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Articles

What Type of Fiscal Rule Promotes the Fiscal Soundness?

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Empirical studies on the impact of fiscal institutions such as fiscal rule and the establishment of independent fiscal institutions on fiscal performance have often overlooked the endogeneity issues. This study utilizes the system GMM model in dynamic panel analysis to control for the endogeneity inherent in fiscal institutions. This study is distinctive from the previous researches in the following aspects: ① It indices the levels of fiscal rules and independent fiscal institutions, ② Furthermore, it includes an interaction term between the level of fiscal rule and the level of independent fiscal institutions, ③ It analyzes the type of fiscal rules that affects fiscal soundness effectively. The study finds the followings: First, the level of fiscal rules has a positive (+) impact on the fiscal balance. Second, among fiscal rule types, the level of expenditure rule has a positive (+) impact on the fiscal balance. Third, the interaction term between the level of expenditure rule and the level of independent fiscal institutions has a positive (+) impact on the fiscal balance. The implications of this study are as follows: Countries with strict fiscal rules tend to reduce fiscal deficits, and among various fiscal rule types, expenditure rule has a significant impact on fiscal soundness improvement. Moreover, it was confirmed that countries with well-established expenditure rule experience an increased impact on fiscal soundness when activating independent fiscal institutions.

Ⅰ. Introduction

Countries around the world have recognized the importance of fiscal restructuring in overcoming the global financial crisis and national debt crises. They have made efforts towards policy coordination to address these challenges (Arévalo et al., 2019; Căpraru et al., 2022). After the global financial crisis of 2008-2009, many European countries introduced fiscal rules and established Independent Fiscal Institutions (IFIs) to build fiscal frameworks.

Many previous studies have analyzed that the introduction of fiscal rule has a positive impact on fiscal performance, and at the same time, they highlight that the effectiveness is enhanced when operating Independent Fiscal Institutions (Hallerberg et al., 2007; Wyplosz, 2013).

Fiscal rule is an important supporting tool for fiscal sustainability. However, fiscal rule can limit the level of national debt by controlling spending incentives, but they can also lead to problems such as adjustment of spending timing due to spending-biased policies, mainly due to political reasons (Alfaro et al., 2016).[1] The fiscal rule applies to the central government or the public sector in general and are currently being introduced and implemented in more than 96 countries around the world.

Existing previous studies on the fiscal rule report that countries those operate fiscal rules show sounder fiscal performance, such as a reduction in national debt. However, many empirical studies do not consider endogeneity problem, which is pointed out as a limitation of empirical research (Bergman & Hutchison, 2020; Debrun et al., 2008): (1) Fiscal rule reflects the direction of the country's fiscal policy. In particular, the availability and level of operation of specific fiscal rule may vary depending on the fiscal situation of each country. Therefore, countries with unsound finances are likely to apply relatively strict standards (Heinemann et al., 2018). (2) It is not easy to establish a causal relationship between financial performance and financial systems (Caselli et al., 2019). Heinemann et al. (2018) explain that the correlation between the operation of fiscal rule and fiscal soundness may vary depending on whether endogeneity problem is corrected. This is because fiscal rules are introduced during a fiscal crisis, but reverse causality may appear when fiscal soundness is restored.

Previous studies have limitations in explaining the relationship between fiscal institutions and fiscal performance when analyzing differences between countries, using only macroeconomic variables. Indeed, the fiscal performance

1 Adjusting the timing of spending means putting off spending this year to next year. In this case, the effect of this year's fiscal balance appears to be very sound. Fiscal rules that focus on adjusting the timing of expenditures may degenerate into a 'game of numbers' that technically adjusts balances rather than measures for fiscal sustainability.

in the post-2007 global financial crisis has varied widely across the countries (Shin et al., 2016). In the immediate aftermath of the financial crisis, many countries experienced a significant threat to their fiscal soundness, with rising national debt and declining fiscal balances. This has led OECD countries to prioritize policies to ensure fiscal consolidation. However, despite the commonality of such policies, the subsequent fiscal performance (e.g.fiscal balances) has been very different across countries. For example, Ireland was the lowest at -31.1% in 2010, and the primary balance was also the lowest in Ireland at -29.9% in 2010. Greece's adjusted fiscal balance was low at -14.8% in 2009.

Countries with a debt rule are more likely to have sustained improvements in their fiscal deficits than countries without one (EU 2006, 2009). The combination of fiscal balance rules and expenditure rules has proven to be more effective compared to other methods (IMF 2009). Expenditure rules are being applied more prominently in countries that have undergone large-scale fiscal adjustments. These rules are effective in restoring fiscal soundness in countries with high expenditure levels. Expenditure rules are advantageous because they explicitly exclude volatile fiscal revenues, allowing them to move in accordance with the automatic stabilization function of fiscal policy (Park, 2022).

The missing points in the previous studies are as follows : (1) Until now, discussions have focused solely on the impact of the adoption of fiscal rules on fiscal performance. (2) Research is still in its early stages regarding how the level of fiscal rules influences fiscal performance or which types of fiscal rules affect fiscal soundness improvement. (3) Fiscal institutions interact with political and administrative systems, yet there is insufficient consideration of this interaction. (4) There is a lack of consideration for the interaction between Independent Fiscal Institutions and fiscal soundness (The level of Independent Fiscal Institutions may be determined based on the level of fiscal soundness.). (5) Correction for endogeneity is necessary.

