal relationship between them. Secondly, the study investigates the implementation of the FSL in the short-run. The goal of this research is to generate understanding of how resource abundant countries should respond to volatility in natural resource prices and minimize fiscal imbalances without hindering the economic growth.

**Literature reviews**

There are a growing number of studies in public finance literatures analysing the link between government revenue and expenditure. The research focused on countries where natural resource windfalls do not play crucial role in their economies. The adjustment of government revenue and spending determines the size of the budget deficit and plays an important role in the savings and economic growth of the country. [13] It, therefore, has

been an important issue among researchers, particularly explaining the impact of natural resource price shock on fiscal variables. In determining the causality between revenues and expenditures, there are four hypotheses. The first approach is the *tax-spend hypothesis* argued by Friedman and Buchanan & Wagner. [4] [8] In their framework, rising taxes will lead to increase in spending. They assumed that a government will spend all of its resources in

order to finance the growth of expenditure that is caused by the hike in taxes. As a result, it implies that there will be no change in deficit due to the increase in public demand, caused by the growth in government spending. The direction of causality runs from government revenue to expenditure.

The second approach is the *spend-tax hypothesis*. According to Peacock and Wiseman, expenditure decisions are made prior to intakes of revenue, particularly during war, economic recession or the occurrence of natural disasters, which leads to large increases in spending. [18] Consequently, the only way to finance spending is increasing taxes, which the next generation has to bear. The direction of causality runs from spending to tax.

The third view is fiscal synchronization, which is characterized by bidirectional causality between revenue and spending. Meltzer and Richard claim that the government makes decisions on revenue and expenditure at

the same time, which benefits the optimal choice of voters within the budget constraints. [15]

The last and fourth hypothesis is the *fiscal neutrality or institutional separation*, which results in the absence of causality between revenue and expenditure. This approach stresses that decisions of revenue and expenditure are made independently, and are determined by the long-term economic growth. [1] Perhaps, while determining the causality between revenue and expenditure, all these four hypothesis have significant role in ensuring budget imbalances, specifically in managing the budget deficit.

Perhaps the results of studies on *resource curse* are extremely mixed and controversial, and this study attempts to examine the effect of copper price shock on the relationship between government revenue and expenditure nexus, as well as the implementation of the FSL in Mongolia.

## MATERIALS AND METHODS

This study analyses the impact of copper price on government revenue and government expenditure in Mongolia by using quarterly data of Mongolian GDP, government revenue, expenditure and the international copper price within the time period of 2000 to 2015.

As regards the **Model** to test the effects of copper price on GDP, government revenue and government expenditure in Mongolia, this researcher adopted the VAR framework that

was developed by Sims [20]. In the VAR model, all variables are treated as endogenous variables; however, this contemporaneous correlation can be mitigated by using an identification strategy such as the Cholesky decomposition of matrices, which had been used in this study.

The mathematical system of equations is presented as follows:

$$\begin{aligned} \Delta lcop &= \sum_{i=1}^n \alpha_i L^i \Delta lcop_t + \sum_{i=1}^n \beta_i L^i revgdp_t + \sum_{i=1}^n \beta_i L^i expgdp_t + \varepsilon_t \\ revgdp &= \sum_{i=1}^n \alpha_i L^i \Delta lcop_t + \sum_{i=1}^n \beta_i L^i revgdp_t + \sum_{i=1}^n \beta_i L^i expgdp_t + \varepsilon_t \\ expgdp &= \sum_{i=1}^n \alpha_i L^i \Delta lcop_t + \sum_{i=1}^n \beta_i L^i revgdp_t + \sum_{i=1}^n \beta_i L^i expgdp_t + \varepsilon_t \end{aligned}$$

Where  $\Delta lcop$  = the log difference of the copper price,  $revgdp$  = the government revenue to GDP ratio,  $expgdp$  = government expenditure to GDP ratio,  $L^i$  = the length of the lag term, and  $\varepsilon_t$  = the error term.

