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Bayesian VAR Estimates for the Fiscal Multipliers in Turkiye

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Abstract
Studying the economic growth effects of each type of tax and expenditure through fiscal multiplier analysis is crucial for responding to the economic cycle while maintaining fiscal soundness. This approach may help maximize the effectiveness of fiscal policy. This study estimates a structural VAR model to measure the impact of expansionary fiscal policy shocks—specifically, tax cuts and public spending increases—on GDP. It employs a Bayesian method that imposes range constraints on the parameters. While the initial impact of tax cuts and public spending increases is limited, their influence on economic growth becomes apparent within 1 to 2 years. The effect is substantially greater for public spending increases than for tax cuts. Distribution analysis of the impulse-response functions indicates that the spending increase shock has a larger effect on economic growth than the tax cut shock. The inclusion of two significant turbulent periods in the study's sample -the global financial crisis and the Covid-19 pandemic- plays a crucial role in this finding. Other contributing factors include changes in population structure, such as population aging, and the weakening of monetary policy effectiveness.

Keywords: fiscal multipliers, Bayesian estimation, Turkiye.

1. Introduction

Since fiscal soundness is a prerequisite for a stable economic environment, analyzing the economic effects of government spending and taxation is important for implementing fiscal policy. This importance has increased, particularly after the 2008 financial crisis and the 2020 Covid-19 pandemic. In a regular economic cycle, it is possible to stimulate the economy during a slowdown through budget deficit financing while reserving fiscal space for recovery. However, if an expansionary fiscal policy is implemented to stimulate the economy during a prolonged period of low growth, the risks of increasing national debt also rise (Hill et al., 2023). Therefore, during this period, it is essential to explore measures to enhance the effectiveness of fiscal policy activities, such as taxes and public expenditures. A detailed examination of the fiscal impacts of each type of tax and expenditure through fiscal multiplier analysis is crucial for responding to the economic cycle while maintaining fiscal soundness. This approach may help maximize the effectiveness of fiscal policy.

The stability function of fiscal policy is actively employed in developed economies to maintain economic and financial stability in the face of real economic shocks (Lahouel et al. 2024; Ilyes, 2023). Many studies are being conducted on fiscal multipliers due to the extensive use of policy. National research institutions employ various models, including econometric models with simultaneous equation systems and New Keynesian dynamic stochastic general equilibrium models. However, the majority of existing research relies on the SVAR model developed by Blanchard-Perotti (2002) (Andres, 2024). In this regard, the studies conducted by Anos-Casero et al. (2010) for Argentina, Espinosa-Senhaji (2011) for Saudi Arabia, Muir-Weber (2013) for Bulgaria, Borg (2014) for Malta, Matheson-Pereira (2016) for Brazil, David (2017) for Paraguay, Elkhdari et al. (2018) for Algeria, and Lahouel et al. (2024) for Tunisia are particularly noteworthy among recent empirical studies using the SVAR model. Studies conducted by Ilzetzki et al. (2013), which analyzed data from 44 countries (24 of which are developing countries), and by Cerisola et al. (2015), which focused on data from MENA countries, stand out among those that estimate using the panel VAR model.

The method proposed by Blanchard-Perotti (2002) imposes constraints on the income (GDP) elasticities of fiscal variables. These constraints are a key component in identifying exogenous fiscal policy shocks, where changes in GDP are automatically determined in response to variations in public spending and taxes. However, whether the constraint involves an increase in spending or a reduction in taxes significantly impacts the identification of the exogenous fiscal policy shock. When the VAR model is estimated under this constraint, the issue arises where the fiscal multiplier becomes sensitive to the elasticity assumption. This identification problem is particularly evident in the discrepancies observed in the elasticity of tax revenues to GDP. To address this issue, it may be preferable to use the Bayesian VAR method, which accounts for the uncertainty associated with the identification constraints imposed on fiscal variables. This technique also helps to overcome the problem of short time series by imposing a priori distributions on the parameters. Consequently, fiscal multipliers can be consistently estimated for each detailed fiscal policy item. Due to these advantages, the Bayesian VAR methodology has been favored for estimating each of the fiscal multipliers in this study.

The rest of the paper is organized as follows: First, sections 2 and 3 explain the estimation of the Bayesian VAR model and the identification of exogenous fiscal policy shocks. Next, sections 4 and 5 discuss the measurement of the effects of spending increases and tax cuts in the context of general and detailed items, using data from Turkiye. Finally, section 6 provides an overview of the study and its policy implications.

2. Bayesian VAR Estimation Methodology

To examine the impact of government expenditures and taxes on economic growth, we construct a reduced-form VAR model as follows:

$$Y_t = \alpha_0 + \alpha_1 t + \Phi_1 Y_{t-1} + \cdots + \Phi_k Y_{t-k} + \xi_t \tag{1}$$

where Y_t, α_0, and t and represent endogenous variable, constant term, linear trend vectors, respectively. While Φ_t is the coefficient matrix ($1 \leq j \leq k$), ξ_t shows the residual vector satisfying the conditions $E(\xi_t) = 0$, $E(\xi_t \xi_t') = \Omega$ and $E(\xi_t \xi_s') = 0$ for $s \neq t$. The endogenous variable vector is constructed as follows:

$Y_t = VAR[g_t, \tau_t, y_t, i_t, r_t]$

where g_t, τ_t, y_t, i_t, and r_t represent government expenditures, tax revenue, GDP, interest rate, and real exchange rate, respectively. The first three variables are fundamental to fiscal multiplier models. According to existing literature, the interest rate and real exchange rate are included in the model because the effectiveness of fiscal policy may vary depending on the stance of monetary policy and its interaction with foreign economies (Smidkova, 2001). To evaluate the effects of the fiscal policy changes experienced during the 2008 crisis and the 2020 Covid-19 pandemic, the estimation period was set from 2006 to 2023. Quarterly data was used to capture the dynamic relationships among the model variables. All model variables (except the interest rate) are seasonally adjusted using the X12 methodology. After calculating the variables representing the monetary quantities (g_t, τ_t, and y_t) in real terms, real variables per employee were obtained by dividing by the number of employees. Detailed information on the definitions and sources of the data for the variables used in the study is provided in Appendix 1.