If so, does the introduction of fiscal rules lead to financial sustainability? And which fiscal rule contributes to fiscal consolidation? In this regard, this study utilizes a system GMM model in a dynamic panel analysis to control for the endogeneity of fiscal institutions. Additionally, it differentiates from previous research in the following aspects. First, this study indexes the level of fiscal rules and the level of independent fiscal institutions. While previous studies simply have used dummy variables for the introduction of fiscal rules and fiscal institutions, this study utilizes IMF data to index them. Second, by constructing interaction terms for the levels of fiscal rules and fiscal institution independently, we assess the impact of the interaction of fiscal regimes on fiscal soundness. Third, we analyze which type of fiscal rule has the strongest impact on fiscal sustainability. Previous studies have focused on the impact of fiscal rule adoption on fiscal performance, but have tended to overlook research on the types of fiscal rules that have the most significant impact on fiscal performance. Finally, this study analyzes the impact of the level of fiscal discipline and the level of independent fiscal institutions on the fiscal balance by constructing a panel data with 36 OECD countries as the spatial target and 1995 to 2021 as the temporal target.

The structure of this study is as follows. First, Chapter Ⅱ reviews the significance and status of fiscal rules and independent financial institutions, and previous research. Chapter Ⅲ indexes the level of fiscal rules and independent financial institutions and explains the analysis model and method. Chapter Ⅳ presents analysis results deriving the impact of the level of fiscal rules on the fiscal balance, the level of fiscal rules by type and the level of independent financial institutions on the fiscal balance. Finally, Chapter V summarizes the main results of this study and draws policy implications.

Ⅱ. Theoretical discussion and review of previous research

1. Fiscal rule

Fiscal rule refers to legally binding principle or norm that sets quantitative management goal as indicator in the process of maintaining, operating and managing finances soundly. The level of application varies depending on the type of fiscal rules, but for maintaining financial soundness, it can be said to be the most effective device to (IMF, 2022).

Fiscal rules can be classified into Expenditure Rule (ER), Revenue Rule (RR), Budget Balance Rule (BBR), and Debt Rule (DR). First, expenditure rule (ER) refers to a method of directly limiting the amount of government spending. Although it is easy to control because spending restrictions are directly implemented, there are limits to maintaining a sustainable fiscal policy. This is because there is a possibility that fiscal expenditure control would only be a one-time thing. Additionally, there is a risk of diversion of tax expenditures. Next, the revenue rule (RR) is a method of adjusting revenue and taxes by applying upper and lower limits when setting revenue. Although it is possible to temporarily maintain fiscal balance by using part of the income to repay debt, there are limits to expecting sustainability in this method. And the budget balance rule (BBR) is a method of maintaining fiscal balance at a certain level, but there is a risk of ledger manipulation in that it is influenced by the business cycle and that income and expenditure can be adjusted to achieve fiscal balance. Lastly, the Debt Rule (DR) is a method of presenting specific targets for the level of national debt and imposing restrictions to achieve them. Although it is effective in maintaining financial soundness, it has the limitation that it is not easy to reach a social consensus on appropriate debt level.

According to the IMF (2022)[2], the budget balance rule (BBR) is being used in a total of 78 countries and is said to be the most widely adopted single rule in the world.

2 IMF, "Fiscal Rules Dataset 1985-2021," 2022.

Table 1. Contents and evaluation of fiscal rules by type

type	content	evaluation
expenditure rule (ER)	directly limiting the amount of government spending method	direct spending restrictions are in place, making it easy to control, but there are limits to maintaining a sustainable fiscal policy.
revenue rule (RR)	adjusting income and taxes based on the upper and lower limits method	temporarily maintaining fiscal balance by using part of income to repay debt, but it might not be sustainable.
budget balance rule (BBR)	maintaining fiscal balance at a certain level method	risk of accounting manipulation to achieve fiscal balance.
debt rule (DR)	limiting the national debt level to be achieved by presenting specific targets.	Although effective in maintaining financial soundness, the limitation is that it is not easy to reach a social consensus on appropriate debt level.

source: (A. J. Kim, 2022)

Table 2. Status of adoption of fiscal rules in OECD countries

state	ER	RR	BBR	DR	state	ER	RR	BBR	DR
Australia	○	○	○	○	Latvia	○		○	○
Austria	○		○	○	Lithuania	○		○	○
Belgium	○		○	○	Luxembourg	○		○	○
Chile			○		Mexico	○		○	
Czech Republic	○		○	○	Netherlands	○	○	○	○
Denmark	○		○	○	New Zealand			○	○
Estonia	○		○	○	Norway			○	
Finland	○		○	○	Poland	○		○	○
France	○	○	○	○	Portugal	○		○	○
Germany	○		○	○	Slovakia	○		○	○
Greece	○		○	○	Slovenia	○		○	○
Hungary	○		○	○	Spain	○		○	○
Iceland			○	○	Sweden	○		○	○
Ireland	○		○	○	Switzerland			○	
Israel	○		○		United Kingdom			○	○
Italy	○		○	○	United States	○			
Japan			○						

source: IMF, 「Fiscal Rules Dataset 1985-2021」, 2022

Debt rules (DR) are in operation in 75 countries, expenditure rules (ER) in 45 countries, and revenue rules (RR) in 14 countries. There are 65 countries that are introducing both the debt rule (DR) and the budget balance rule (BBR); 40 countries are introducing the expenditure rule (ER) and the budget balance rule (BBR); There are 38 countries those are also introducing both the debt rule (DR) and expenditure rules (ER). Recently, there is a trend to operate multiple rules together according to the national situation.

According to the IMF, 105 countries around the world have adopted fiscal rules, but only South Korea and Türkiye are members of the OECD without fiscal rules. In the case of South Korea, the legal enactment of fiscal rules is emphasized for efficient fiscal execution, and the Korean government has prepared bills for the introduction of fiscal rules in 2020 and 2022, submitting them to the National Assembly.