The advantage of VAR is that it allows us to forecast the future trends of variables and distinguish between the long-and short-term effects. Also, it gives us the possibility to look at the dynamic effects of copper price shocks on

fiscal revenue and spending, by applying the impulse response functions and variance decomposition, which are the main tools of the VAR model. Impulse response analyses can quantify and graphically interpret the time path of the copper price effect on fiscal variables. [7]

The main objective of the study is to test the causal short-term relationship between government revenue and expenditure. To meet this objective, the process of the model can be divided into three steps. In the first step, the Augmented Dickey-Fuller (ADF) and Philips-Peron (PP) tests were used to verify if the variables are stationary or not [5] [19]. In next step, Johanson-Fisher method was used to identify co-integration. [12] In the third and final step, long and short-term elasticities were measured by estimating the VAR model. In addition, the Cholesky decomposition method was used to identify impulse responses. In order to identify the sequence of the variables, economic theory, based on sensitivity of the variables, was utilized. Consequently, the following order was set: copper price (*cop*), revenue to GDP (*revgdp*), and government expenditure to GDP (*expgdp*).

## RESULTS AND DISCUSSION

The results of the study show the estimated impulse responses of a copper price shock on fiscal variables in Mongolia, particularly the effect of copper price shock on government revenue and expenditure as a percentage of GDP. The main findings of the analyses are presented in Figure 1. It shows the responses of government revenue and expenditure to a one-standard-deviation increase in the current value of copper price shock. The impulse response function is for a time horizon of 10 quarters.

The copper price shock is found to have statistically significant positive effect on government revenue and a negative effect on expenditure; in other words, the shock increases government revenue, but decreases expenditure. Following the copper price shock, government revenue increases gradually, with the rate of increase peaking at the second quarter. The increase in revenue levels off at around 1

All variables are used in levels, excluding the copper price, which becomes stationary at first differences. In order to test the fit of the model, optimal lag length is set at 3, according to the most commonly used criteria, the Akaike Information Criterion (AIC) and the Schwartz Bayesian Criterion (SBC), in which values are selected to provide the smallest prediction of error. Next, Johansen co-integration test was estimated, where the result indicates no co-integration between variables.

The study uses monthly data of nominal government revenue and expenditure and quarterly data of nominal GDP from 2000 to 2015 obtained from the National Statistical Office of Mongolia (NSO). [9] [16] [17]

Data on international copper price were obtained from International Monetary Fund Commodity data. [11]

Since time series were not seasonally adjusted, this researcher applied seasonal adjustment by using Census X12, excluding copper price and converted into quarterly data, by taking average values.

percent by quarter 6. Meanwhile, expenditure drops to around 1.2 percent by the fourth quarter, but after quarter 5 the result becomes statistically insignificant. Note that the responses of both revenue and expenditure are strong and expenditure reacts slower than the revenue response in terms of reaching the peak.

Now that I have looked at the behaviour of revenue and expenditure after copper price shock, what remains is the completion of the model by incorporating the revenue and expenditure shocks. As mentioned in methodology part, the advantage of VAR is to forecast future trends of variables and generate predictions on how fiscal policies behave in response to changes in the economy. The expenditure shock is found to have a statistically insignificant effect on revenue. In other words, increases in expenditure most likely will not be accompanied by rises in revenue. However, following revenue shock,

expenditure rises gradually to 0.02 percent by the tenth quarter and maintains its level in the future. This result is statistically significant. These findings are consistent with the *revenue-spent hypothesis*, put forth by Buchanan and Wagner and Friedman [2] [9]. The findings

suggest that expenditure is vulnerable to revenue, and therefore, in order to minimize budget imbalances, the government should manage fiscal budget by enhancing effective policies such as FSL.

Accumulated Response to Cholesky One S.D. Innovations  $\pm$  2 S.E.