The model constructed above was estimated using Bayesian methodology, employing a 2-period lag (see Appendix 2), which was determined to be the most appropriate lag length (k). According to Uhlig (2005), Mountford-Uhlig (2009), and Caldara-Kamps (2017), the prior distributions of the coefficients and variance-covariance matrices of the reduced VAR model presented in equation (1) follow a normal distribution with infinite variance. Therefore, it is assumed that the distribution follows a Normal-Wishart distribution. This prior distribution is also utilized by Şahin (2023), who examines the effectiveness of monetary policy in Turkiye. The Normal-Wishart distribution with infinite variance minimizes the information about the coefficients derived from the prior distribution, resulting in posterior estimates of the coefficients and variance-covariance matrices that are similar to OLS estimates. This approach reduces the differences between the results of the current study and those of previous studies employing different methods.

3. Identification of Exogenous Fiscal Policy Shocks

The residual terms of the reduced-form VAR model presented in equation (1) are correlated. Consequently, the off-diagonal elements of the reduced-form residual variance-covariance matrix have nonzero values. To identify mutually independent exogenous shocks, the VAR is linearly transformed into the structural VAR form:

$$\Gamma X_t = \Gamma \alpha_0 + \Gamma \alpha_t t + \Gamma \Phi_1 X_{t-1} + \cdots + \Gamma \Phi_k X_{t-k} + \zeta_t \qquad (2)$$

where Γ represents a square matrix of the same dimension as the endogenous variables vector and satisfies the condition $\Gamma \xi_t = \zeta_t$. Here, ζ_t is the structural shock vector with the traditional properties $E(\zeta_t) = 0$ and $E(\zeta_t \zeta_t') = \Omega_t$ where Ω_t represents a diagonal matrix. The identification of exogenous shocks depends on how the elements of the Γ matrix are determined. According to

Caldara-Kamps (2017), the linear transformation between the reduced VAR residuals and the structural VAR impulse vector can be expressed as:

$$\begin{bmatrix} 1 & 0 & -\gamma_{\tau,y} & -\gamma_{\tau,i} & -\gamma_{\tau,r} \\ 0 & 1 & -\gamma_{g,y} & -\gamma_{g,i} & -\gamma_{g,r} \\ -\gamma_{y,\tau} & -\gamma_{y,g} & 1 & 0 & 0 \\ -\gamma_{i,\tau} & -\gamma_{i,g} & -\gamma_{i,y} & 1 & -\gamma_{i,r} \\ -\gamma_{r,\tau} & -\gamma_{r,g} & -\gamma_{r,y} & -\gamma_{r,i} & 1 \end{bmatrix} \begin{bmatrix} \zeta_t^{\tau} \\ \zeta_t^{g} \\ \zeta_t^{y} \\ \zeta_t^{i} \\ \zeta_t^{r} \end{bmatrix} = \begin{bmatrix} \xi_t^{\tau} \\ \xi_t^{g} \\ \xi_t^{y} \\ \xi_t^{i} \\ \xi_t^{r} \end{bmatrix} \quad (3)$$

In this notation, the term $\gamma_{x,z}$ represents the elasticity of the variable x with respect to z. For instance, $\gamma_{\tau,y}$ and $\gamma_{g,y}$ represent the elasticities of tax revenue and government expenditures relative to GDP, respectively.

It is impossible to estimate the Γ matrix using equation (3) because the variance-covariance matrix of the reduced VAR residual term has 10 different off-diagonal elements, while the Γ matrix in equation (3) has 16 parameters. In other words, the number of parameters to be identified exceeds the number of available constraints, necessitating additional constraints to estimate a unique solution for the Γ matrix elements. To solve this problem, Blanchard-Perotti (2002) proposes a method that imposes additional constraints on the elasticities of fiscal variables ($\gamma_{\tau,..}$, $\gamma_{g,..}$) relative to macro variables outside the model. This approach is utilized in most existing studies that estimate fiscal multipliers using the SVAR method.

In previous studies conducted for Turkiye, the elasticity of tax revenue to GDP ($\gamma_{\tau,y}$) was estimated at approximately 1 by Kustepeli-Sapci (2006) and Ceylan (2024), and at 1.5 by Cebi-Ozlale (2011). Based on these values, our study assumes that the GDP elasticity of tax revenue follows a uniform distribution between 0 and 2 to identify exogenous tax shocks. In contrast, the GDP elasticity of public expenditures ($\gamma_{g,y}$) is assumed to be 0. This assumption is commonly used in the international literature to indicate that government spending decisions can be made independently of the current economic situation of the country (Gali et al., 2007; Poku et al., 2022). Finally, we assume that tax revenues and public expenditures do not respond simultaneously to the interest rate and real exchange rate, and we include the constraint $\gamma_{\tau,i} = \gamma_{\tau,r} = \gamma_{g,i} = \gamma_{g,r} = 0$ in the model.

Government spending and tax multipliers are defined as the ratio of the change in GDP (Δy) to the change in government spending (Δg) or the change in taxes ($\Delta \tau$). Consequently, the multiplier indicates the increase or decrease in GDP resulting from a 1 TL change in the fiscal variable. Multipliers can be calculated in various ways depending on the period used. Generally, the impact multiplier represents short-term effects (Blanchard-Perotti, 2002), while the cumulative multiplier reflects long-term effects (Woodford, 2011). Based on this approach, this study defines impact multipliers and cumulative multipliers as follows:

$$\text{Impact Multiplier} = \frac{\Delta y_t}{\Delta g_t} \text{ and } -\frac{\Delta y_t}{\Delta \tau_t}$$

$$\text{Cumulative Multiplier} = \frac{\sum_{j=0}^{N} \Delta y_{t+j}}{\sum_{j=0}^{N} \Delta g_{t+j}} \text{ and } -\frac{\sum_{j=0}^{N} \Delta y_{t+j}}{\sum_{j=0}^{N} \Delta \tau_{t+j}}$$

Within the framework of the assumptions and calculation methods outlined above, 20,000 government spending increases and tax cut shocks were defined, and the posterior distributions of expenditure and tax multipliers were derived.