In Korea, there are various opinions regarding the effects of fiscal rules on fiscal soundness. The arguments in favor of introducing fiscal rules are as follows. First, fiscal rules fail to adequately address the societal demand for strengthening public safety nets (Na, 2023). Second, South Korea's national debt level is relatively low compared to other advanced countries, and there is still ample fiscal capability (T. Kim, 2023). Third, one key conclusion of the IMF (2011, p. 3) on fiscal sustainability was that "60 percent of GDP should not be construed as a level beyond which debt distress is likely or inevitable, nor should it be used to judge whether debt is sustainable or not". This means that the 60% benchmark for the national debt ratio lacks objective

justification, and the same applies to the fiscal deficit ratio of 3% (Na, 2023). Finally, it's not that lower debt is better, it's that it's appropriate, because the money raised through debt is used to boost economic growth and increase social welfare (S. Lee, 2023).

On the other hand, the reasons for taking a negative stance on the introduction of fiscal rules are as follows. First, it will reduce uncertainty in the government's fiscal management, thereby securing the trust of internal and external markets and the public. So, fiscal rules can help ensure the effectiveness of medium-term fiscal planning (T. Kim, 2023). Second, despite traditionally lacking explicit forms of fiscal rules, South Korea has made efforts to maintain fiscal balance in its own way. However, since the 2010s, chronic fiscal deficits have begun to emerge (Oak, 2023). Third, as fiscal rules begin to be recognized by the general public as a quantitative constraint on fiscal operations, discussions on achieving the optimal fiscal performance within the overall limit become more active (Oak, 2023). Finally, empirical studies by the EU (2006, p. ,@298296), IMF (2009) and OECD (Guichard et al., 2007) and IMF (2022) show that while fiscal discipline is not a panacea, it can play a role in strengthening the maintenance of fiscal consolidation and the continuation of fiscal rule (Park, 2022).

2. Independent financial institution

An independent financial institution is a watchdog of public finances that supervises the fiscal policies prepared by the government and their results and refers to an institution that is independent in terms of non-partisan operation in terms of politics (Beetsma et al., 2019). In general, independent financial institutions perform macroeconomic forecasts, support for parliamentary budget analysis, monitor compliance with fiscal rules, and cost estimates. Kim Chun-soon, Kwon Soon-young, and Yoon Ju-cheol (2020) describe the organizational characteristics of independent financial institutions. While analyzing, it is explained that the functions it performs are different depending on its characteristics. Previous studies argue that the introduction of fiscal rule has the effect of reducing the fiscal deficit, and that fiscal performance is further increased when independent financial institutions are operated together (Hallerberg et al., 2007; Wyplosz, 2013).

According to the status of independent financial organizations announced in 2022, some independent financial organizations are performing various functions during the pandemic, such as analyzing the impact on the budget economy, analyzing costs related to COVID-19, and considering transparency when providing emergency financial support. The IMF divides the institutional models of independent financial institutions into three types: fiscal council, legislative budget office, and audit institution. Korea has a parliamentary budget office, the National Assembly Budget Office (NABO), and the IMF explains that the NABO performs the role of an independent financial organization.

However, in the case of the NABO, there is no function to monitor fiscal rule, and although it performs empirical analysis, but it has the limitation of not performing normative analysis. Among the 29 OECD countries with established independent financial institutions, many of them exist in the form of committees, and 24 countries carry out fiscal rule monitoring.

3. Review of previous research

So far, empirical studies on the effectiveness of fiscal rule has mainly focused on their relationship with fiscal performance. As a result, fiscal rule has been shown to have positive effects on fiscal soundness improvement (Bohn & Inman, 1996; Guichard et al., 2007), reduction in macroeconomic volatility (Fatás & Mihov, 2006), decreased procyclicality of fiscal policy (Bergman & Hutchison, 2015), reduction in public debt (Azzimonti et al., 2016), narrowing of fiscal deficits (Caselli et al., 2019), and reduced likelihood of experiencing a national fiscal crisis (Asatryan et al., 2018). A number of researchers have shown that fiscal rule improves financial health (Park, H · Ryu, D., 2006; Ryu, 2013); Kim, 2010; A. J. Kim, 2022). The evidence supporting the idea that fiscal rules can enhance fiscal soundness is as follows. First, binding limits are set on the aggregate size of the fiscal budget, which can improve fiscal sustainability by reducing the fiscal deficit and national debt (Park and Ryu, 2006). Second, the introduction of fiscal rules make it easier to measure fiscal performance according to the rules, and adherence to these rules can free the process from various interest groups or political pressures, leading to enhanced fiscal soundness (Ryu, 2013). Meanwile, there is an argument that a combination of fiscal balance rules and expenditure rules is more effective in improving fiscal soundness than operating a single rule such as fiscal balance rules, expenditure rules, or national debt rules (Kim, 2010).