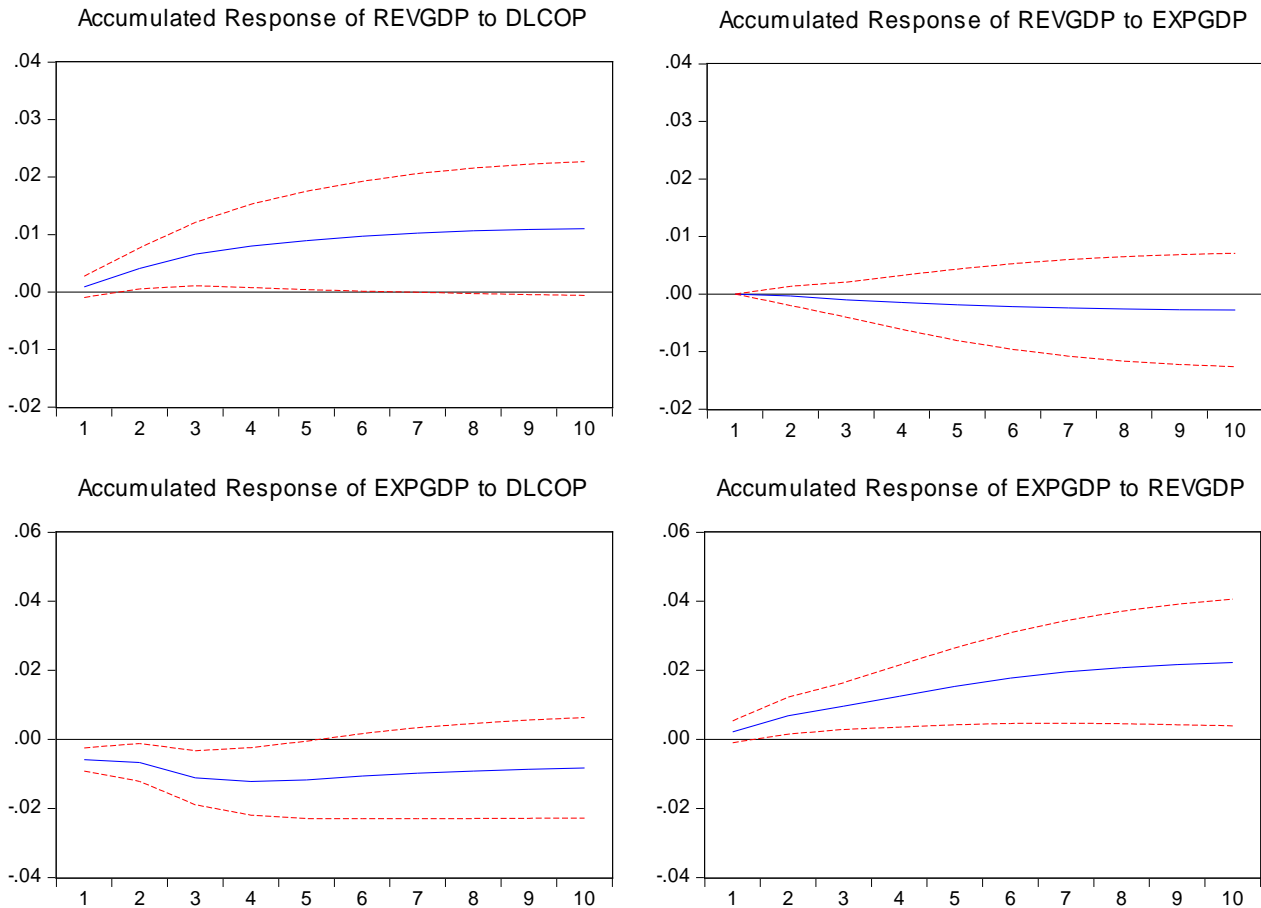


Figure 2. Responses of government revenue and expenditure to GDP ratio to copper price shock

The findings of the study support the FSL. Figure 2 shows that the expenditure decreases after the copper price shock, but increases after revenue shock. This means that if the copper price increases, creating a boost in GDP, expenditure will not be responsive to the portion of GDP affected by the shock. Thus, the FSL seems to be having its intended effect, since expenditure growth should not exceed the non-mining GDP growth rate for the particular year.

To understand the broader spending implications of the FSL, in Figure 3 this researcher has plotted the expenditure and

copper price separately for the time periods of 2000-2007 and 2008-2015 and has estimated the regressions between them. The correlation coefficients of the interaction between expenditure and copper price are negative for two regressions. However, it is much larger (in absolute value) for the period of 2000 to 2007 (-0.06) than the period of 2008 to 2015 (-0.02), where both results are statistically significant. Thus, expenditure initially decreases but later increased. This result suggests that ceiling on expenditure is the main mechanism that FSL affects the fiscal policy in Mongolia.