4. Estimation Results

The impulse-response functions for public expenditure increases and tax cut shocks, which serve as indicators of expansionary fiscal policy, are presented in Figure 1. In the graphs, solid lines represent median values, while shaded areas indicate 69% and 95% confidence intervals. Although many of the impulse-response functions lack statistical significance for a substantial portion of the 5-year simulation period, the results should be regarded as indicative. According to Figure 1, the impact of tax cuts and government spending increases on real GDP is initially quite small. However, the effect becomes evident after the second quarter for tax cuts and in the fourth quarter for increases in public expenditure. This effect is clearer for public expenditure increases than for tax cuts. Following the initial 1 TL negative shock in taxes, growth decreases in the first two quarters but begins to turn positive after the third quarter. In contrast, there is no significant impact on growth during the first three quarters following a 1 TL increase in public expenditures. However, the positive effects on growth become noticeable starting in the fourth quarter. The response of interest rates to expansionary fiscal policy shocks is similar. An increase in government spending or a tax cut initially lowers interest rates, but they subsequently begin to rise. However, the increase in interest rates occurs earlier in response to public expenditure shocks and takes longer with tax cuts. The real exchange rate's response to both types of expansionary fiscal policy shocks is also similar. Following an expansionary fiscal policy shock, the real exchange rate rises slightly (indicating depreciation of the domestic currency) for a short period (two quarters) before beginning to decline (indicating appreciation of the domestic currency).

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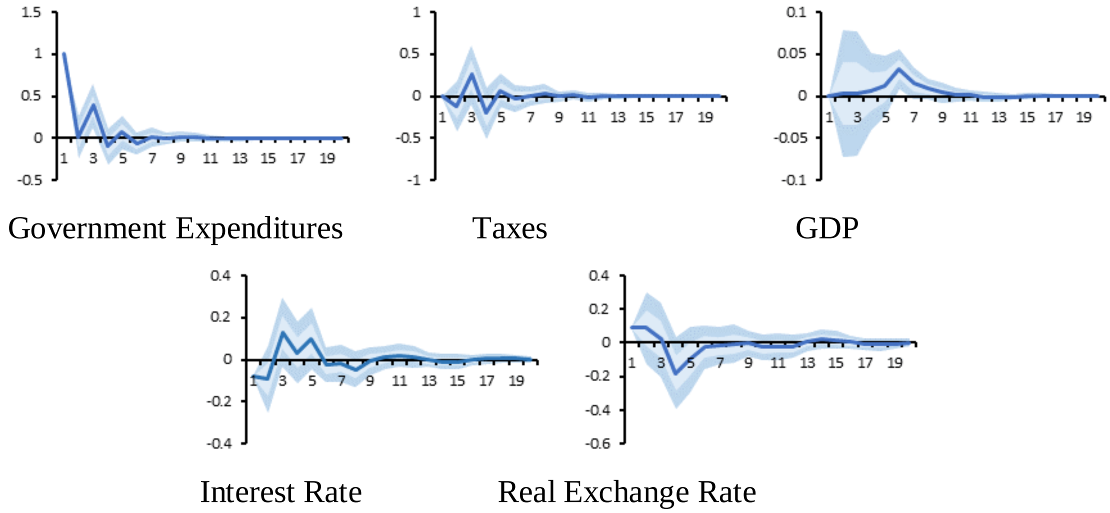
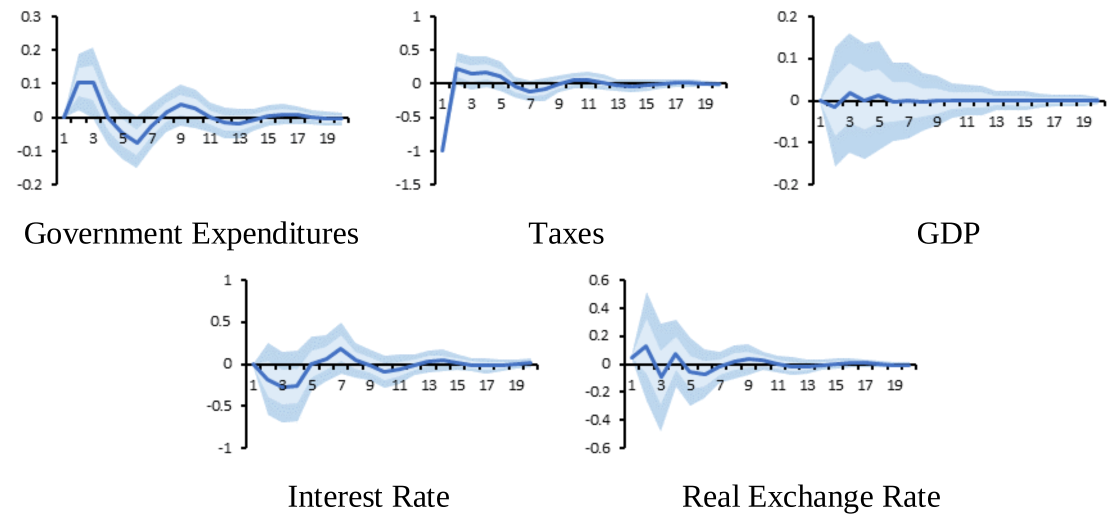


(a) Responses to 1 TL Increase in Government Expenditures



(b) Responses to 1 TL Decrease in Taxes

Figure 1: Responses of Model Variables to an Expansionary Fiscal Policy Shock

Figure 2 compares the posterior distributions of GDP response functions to expansionary fiscal policy shocks, specifically spending increases and tax cuts, during the shock period and for 1 to 5 years afterward.

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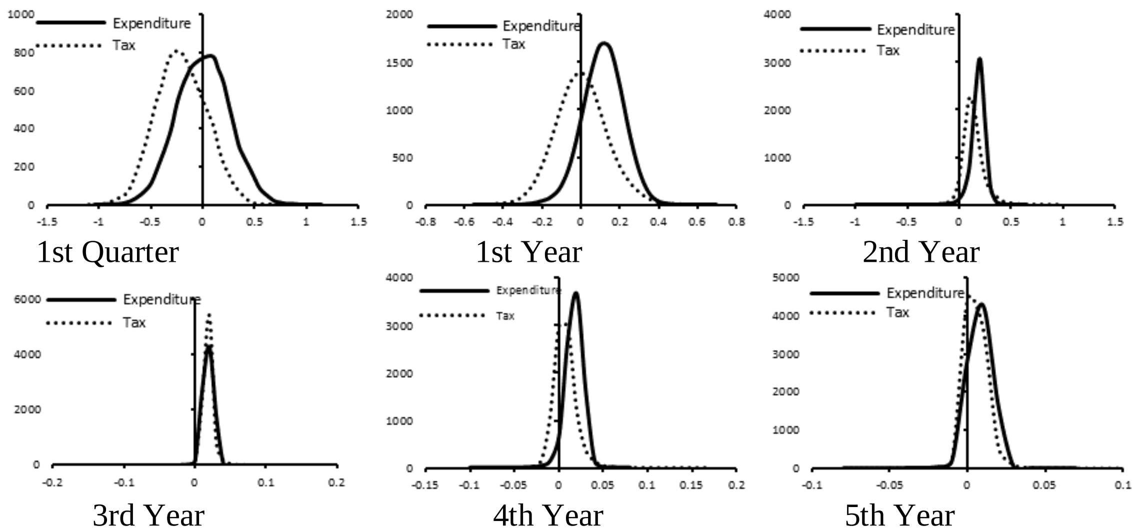