On the other hand, there is also an opposing argument that fiscal regulations do not have a positive impact on fiscal management. The reasons are as follows. First, The contention is that achieving fiscal performance requires the government's flexible fiscal management capabilities. Introducing fiscal regulations may limit the fiscal authorities' ability to exercise flexibility in management, potentially having a negative impact on fiscal stability instead (Lane, 2003; Wyplosz, 2013). Second, Fiscal rules are not a magic key that automatically ensures fiscal soundness with the mere introduction of the system (J. Kim, 2020). Kim and Park (2020) argue, based on a study targeting U.S. state governments, that higher strength in balanced budget constraints leads to a reduction in fiscal deficits, thereby ensuring fiscal soundness. Meanwile, Heinemann *et al.* (2018) argue that fiscal rules control fiscal deficits but do not extend control over debt, expenditures, and revenues. Dorn, Gaebler, and Rösel (2019), fiscal rules are designed to restrict government spending and enhance sustainable budgeting, and empirical studies suggest that they operate to regulate biased fiscal behavior. In the same vein, some studies have pointed to the risk of tax expenditures being used to circumvent revenue rules and the potential for accounting manipulation to achieve balance of payments targets (A. J. Kim, 2022; D. C. Kim, 2021).

In recent years, the effective implementation of fiscal rule requires not only setting numerical limits on fiscal aggregates, but also creating an enabling environment for

compliance with fiscal rule. In this regard, studies have emerged advocating for the introduction and operation of an independent fiscal institutions, a device that can objectively interpret the exceptions to the fiscal rule and apply them to various situations to enhance the effectiveness of the fiscal rule (Ha et al., 2018; A. J. Kim, 2022; G. Lee, 2020).

Conflicting claims about the effectiveness of fiscal rules highlight the trade-off between the effectiveness of fiscal rules and the flexibility of fiscal management. The argument is that in some cases, fiscal rules can help strengthen fiscal soundness and increase policy transparency, but in other cases, they can limit flexible fiscal management and limit the ability to achieve goals such as economic regulation. These issues continue to be the subject of discussion and research among academia and policy makers regarding fiscal policy and fiscal systems. For example, Eliason and Lutz (2018) found no evidence that Colorado's Taxpayer Bill of Rights, one of the most stringent fiscal rules in the United States, had any effect on tax or spending levels. Similarly, Heinemann et al. (2016) found in a survey of politicians from 16 federal governments in Germany that fiscal rules had no significant impact on policymakers' debt break.

These various research results explain the effect of fiscal rules on fiscal soundness, but detailed discussion is needed on the degree of effect and detailed mechanisms. Meanwhile, countries those have introduced fiscal rules mainly apply budget balance rules (BBR) and debt rules (DR), but among the types of fiscal rules, there is little information on fiscal rules that have a significant impact on fiscal soundness. Research is lacking. Gomez-Gonzalez, Valencia, and Sanchez (2022) emphasizes the importance of studying the existence of types of fiscal rules that contribute more to macroeconomic stability. Therefore, in this study, we would like to explore the research question; do fiscal rules contribute to fiscal consolidation? So, what type of fiscal rule contributes more to fiscal soundness?

Ⅲ. Research design

1. Analysis model

Do fiscal rules contribute to the fiscal soundness? Many EU countries have introduced and are operating fiscal rules. As a result of empirical research targeting these countries, fiscal rules were found to have a positive effect on improving fiscal soundness. In particular, the wider the scope of government to which fiscal rules are applied, the stricter the legal basis, and the greater the strength of fiscal rules, the greater the effect of fiscal soundness.

In addition, Beetsma et al. (2019) presented results in a study on the relationship between the establishment of an independent financial organization and financial performance, showing that the establishment of an independent financial organization has a positive (+) effect on compliance with fiscal rules. This is because independent financial institutions promote the establishment of sound fiscal policies and promote the sustainability of public finances.

This study aims to find answers to the following research questions. First, do fiscal rules have a significant impact on fiscal soundness? If so, are there types of fiscal rules that contribute more to macroeconomic stability? Second, does the level of independence of fiscal institutions have a meaningful impact on fiscal soundness?

Various studies have confirmed claims about the effectiveness of fiscal rules in improving financial soundness. Some studies have suggested that fiscal soundness can be improved by reducing fiscal deficit and national debt by setting a binding limit on fiscal size (Alesina & Perotti, 1996; Bohn & Inman, 1996; Park, H · Ryu, D., 2006). Therefore, hypotheses can be formulated as follows:

hypothese 1: Fiscal rules will improve the fiscal balance.

According to the study by Guichard et al. (2007), they argued that the fiscal balance rule known as the "Graham-Rudman-Hollings (GRH) Act," enacted in 1985, failed to control the federal government's fiscal deficit. They claimed that the "Budget Enforcement Act," which set a cap on nominal discretionary spending and required offsetting reductions in fiscal spending or tax increases for new fiscal expenditures or tax cuts, successfully achieved fiscal surplus for several years until its expiration in 2002. Based on this study, one could formulate the following hypothesis:

hypothese 2: Among fiscal rule types, expenditure rules will have the most positive impact on macroeconomic stability.

In studies on the relationship between fiscal rules and Independent Fiscal Institutions, many researchers have presented results indicating that Independent Fiscal Institutions have a positive impact on the implementation of fiscal rules. The results are as follows:

First, the presence of Independent Fiscal Institutions reduces optimistic biases in fiscal forecasts, enhances accuracy, and contributes to improved compliance with fiscal rules (Beetsma et al., 2019). Second, the higher the level of Independent Fiscal Institutions, the higher the quality of medium-term fiscal management (Szymańska, 2019). Third, the presence of Independent Fiscal Institutions has a positive impact on the introduction of fiscal rules (A. J. Kim, 2022). Therefore, hypotheses can be formulated as follows:

hypothese 3: The higher the level of Independent Fiscal Institutions, the more the fiscal balance improves.

Gootjes et al. (2020) examined the relationship between fiscal rules and the political business cycle and indexed the level of fiscal rules. This study also referred to Gootjes et al. (2020) and indexed the level of fiscal rules and independent financial institutions.