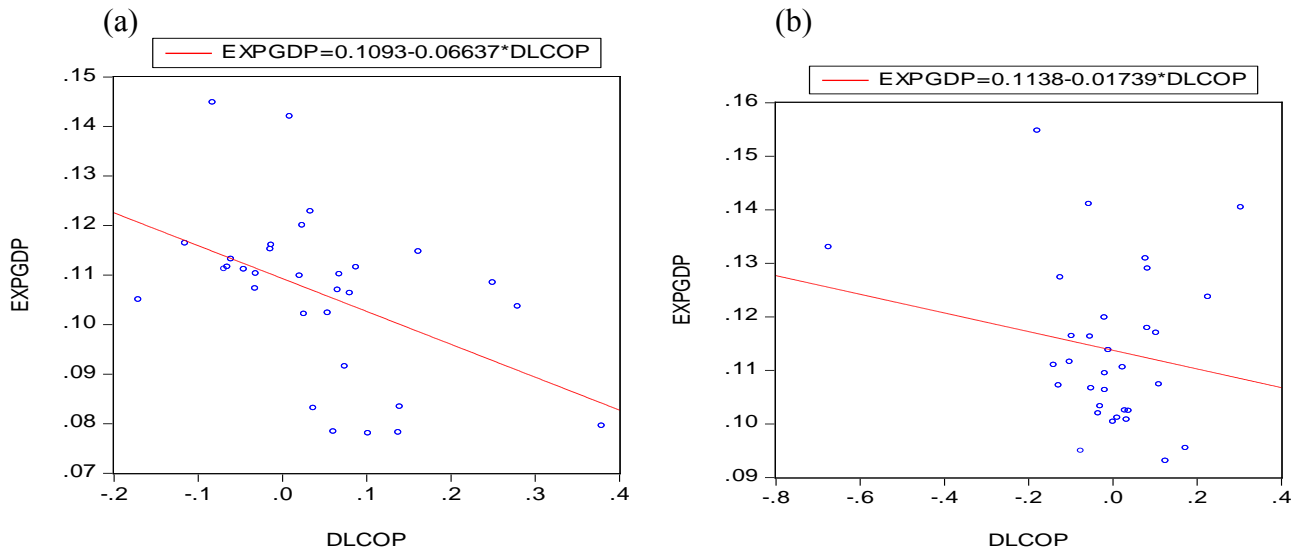


Figure 3. Scatter plot of two variables of government expenditure as a share of GDP and logged difference of the copper price.

- (a) A scatter plot of two variables of government expenditure as a share of GDP and logged difference of the copper price for 2000-2007.
- (b) A scatter plot of two variables of government expenditure as a share of GDP and logged difference of the copper price for 2008-2015

## CONCLUSIONS

The recent fluctuation in copper price has increased concern about the fiscal outcomes of Mongolia as a natural resource abundant country. Due to the large share of copper export in the country's GDP, it has become a crucial issue to study the effect of copper price shock on the fiscal outcomes.

This research aims to investigate the dynamic effect of copper price shock on the relationship between government revenue and expenditure by using VAR model and provide additional comparison across resource dependent countries. Based on the empirical evidences of two groups of countries, the finding shows that resource dependency appears to be positively correlated with the government expenditure growth. However, the results of the VAR model estimation show that the impact of the

copper shock on government revenue is strong and positive, while the expenditure most likely will not respond significantly to revenue shock.

Thus, the result is consistent with the *revenue-spend* hypothesis for Mongolia. Therefore, the findings show that copper price shock increases revenue, but decreases expenditure. The potential explanation for this behavior is the efficient implementation of the FSL on fiscal outcomes. In order to make the government expenditure growth less driven by natural resource rents, it is important to enhance effective fiscal rules like FSL and the establishment of wealth fund, where it seems to be having its intended effect on restricting government spending with occurrence of copper price shock in Mongolia.



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