Figure 2: Posterior Distributions of Expenditure and Tax Multipliers

According to Figure 2, compared to the tax cut shock, the expenditure shock has a distribution that shifts further to the right for each simulation period, except for the third year. This indicates that the impact of increased public expenditures on real GDP is greater than that of tax cuts. The difference becomes particularly evident starting from the first quarter. These findings are supported by Table 1, which presents the median values of the multipliers obtained through Bayesian VAR estimation. The median values reveal that the expenditure multiplier is consistently positive during the shock and in subsequent periods, whereas the tax cut multiplier is negative during the shock period but mostly positive in the following periods. Cumulative multipliers exhibit a similar pattern.

Table 1: Posterior Median Estimates for Fiscal Multipliers

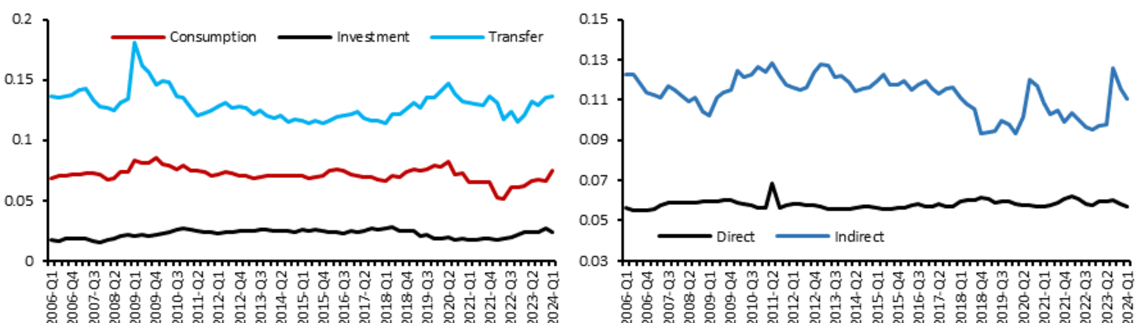
Period	Expenditures		Taxes	
	Impact Multipliers	Cumulative Multipliers	Impact Multipliers	Cumulative Multipliers
1st quarter	0.06	0.06	-0.28	-0.28
1st year	0.11	0.23	0.00	0.09
2nd year	0.18	1.41	0.07	0.20
3rd year	0.02	1.73	0.02	0.24
4th year	0.02	1.80	0.00	0.21
5th year	0.01	1.84	0.00	0.23

In Turkey, the economic growth-enhancing effect of increases in public expenditure is greater than that of a tax cut policy. This finding is consistent with the results obtained by Akar-Sahin (2015) and Cebi-Ozlale (2011). Another criterion for measuring the effectiveness of fiscal policy is whether the cumulative multiplier exceeds 1. It is determined that, in addition to the expenditure multiplier being greater than the tax cut multiplier, the tax cut multiplier is less than 1, while the expenditure multiplier is greater than 1. An expansionary fiscal policy shock, represented by a 1 TL increase in public expenditures, results in an increase of more than 1 TL in real GDP from the second year onward. In contrast, a shock of the same magnitude in the form of a tax cut produces a significantly lower increase in GDP. This underscores the effectiveness of fiscal policy in fostering economic growth, particularly regarding government spending. While this finding aligns with the results obtained by Sevgi (2023) and Ozen-Kose (2022) in the context of Turkiye, it contradicts the findings of Cebi-Ozlale (2011). Differences in estimation methods and the periods analyzed contribute to this discrepancy. Additionally, the relatively low average tax burden in Turkiye (approximately 16% as of 2023) compared to developed countries is cited as one reason for this outcome (Siklar, 2024a).

5. Decomposing Fiscal Components and Policy Shocks

By breaking down fiscal policy indicators -specifically public expenditures and taxes- into their sub-components, we can achieve a more consistent evaluation of fiscal policy effectiveness. Following Uhlig (2010), tax revenues are decomposed into two sub-components: direct taxes (such as income and corporate taxes) and indirect taxes (such as value-added and special consumption taxes). Public expenditures are divided into three sub-components: consumption, investment, and transfer expenditures. Due to the rapid increase in transfer payments during the study period and the general belief that their contribution to economic growth will be limited (Zubairy, 2014), it is appropriate to consider this item separately and evaluate its effects.

Before examining the estimation model and its results, it is helpful to briefly evaluate the development of the mentioned expenditure and tax sub-components during the study period. Panels A and B of Figure 3 display the ratios of the sub-components of government expenditures and taxes to GDP for the sample period, respectively.



(A) Sub-components of Government Expenditures (B) Sub-components of Tax Revenues

Figure 3: Ratios of Detailed Fiscal Variables to GDP

In Turkiye, the weight of indirect taxes in total tax revenue is quite high. The ratio of direct taxes to GDP remained stable throughout the sample period, averaging around 6%. In contrast, the ratio of indirect taxes to GDP fluctuated between 9% and 13%, with an average of approximately

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11%. This significant reliance on indirect taxes is the main reason the tax cut multiplier is less than the unity identified in the previous section. From the perspective of public expenditures, consumption and investment expenditures remained stable during the 2006-2020 period; however, a rapid decline in consumption expenditures was observed in the post-pandemic period. This decline in consumption expenditures reversed from 2022 onwards, rising rapidly and exceeding the study period average of 7.1%, ultimately reaching the highest value of the period at approximately 9%. While public transfer expenditures increased rapidly in 2009, reaching 18% of GDP, they subsequently decreased to around 12% in the following years before starting to rise again after 2018. The transfer expenditures-to-GDP ratio, which had been declining in the post-pandemic period, began to increase again in 2023. This rise is largely due to increased welfare spending, such as public pension payments. Naturally, such expenditures are one of the underlying factors contributing to the high expenditure multiplier value.