Equation (1) is a model that indexes fiscal rules. And equation (2) is a model that indexes the fiscal rules for each type.

$$\begin{aligned} \textit{Fiscal Rules Index}\,(FRI_{i,t}) &= \textit{Expenditure Rules Index}\ (ERI_{i,t}) \\ &+ \textit{Revenue Rule Index}\ (RRI_{i,t}) \\ &+ \textit{Budget Balance Rules Index}\ (BBRI_{i,t}) \\ &+ \textit{Debt Rules Index}\,(DRI_{i,t}) \end{aligned} \tag{1}$$

$$\begin{aligned} ERI_{i,t}, RRI_{i,t}, BBRI_{i,t}, DRI_{i,t} =& Implement_{i,t} + Coverage_{i,t} \\ &+ Legalbasis_{i,t} \\ &+ Enforcement_{i,t} \\ &+ National_{i,t} \\ &+ Escape_{i,t} \end{aligned} \tag{2}$$

First, the Fiscal Rules Index ($FRI_{i,t}$) in Equation (1) is an index of the level of rules by type being introduced by each country. $FRI_{i,t}$ means the fiscal rule index considering the expenditure rule level ($ERI_{i,t}$), revenue rule level ($RRI_{i,t}$),

budget balance rule level ($BBRI_{i,t}$), and debt rule level ($DRI_{i,t}$).

And in Equation (2), the factors that make up the level of each rule are composed of a total of six factors. $Implement_{i,t}$ refers to whether the relevant rule has been introduced, $Coverage_{i,t}$ refers to the scope of application to which the fiscal rule is applied (central or general government), and Legal $basis_{i,t}$ refers to the legal basis of the fiscal rule, ranging from political agreements to laws and constitutions. $Enforcement_{i,t}$ refers to formal sanctions' provisions, including formal enforcement procedures and monitoring mechanisms outside the government. $National_{i,t}$ refers to whether the fiscal rules operated by each country are supernational rules operated by an economic union or community, or national rules operated by individual countries. Lastly, $Escape_{i,t}$ refers to the existence of an explicit exception clause.

The following is a model that indexes the level of independent financial institutions.

$$\begin{aligned} Independent\ Fiscal\ Institutions\ Index\ (IFII_{i,t}) = & Establishment_{i,t} + Positiveanalysis_{i,t} \\ & + Normativeanalysis_{i,t} + Fiscalmonitoring_{i,t} \\ & + Pandemic_{i,t} \end{aligned} \quad (3)$$

In Equation (3), $Establishment_{i,t}$ means whether an independent financial organization is established. $Positive\ analysis_{i,t}$ is whether the IFI performs empirical analysis, $Normative\ analysis_{i,t}$ is whether the IFI performs normative analysis, $Fiscal\ monitoring_{i,t}$ is whether the IFI has a financial rule monitoring function, and $Pandemic_{i,t}$ is the activities performed by the IFI during the pandemic.

As mentioned earlier, fiscal institutions such as fiscal rules and the introduction of an independent fiscal institutions vary depending on the economic conditions of each country. Heinemann et al. (2018) find that endogeneity explains the lack of consensus in the literature on the relationship between fiscal redistribution and economic growth.

Factors that are not explicitly included in the model but can influence fiscal soundness may affect the level of fiscal rule. In other words, if there are unobserved characteristics that impact fiscal soundness and are influenced by fiscal rule, there may be biases in the estimation results.

If the explanatory variable, fiscal rule, is endogenous, meaning $cov(x_1, e) \neq 0$, it is not possible to obtain consistent estimates. In such cases, instrumental variables can be used for estimation through two-stage least squares (2SLS), or fixed effects or random effects models can be employed.

First, 2SLS can address the endogeneity of the model to achieve consistency, but it has the drawback of reduced efficiency because it does not use all available moment conditions (Ahn & Schmidt, 1995).

The next approach is to use a fixed effects model, such as Equation (4). In Equation (4), μi represents the unobserved heterogeneity that is time-invariant and influences the dependent variable.

$$y_{i,t} = \alpha + \beta_1 x_{i,t} + \mu_i + e_{i,t} \quad (4)$$

The fixed-effects model assumes strong exogeneity to control for heterogeneity. Strong exogeneity implies that the current independent variables of a country are not influenced by past or current dependent variables. However, in practice, the assumption of strong exogeneity is often likely to be violated.

Because the fiscal soundness of each country in the present or past can influence both current and future fiscal soundness, the assumption of strong exogeneity is likely to be violated. Therefore, including lagged variables of the dependent variable as explanatory variables allows for the control of this influence.

However, if the fixed effects model include the lagged dependent variable ($y_{i,\,t-1}$) as an explanatory variable as shown in Equation (5) below, the lagged dependent variable will be endogenous due to the time-series correlation with the mean of the error term. Even though fixed effects address endogeneity issues arising from nation-specific characteristics that do not change over time, if there are nation-specific characteristics that vary over time, endogeneity problems may persist.

$$y_{i,t} = \alpha + \gamma y_{i,t-1} + \beta_1 x_{i,t} + \mu_i + e_{i,t} \quad (5)$$

The fixed effects model, which is an analysis method typically used when using panel data. The fixed effects model, considers the cross-sectional characteristics of the data as a fixed value called the mean. Therefore, because the fixed effects model, does not consider the heteroskedasticity problem of the residual terms in individual countries, efficiency problems arise due to restrictions on the degree of freedom. On the other hand, the random effects model considers the cross-sectional characteristics of the data in the error term, so it can solve the problem of efficiency overlooked in the fixed effects model, but it has the error of assuming the error term as a random variable. The Hausman test results of this study's empirical analysis model showed that the fixed effects model, was appropriate. The estimation equation based on the fixed effects model is as follows.