To investigate the effects of government expenditure sub-components on economic growth, a 5-variable VAR model was constructed for each expenditure component (g_t^j) (for j=1,2,3). The model consists of tax revenues (τ_t), GDP (y_t), interest rates (i_t), and the real exchange rate (r_t). Accordingly, the identification of the structural VAR model is as follows:

$$\begin{bmatrix} 1 & 0 & -\gamma_{\tau,y} & -\gamma_{\tau,i} & -\gamma_{\tau,r} \\ 0 & 1 & -\gamma_{g^j,y} & -\gamma_{g^j,i} & -\gamma_{g^j,r} \\ -\gamma_{y,\tau} & -\gamma_{y,g^j} & 1 & 0 & 0 \\ -\gamma_{i,\tau} & -\gamma_{i,g^j} & -\gamma_{i,y} & 1 & -\gamma_{i,r} \\ -\gamma_{r,\tau} & -\gamma_{r,g^j} & -\gamma_{r,y} & -\gamma_{r,i} & 1 \end{bmatrix} \begin{bmatrix} \zeta_t^{\tau} \\ \zeta_t^{g^j} \\ \zeta_t^{y} \\ \zeta_t^{i} \\ \zeta_t^{r} \end{bmatrix} = \begin{bmatrix} \xi_t^{\tau} \\ \xi_t^{g^j} \\ \xi_t^{y} \\ \xi_t^{i} \\ \xi_t^{r} \end{bmatrix}$$

Similarly, to examine the effects of tax revenue sub-components on GDP, another VAR model is constructed, consisting of government expenditures (g_t), GDP (y_t), interest rate (i_t), and real exchange rate (r_t) for each tax revenue component τ_t^j (for j=1,2). The model is identified as follows:

$$\begin{bmatrix} 1 & 0 & -\gamma_{\tau^j,y} & -\gamma_{\tau^j,i} & -\gamma_{\tau^j,r} \\ 0 & 1 & -\gamma_{g,y} & -\gamma_{g,i} & -\gamma_{g,r} \\ -\gamma_{y,\tau^j} & -\gamma_{y,g} & 1 & 0 & 0 \\ -\gamma_{i,\tau^j} & -\gamma_{i,g} & -\gamma_{i,y} & 1 & -\gamma_{i,r} \\ -\gamma_{r,\tau^j} & -\gamma_{r,g} & -\gamma_{r,y} & -\gamma_{r,i} & 1 \end{bmatrix} \begin{bmatrix} \zeta_t^{\tau^j} \\ \zeta_t^{g} \\ \zeta_t^{y} \\ \zeta_t^{i} \\ \zeta_t^{r} \end{bmatrix} = \begin{bmatrix} \xi_t^{j} \\ \xi_t^{g} \\ \xi_t^{y} \\ \xi_t^{i} \\ \xi_t^{r} \end{bmatrix}$$

As in the spending and tax cut multipliers discussed in Section 4, the elasticities of the subcomponents of government spending, the interest rate, and the real exchange rate with respect to income are assumed to be zero. Therefore, the constraints that vary depending on the model are the GDP elasticities of the tax revenue subcomponents.

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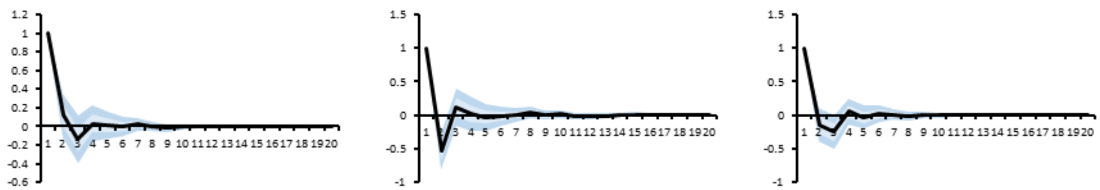
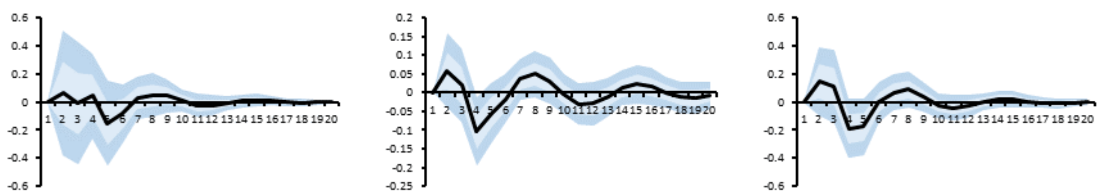
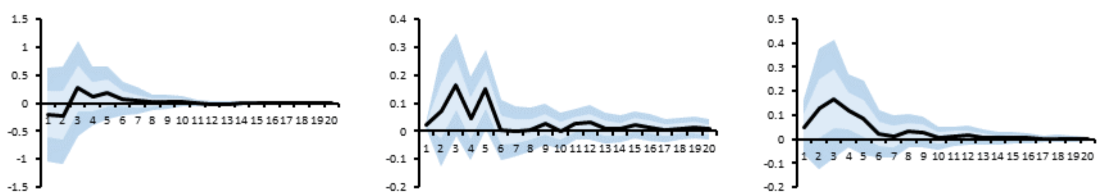
Figure 4 illustrates the median values of the model variables' responses to a positive shock of a 1 TL increase in each component of public expenditure: consumption, investment, and transfer expenditures. The impact of the shock in transfer expenditures on GDP growth is greater than that of the shocks in consumption and investment expenditures. While both investment and transfer expenditure shocks positively affect GDP from the onset of the shock, the effect of the consumption expenditure shock on GDP turns positive only after the third quarter. While the effects of consumption and investment expenditure shocks are short-lived, the impact of transfer expenditure shocks persists in the long term. The GDP response to the first two shocks fades by the 6th quarter, while the response to the transfer expenditure shock diminishes by the 14th quarter. Additionally, the responses of interest rates and real exchange rates are larger for transfer expenditure shocks, whereas they remain limited for consumption and investment expenditure shocks. Consequently, although a decrease in interest rates and a depreciation of the real exchange rate are initially observed, a trend toward an increase in interest rates and an appreciation of the real exchange rate becomes evident after a few quarters.



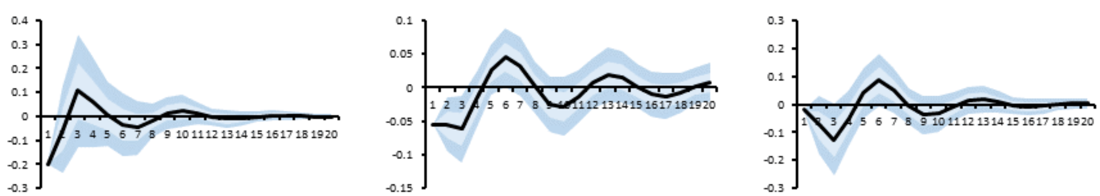
Consumption Expenditures   Investment Expenditures   Transfer Expenditures



Taxes



GDP



Interest Rate

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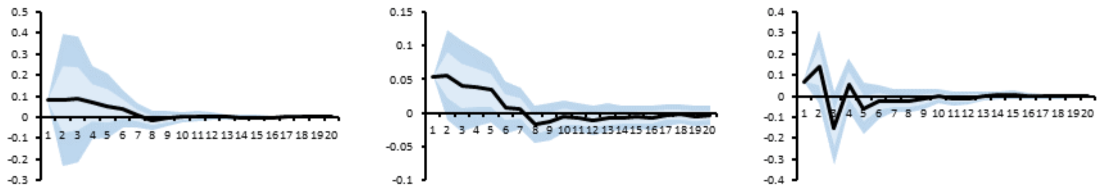

Real Exchange Rate

Figure 4: Responses to a 1 TL Increase Shock in Sub-Components of Government Expenditures

Table 2 summarizes the estimated impact and cumulative multiplier values for each expenditure component based on the posterior median values. The cumulative median values for investment and transfer expenditures are positive starting from the first quarter, while consumption expenditures positively affect GDP only after the second year. Consistent with our examination of the impulse-response functions, government transfer expenditures have the highest cumulative multiplier value. This is followed by investment expenditures; however, the multiplier effect of consumption expenditures remains limited and decreases to nearly zero by the third year. An important factor in the emergence of this result is that the full sample of this study includes two major turbulence sub-periods: the global financial crisis and the Covid-19 epidemic (Andres, 2024). Additionally, the acceleration of the aging trend in the Turkish population and the weakening effectiveness of monetary policy can also be considered contributing factors to this result (Siklar, 2024b).

Table 2: Posterior Median Estimates for Sub-Expenditure Multipliers

Period	Consumption Expenditures		Investment Expenditures		Transfer Expenditures	
	Impact Multipliers	Cumulative Multipliers	Impact Multipliers	Cumulative Multipliers	Impact Multipliers	Cumulative Multipliers
1st quarter	-0.21	-0.21	0.02	0.02	0.05	0.05
1st year	0.12	-0.03	0.05	0.31	0.12	0.46
2nd year	0.02	0.29	0.01	0.47	0.03	0.62
3rd year	-0.01	0.33	0.03	0.55	0.02	0.68
4th year	0.01	0.32	0.02	0.61	0.01	0.71
5th year	0.00	0.33	0.00	0.64	0.01	0.74

Figure 5 illustrates the effect of a 1 TL cut shock in each component of tax revenues (direct and indirect taxes) on the model variables. The figure indicates that the impact of a shock in tax revenue components on economic growth is relatively limited. However, the effect of indirect taxes on GDP is greater than that of direct taxes. While a 1 TL cut in indirect taxes negatively affects GDP in the two quarters following the shock, it generates a significant positive effect starting from the third quarter. This positive effect diminishes beginning in the seventh quarter, eventually decreasing to approximately zero. Conversely, the impact of a 1 TL cut in direct taxes on economic growth is also limited and fluctuates around zero. Additionally, the effects of cut shocks on the two tax revenue items concerning the interest rate and real exchange rate are minimal.