$$\begin{aligned} FiscalBalance_{i,t} = & \alpha + \beta FiscalRuleIndex(FRI)_{i,t} \\ & + \delta IndependentFiscalInstitutionIndex(IFII)_{i,t} \\ & + \theta FiscalRuleIndex(FRI)_{i,t} \\ & * IndependentFiscalInstitutionIndex(IFII)_{i,t} \\ & + \varphi X_{i,t} + \mu_i + \tau_t + \varepsilon_{i,t} \end{aligned} \quad (6)$$

$FiscalBalance_{i,t}$: i state's year t budget balance

$FRI_{i,t}$: i state's year t fiscal rule index

$IFII_{i,t}$: i state's year t independent financial institution index

$FRI_{i,t} * IFII_{i,t}$: interaction term

$X_{i,t}$: control variable

μ_i state fixed effect

τ_t : time fixed effect

$\varepsilon_{i,t}$: error term

Therefore, in this study, besides the fixed-effects model, Generalized Method of Moments (GMM) was employed.

GMM employs lagged variables of explanatory variables as instrumental variables to address endogeneity issues that cannot be resolved by the fixed-effects model. Using instrumental variables that are uncorrelated with the error term can address endogeneity issues. However, finding appropriate instrumental variables can be a challenging task.

Therefore, utilizing lagged variables of the dependent variable as instrumental variables can address endogeneity issues. GMM includes difference GMM and system GMM. The difference GMM removes fixed effects through differ-

encing and then utilizes the lagged variables of the explanatory variables as instrumental variables.[3]

However, differenced lagged variables may have correlations with the error term in the time-series. Rodman (2009)[4] argues that Difference Generalized Method of Moments (GMM) is more efficient than Two-Stage Least Squares (2SLS) because it can use not only t-1 but also t-2 and earlier lagged variables as instrumental variables.

On the other hand, Blundell and Bond (1998) proposed a system GMM that utilizes both difference GMM and level GMM[5]. This is because, even though difference GMM addresses the endogeneity issue of the error term through first-order differencing, in cases where the time series is short and persistent, lagged dependent variables may not be strong instruments, leading to bias in the estimates (Blundell & Bond, 1998).

System GMM estimates by adding the endogenous explanatory variable $y_{i,t-1}$ from Equation (5) as an instrumental variable. Therefore, this study utilized system GMM, taking into account the endogeneity that fiscal rules may possess. The model for the impact of fiscal rule stringency on fiscal soundness was formulated as shown in Equation (7).

$$\begin{aligned} FiscalBalance_{i,t} = \alpha_0 &+ \alpha_1 FiscalRuleIndex_{i,t-1} \\ &+ \alpha_2 FiscalRuleIndex_{i,t} \\ &+ \alpha_3 X_{i,t} + \alpha K_i + \alpha M_t + \gamma_{i,t} \end{aligned} \tag{7}$$

This methodology is a dynamic panel analysis model. The dynamic panel analysis model is an estimation method that includes lagged dependent variables in the explanatory variables to control effects that are difficult to observe and takes endogeneity between variables into consideration. Due to the nature of the panel data used in this study, fiscal soundness at a specific point in time has the explanatory variables and the endogeneity measured at the level of various financial systems that make up a country. In other words, here we must consider that $FRI_{i,t}$ may be correlated with $IFII_{i,t}$ and $\varepsilon_{i,t}$. This is because the level of fiscal rules and the level of independent financial institutions may be endogenous to fiscal soundness variables. For example, if the level of fiscal rules and independent fiscal institutions are likely to be high in countries with a high level of fiscal soundness, an upward bias may appear in β. In another aspect, countries with a high level of fiscal soundness have a low level of fiscal rules and independent financial institutions, while countries with unhealthy fiscal soundness are likely to avoid the introduction of fiscal rules and independent financial institutions.

In other words, if unobserved characteristics that affect the level of fiscal rules and the level of independent financial institutions are correlated with fiscal soundness, consistent estimates cannot be obtained. Therefore, this study uses a dynamic panel model considering the endogeneity that may exist at the level of fiscal rules and independent financial institutions. The dynamic panel model uses the previous year's value of the dependent variable as an explanatory variable, and the regression equation can be expressed as the following Equation (8).

$$\begin{aligned} FiscalBalance_{i,t} = \alpha &+ \gamma FiscalBalance_{i,t-1} \\ &+ \beta FRI_{i,t} + \delta IFIIi_{i,t} \\ &+ \theta\left(F_{i,t} * I_{1FI}\right) + \varphi X_{i,t} \\ &+ \mu_i + \tau_t \\ &+ \varepsilon_{i,t} \end{aligned} \tag{8}$$

Dynamic panel models use instrumental variables to correct the endogeneity, and generally use the generalized method of moments (GMM) to calculate efficient estimators. Equation (8) is a differential GMM, which is the equation presented by Arellano and Bond (1991) and is a model that uses the first-order differential equation. This model uses non-differential lagged variables as instrumental variables for the endogenous variables in the first-difference equation.

$$\begin{aligned} \Delta FiscalBalance_{i,t} = &\Delta\gamma FiscalBalance_{i,t-1} \\ &+ \beta\Delta FFI_{i,t} \\ &+ \delta\Delta IFIIi_{i,t} \\ &+ \theta\Delta\left(FRI_{i,t} * IFII_{i,t}\right) \\ &+ \varphi\Delta X_{i,t} + \Delta\varepsilon_{i,t} \end{aligned} \tag{9}$$

Afterwards, Arellano and Bover (1995) and Blundell and Bond (1998) proposed the System GMM model, which uses the level variable of the dependent variable and the differential lagged variable as instrumental variables. System GMM is a form of estimation that combines the regression equation (Equation (8)) and the difference equation (Equation (9)), and the first difference equation uses the level lag variable of the explanatory variable and the difference lag variable of the explanatory variable as instrumental variables. Therefore, compared to GMM, System GMM, which uses additional instrumental variables, has the advantage of being able to derive a more efficient matching estimator. For this reason, this study conducts dynamic analysis using System GMM. And to verify the suitability of the System GMM model, the autocorrelation test and Sargan test are performed.