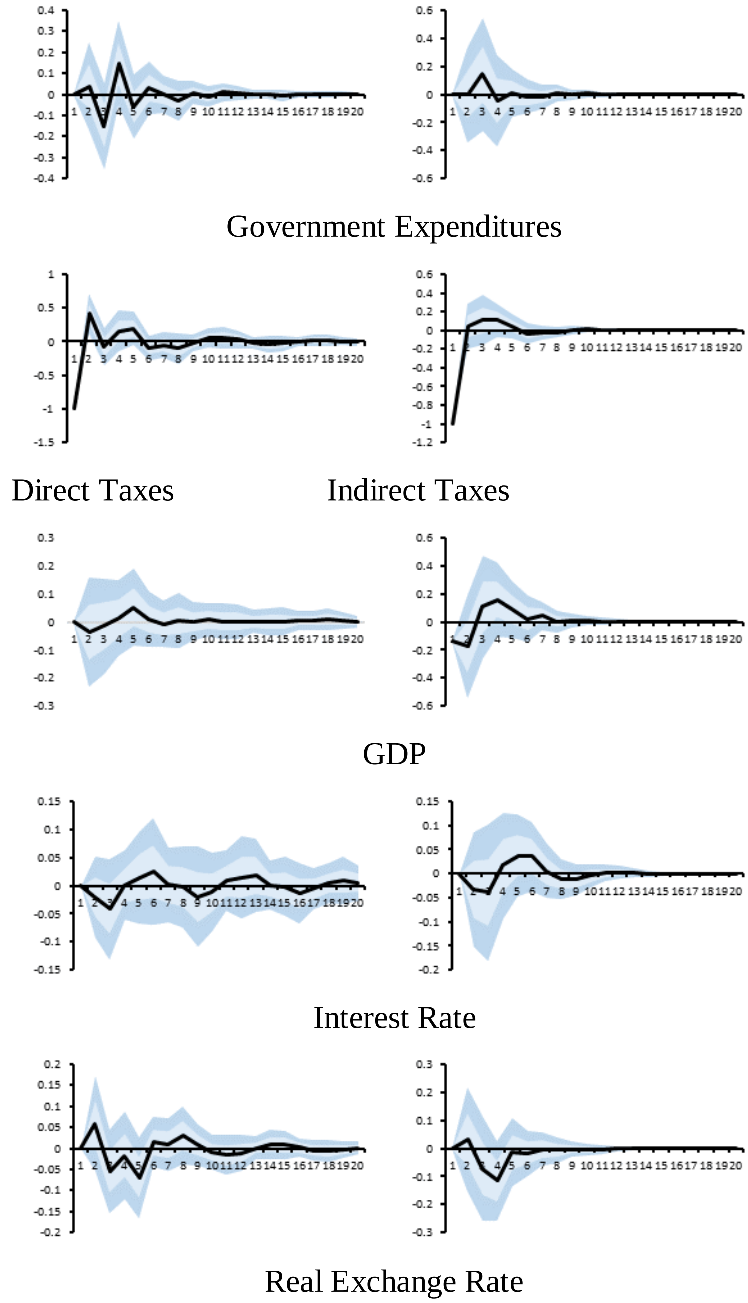

Figure 5: Responses to a 1 TL Increase Shock in Sub-Components of Tax Revenues

Table 3: Posterior Median Estimates for Sub-Revenue Multipliers

Period	Direct Taxes		Indirect Taxes	
	Impact Multipliers	Cumulative Multipliers	Impact Multipliers	Cumulative Multipliers
1st quarter	-0.04	-0.04	-0.14	-0.14
1st year	0.01	-0.04	0.16	-0.05
2nd year	0.01	0.02	0.01	0.11
3rd year	0.00	0.03	0.00	0.14
4th year	0.00	0.04	0.00	0.15
5th year	0.00	0.06	0.00	0.16

Using the estimated median values, Table 3 summarizes the impact and cumulative multipliers for the tax revenue sub-component multipliers. Both impact multipliers for direct and indirect taxes show negative values during the shock period but turn positive over time. While the cumulative indirect tax multiplier continues to increase throughout the simulation period, this trend is quite weak for the direct tax multiplier. In line with our findings from analyzing the impulse-response functions of tax cut shocks, the multiplier effect of indirect taxes is greater than that of direct taxes. However, consistent with the results in Table 1, which examines the multiplier effect of total tax revenues, the multiplier effects of both direct and indirect taxes are far from unity and significantly smaller than the multiplier values of the expenditure components.

6. Conclusion

This study estimates a structural VAR model to measure the impact of expansionary fiscal policy shocks—specifically, tax cuts and public spending increases—on GDP. It employs a Bayesian method that imposes range constraints on the parameters. While the initial impact of tax cuts and public spending increases is limited, their influence on economic growth becomes apparent within 1 to 2 years. The effect is substantially greater for public spending increases than for tax cuts. Distribution analysis of the impulse-response functions indicates that the spending increase shock has a larger effect on economic growth than the tax cut shock, except in the third quarter following the shock.

In the context of impact multipliers based on the median values of the impulse-response functions, the expenditure multiplier shows a positive value starting from the first quarter following the shock, while the tax cut multiplier exhibits a negative value in the first two quarters and then turns positive. Consequently, the cumulative tax multiplier is estimated to remain low until the end of the simulation period, leading to a cumulative expenditure multiplier value that is higher than that of the tax multiplier. This result suggests that increases in public expenditures have a greater growth-creating effect than tax cuts. Furthermore, the fact that the expenditure multiplier value is estimated to exceed unity starting from the second year after the shock indicates that public expenditure policy can serve as an effective tool to support long-term economic growth.

The study decomposes tax revenue into direct and indirect taxes, and public expenditures into consumption, investment, and transfer expenditures, investigating their separate impacts on economic growth. The results indicate that the effect of indirect tax cuts on economic growth is greater than that of direct tax cuts. In the first quarter following the shock, the multiplier value of indirect taxes is negative and exerts a stronger growth-slowing effect compared to direct taxes. However, particularly from the second year onwards, this trend reverses, and the growth effect of indirect taxes positively and significantly differs from that of direct taxes. The results of the analysis of public expenditure subcomponents indicate that investment and transfer expenditures positively impact economic growth starting in the first quarter following the shock. The effect on consumption expenditures turns positive by the end of the second year. Therefore, it is concluded that public consumption expenditures create a growth effect only in the long run and to a limited extent, whereas public investment and transfer expenditures have a growth effect in both the short and long run. In this context, the highest cumulative multiplier value is associated with transfer expenditures. The inclusion of two significant turbulent periods in the study's sample - the global financial crisis and the Covid-19 pandemic- plays a crucial role in this finding. Other contributing factors include changes in population structure, such as population aging, and the weakening of monetary policy effectiveness.

It is crucial to analyze fiscal multipliers to define and effectively implement fiscal policy objectives that promote economic growth and stability. The findings of this study will provide valuable insights for policymakers and establish a foundation for more robust discussions on this important issue.

References

Akar, S. and Sahin, O. (2015). An analysis of tax buoyancy in Turkey. Journal of Economics, Finance and Accounting, 2(1), 29-43.

Andres, J. (2024). The effectiveness of fiscal policy. In (Ed. E. Alberola) *Fiscal policy in a turbulent era*, Elgar, Glos, 86-102.

Anos-Casero, P., Trezzi, P. and Cerdeiro. D. (2010). *Estimating the fiscal multiplier in Argentina*. Policy Research Working Paper No. 5220, World Bank, Washington.

Blanchard, O. and Perotti, R. (2002). An empirical characterization of the dynamic effects of changes in government spending and taxes on output. *Quarterly Journal of Economics*, 117(4), 1329–1368.

Borg, I. (2014). *Fiscal multipliers in Malta*. Working Paper No. 06/2014, Central Bank of Malta, Valletta.

Caldara, D. and Kamps, C. (2017). The analytics of SVARs: A unified framework to measure fiscal multipliers. *The Review of Economic Studies*, 84(3), 1015-1040.

Ceylan, F. (2024). Tax elasticity and progressivity for Turkish tax system. *Advance*, (forthcoming), 1-41.

Cerisola, M., Abdallah, C., Davies, V. and Fischer, M. (2015). *Assessing the impact of fiscal shocks on output in MENAP countries*. Middle East and Central Asia Department Technical Notes and Manuals, International Monetary Fund, Washington.

Cebi, C. and Ozlale, Ü. (2011). *Structural budget balance and fiscal stance in Turkey*. Working Paper No: 11/11, The Central Bank of the Republic of Turkey, Ankara.