2. Measurement of variables

1) Dependent variable

The dependent variable of this study is the fiscal balance of OECD countries from 1995 to 2021. The fiscal balance was measured in three major categories. In general, previous studies use the primary balance, but in this study, it

3 $\Delta y_{i,t} = \gamma\Delta y_{i,t-1} + \beta_1\Delta x_{i,t} + \Delta e_{i,t}$

4 Roodman (2009) argued that there are five assumptions that must be satisfied for GMM. These are: (1) some variables are endogenous, (2) current values are influenced by past values, (3) idiosyncratic disturbances are uncorrelated with individual values, (4) some variables are not strictly exogenous, and (5) panel data has a short time span with a large number of observations. ("small T, large N").

5 This is a method where the model is not differenced, similar to difference GMM, but instead, lagged variables differenced in Equation (5) are used as instrumental variables.

was measured as the overall balance, primary fiscal balance, and cyclical adjusted balance. The integrated fiscal balance is used to analyze the impact of finances on the economy by measuring comprehensive financial activities as the difference between total revenue and total expenditures resulting from the government's pure financial activities. The basic fiscal balance means the consolidated fiscal balance or the managed fiscal balance minus net interest payment. It has the advantage of being able to determine the current financial situation by deducting the net interest burden of debt that appears because of past deficit management. Meanwhile, the cyclically adjusted fiscal balance refers to the fiscal balance that removes changes in the fiscal balance resulting from economic factors. In other words, economic fluctuation factors are reflected in the basic fiscal balance.

2) Independent variables

The explanatory variables in this paper are the financial rule level (FRI) and the independent financial institution level (IFII). The reason each country introduces fiscal rules is to control indiscriminate fiscal expenditures and efficiently allocate budget, which leads to the 'tragedy of the commons.'

The index was made using data from the IMF's fiscal rule database. As for the fiscal rule level, the more binding and stricter it is, the higher the score. The final financial rule level (FRI) was derived by adding transparency and accountability regulations.

First, implement refers to whether a rule is introduced. In other words, it is measured as 0 if the corresponding rule is introduced for each type, and as 1 otherwise. Coverage indicates the scope to which the country applies the standards. The wider the scope of application, the higher the index. Measured as no coverage = 0, central government = 1, general government or higher = 2. The legal basis represents the legal basis of the rule. The more binding the legal basis was, the higher the index was assigned. Therefore, it is measured as political commitment = 1, coalition agreement between political parties = 2, statutory rule = 3, international treaty = 4, and constitutional rule = 5. Additionally, the same weight is applied to all variables.

National is a variable that indicates whether the country in question applies only individual national standards or supranational standards. It is measured as 1 if the country is introducing individual national rules or supranational rules, 2 if it is introducing both individual national and supranational rules, and 0 otherwise. Enforcement refers to sanctions and correction mechanisms for violations. If there are no sanctions and correction mechanisms for violations, it is measured as 0, if there are individual national rules or supranational rules, it is measured as 1, and if both individual national rules and supranational rules are in place, it is measured as 2. Some countries have provisions to suspend the application of fiscal rules in the event of an economic crisis or to exempt the fiscal deficit and national debt ceiling set by fiscal rules.

Escape refers to whether an exception clause exists. It was measured as 1 if the rules provide grounds for exception clauses, and 0 otherwise. After calculating the index of fiscal rules by type, the level of fiscal systems of OECD countries was additionally confirmed. The final fiscal rule index (FRI) was calculated by assigning a score of 1 if the country has prepared a medium-term expenditure plan and provisions for transparency and accountability, and 0 otherwise.

Meanwhile, each OECD country is establishing an Independent Fiscal Institution (IFI) to ensure fiscal sustainability. The OECD has already recommended the establishment of an independent financial institution in 2014, and as of December 2022, a total of 29 OECD countries have established and are operating an independent financial institution. The level of independent financial institutions (IFII) indexes the level of supervision of financial operations and performance by independent financial institutions, such as conducting normative analysis beyond macroeconomic forecasts and empirical analysis.

Establishment is measured as 1 if the country has established an IFI, and 0 otherwise. In addition, the level of analysis was calculated and indexed by checking positive analysis, normative analysis, analysis of the impact on the economy during the pandemic, and monitoring of exceptions to fiscal rules and exemption provisions.[6]

3) Control variable

Factors affecting the dependent variable, fiscal balance, were controlled, and economic growth rate, national debt, inflation, unemployment rate, and fiscal crisis were used as variables. In general, if the economic growth rate slows, there is a risk of an economic recession, and in this case, the current account surplus may shrink due to the global economic slump, which will affect the fiscal balance. In addition, the higher the national debt, inflation, and unemployment rate, the larger the fiscal deficit, so these variables were controlled. Lastly, the temporal variable of financial crisis was controlled. Korea experienced an economic recession during the foreign exchange crisis in 1997 and the global financial crisis in 2008, and recently, in the process of overcoming COVID-19, national debt has increased by 500 trillion won over the past five years. Therefore, the years up to T+2 when the Asian financial crisis, global financial crisis, and pandemic crisis occurred, that is, 1997-1999, 2008-2010, and 2020-2021 were measured as 1, and all other years were measured as 0.