David, A. (2017). *Fiscal policy effectiveness in a small open economy: Estimates of tax and spending multipliers in Paraguay*. Working Paper No: 63, International Monetary Fund, Washington.

Elkhdari, M., Souissi, M. and Jewell, A. (2018). *Empirical estimation of fiscal multipliers in MENA oil-exporting countries with an application to Algeria*. Working Paper No:124, International Monetary Fund, Washington.

Espinosa, R. and Senhadji, A. (2011). *How strong are fiscal multipliers in the GCC?* Working Papers No: 061, International Monetary Fund, Washington.

Galí, J., López-Salido, D. and Valles, J. (2007). Understanding the effects of government spending on consumption. *Journal of the European Economic Association*, 5(1), 227–270.

Hill, S., Jinjarak, Y. and Park, D. (2023). *How do tax revenues respond to GDP growth? Evidence from developing Asia 1998-2020*. Background Paper, Asian Development Bank, Manila.

Ilyes, B. (2023). Does the fiscal policy have an impact on economic growth through the fiscal multiplier in Algeria? *Economic Studies Journal*, 17(1): 1-14.

Ilzetzki, E., Mendoza, E. and Vegh, C. (2013). How big (small?) are fiscal multipliers? *Journal of Monetary Economics*, 60 (2), 239-254.

Kustepeli, Y. and Sapci, O. (2006). Personal income tax elasticity in Turkey: 1974-2005. *International Journal of Business, Management and Economics*, 42(6), 77-88.

Lahouel, M., Tahar, M., Slimane, S. and Houfi, M. (2024). The dynamic effects of fiscal policy and fiscal multipliers in Tunisia. *Applied Economics*, 56(33), 2967-3985.

Matheson T. and Pereira, J. (2016). *Fiscal multipliers for Brazil*. Working Paper No: 79, International Monetary Fund, Washington.

Mountford, A. and Uhlig, H. (2009). What are the effects of fiscal policy shocks? *Journal of Applied Econometrics*, 24(6), 960–992.

Muir D. and Weber, A. (2013). *Fiscal multipliers in Bulgaria: Low but still relevant*. Working Paper No: 49, International Monetary Fund, Washington.

Ozen, A. and Kose, C. (2022). Turkiye'de kamu harcamasi bilesenlerinin ekonomik buyumeye etkisi. *Ekonomi, Politika ve Finans Arastirmalari Dergisi*, 7(1), 32-52.

Poku, K., Opoku, E. and Ennin, P. (2022). The influence of government expenditure on economic growth in Ghana: An ARDL approach. *Economics & Finance*, 10(1), 1-16.

Sevgi, N. (2023). Maliye carpani: Farkli devlet harcamalari arasindaki karsilastirma. *Omer Halis Demir Universitesi Iktisadi ve Idari Bilimler Fakultesi Dergisi*, 16(3), 892-903.

Smidkova, K. (2001). The link between FEER and fiscal policy in a transitional period: The case of the Czech economy. In (Eds. D. Dickinson – A. Mullineux) *Financial and monetary integration in the new Europe*, Edgar: Glos, 59-78.

Sahin, A. (2023). *Turkiye'de para politikasi ve risk ustlenme kanali*. Nisan Kitabevi, Eskisehir.

Siklar, I. (2024a). Cumhuriyet doneminde vergi yuku ve vergi hasilati: Turkiye'de uzun donem Laffer egrisi. In (Ed. V. Karagol) *Makro ekonomide guncel tartismalar: Teori, uygulama ve politika onerileri*, Efe Akademi, Ankara, 20-38.

Siklar, I. (2024b). Turkiye'de enflasyon hedeflemesi doneminde para politikasinin etkinligi. In (Ed. V. Karagol) *Makro ekonomide guncel tartismalar: Teori, uygulama ve politika onerileri*, Efe Akademi, Ankara, 39-58.

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Uhlig, H. (2005). What are the effects of monetary policy on output? Results from an agnostic identification procedure. *Journal of Monetary Economics*, 52(2), 381–419.

Uhlig, H. (2010). Some fiscal calculus. *American Economic Review*, 100(2), 30-34.

Woodford, M. (2011). Simple analytics of the government expenditure multiplier. *American Economic Journal: Macroeconomics*, 3(1), 1-35.

Zubairy, S. (2014). On fiscal multipliers: Estimates from a medium scale DSGE model. *International Economic Review*, 55(1), 169-195.

Appendix 1: Definition and Sources of the Data

Definition	*Source*	*Transformation*
Real gross domestic product	EVDS[1]	S.A[2]., per employee[3], log[4]
Total tax revenue	EVDS	Real[5], S.A., per employee, log
Direct taxes	EVDS	Real, S.A., per employee, log
Indirect taxes	EVDS	Real, S.A., per employee, log
Government expenditures	EVDS	Real, S.A., per employee, log
Government consumption expenditures	EVDS	Real, S.A., per employee, log
Government investment expenditures	EVDS	Real, S.A., per employee, log
Government transfer expenditures	EVDS	Real, S.A., per employee, log
Policy interest rate	EVDS	--
Real exchange rate	EVDS	S.A., log
Consumer price index	EVDS	S.A.
Employment	EVDS	S.A.

Notes: (1) Refers to the Electronic Data Delivery System of the Central Bank of the Republic of Türkiye, (2) refers to seasonal adjustment using X12 methodology, (3) obtained by dividing the number of employed people, (4) refers to the logarithm of the relevant series, (5) obtained through deflating with consumer price index.

Appendix 2: Optimal Lag Selection

Lag	Log Likelihood	Likelihood Ratio	Final Prediction Error	Akaike Information Criterion	Schwarz Information Criterion	Hannan-Quinn Information Criterion
0	541.2594	--	6.03E-14	-16.25028	-16.08440	-16.18474
1	593.0830	94.22484	2.68E-14	-16.06312	-16.16782	-16.06983
2	625.0575	53.29087*	2.20E-14*	-17.27447*	-16.44976*	-16.55344*
3	648.1720	35.02192	2.41E-14	-17.21733	-15.56321	-16.16856
4	675.7728	37.63750	2.38E-14	-17.09615	-14.81261	-15.91963
5	693.0307	20.91864	3.35E-14	-17.06154	-13.74858	-15.35728
6	724.4491	33.32248	3.29E-14	-17.25603	-13.11376	-15.22404
(*) indicates lag order selected by the criterion						