6 Providing rapid analysis of Scores were given by checking whether economic/budgetary impact, monitoring the activation of escape clause or suspension of fiscal rules, costing COVID-19 related measures, promoting transparency for emergency procedures during COVID-19.

Table 3. Measurement and source of variables

Category				measurement	data source
dependent var.	fiscal balance		adjusted	adjusted fiscal balance	IMF Database
independent var.	FRI	ERI, RRI, BBRI, DRI	implement	introduction = 1, non = 0	
			coverage	central gov only= 1 general gov = 2 non = 0	
			national	individual state or supranational rule = 1 individual state+supranational = 2 non = 0	
			enforcement	individual state or supranational rule = 1 individual state+supranational = 2 no saction = 0	
			legal basis	political commitment = 1 coalition agreement = 2 statutory rule = 3 international treaty = 4 constitutional rule = 5	
			escape	non = 0 escape rule = 1	
		midterm expenditure plan		rule = 1, non = 0	
		transparency・accountability		rule = 1, non = 0	
	IFII	establishment +positive +normative +monitoring + pandemic	establishment	introduction = 1, non = 0	
			positive	analysis = 1, non = 0	
			normative	analysis = 1, non = 0	
			monitoring	fiscal rule monitoring = 1, non = 0	
			pandemic	impact analysis and monitoring during the pandemic = 1 non = 0	
control var.			GDP growth rate	per capita GDP growth rate	Worldbank Database
			Debt	government debt/GDP	
			Inflation	yearly consumer price index change	
			fiscal Crisis	Asia financial crisis, global financial crisis, pandemic crisis = 1 (1997, 1998, 1999, 2008, 2009, 2010, 2020, 2021), otherwise =0	

IV. Analysis

1. Basic analysis

If there is a high correlation between independent variables, a multicollinearity problem occurs, which causes the analysis results to be distorted. As a result of conducting correlation analysis to verify multicollinearity, the correlation coefficients for each dependent variable were all below 0.8, confirming that the variables were independent from each other. The correlation coefficient is presented in [Table 4].

Second, collinearity statistics (tolerance limits, variance inflation index) were checked. The minimum standards are a tolerance limit of more than 0.1 and a variance inflation factor (VIF) of less than 10. The average variance inflation index was 1.34 and 1.35 for each dependent variable, so it was determined that there was no multicollinearity problem.

Basic statistics between major variables are presented in [Table 6]. The average fiscal rule index (FRI) of OECD countries was 22, followed by Latvia (66), the Netherlands (60), and Denmark (57). In addition, the average Independent Financial Institutions Index (IFII) of OECD countries was 1.34, with Austria, Iceland, Lithuania, Slovakia, Slovenia, and Spain showing the highest at 7.

Table 4. Correlation analysis

Index	Adjusted	FRI	IFII	GDP	Debt	Inflation	Crisis
Adjusted	1						
FRI	0.1420	1					
IFII	0.0865	0.5578	1				
GDP	0.1845	-0.0540	-0.1332	1			
Debt	-0.2719	0.0758	0.1766	-0.2284	1		
Inflation	-0.1919	-0.3355	-0.2049	0.1829	-0.2575	1	
Crisis	-0.2816	0.0492	0.2262	-0.3795	0.0492	0.0461	1

Table 5. Collinearity statistic

Index	Adjusted	
Variable	VIF	1/VIF
IFII	1.59	0.628216
FRI	1.58	0.633414
GDP	1.27	0.788006
Crisis	1.25	0.797711
Inflation	1.24	0.803977
Debt	1.14	0.879717
Mean VIF	1.35	

Table 6. Descriptive statistic

variable	observations	average	st dev	min	max
Adjusted	886	-2.25474	3.052023	-14.8	12
FRI	972	22.06379	18.13049	0	66
ERI	972	4.134774	6.092097	0	22
RRI	972	.409465	1.635419	0	10
BBRI	972	9.522634	7.124211	0	22
DRI	972	6.809671	6.221271	0	22
IFII	972	1.349794	1.856064	0	7
GDP	972	2.109275	3.44448	-14.46433	23.99909
Debt	972	60.4228	40.33954	3.764939	262.492
Inflation	972	3.539387	7.361171	-4.478103	89.11332
Crisis	972	.154321	.3614421	0	1

2. Panel regression results

[Table 7] The F-test results indicate that the p-value is rejecting the null hypothesis at a 1% significance level. Rejecting the null hypothesis implies that the fixed effects model is relatively more efficient compared to Pooled OLS[7]. Th Hausman test results indicate that the p-value is rejecting the null hypothesis at a 1% significance level. Rejecting the null hypothesis implies that the fixed effects model is relatively more efficient compared to the random effects model[8].

7 F-test that all u_i=0: F(35, 843) = 12.16 Prob > F = 0.0000

8 Chi2(5) =chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B) Prob > F = 0.000

Table 7. fiscal rule impact on fiscal soundness

Variables	Pooled OLS	Fixed Effects Model	Randem Effects Model
ΔFRI	0.0388922*** (0.0109644)	0.0534014*** (0.0119387)	0.062904*** (0.0121636)
ΔIFII	-0.1485908 (0.1233106)	-0.2001417 (0.127526)	-.02699027 (0.1459821)
ΔFRI x IFII	0.0055702** (0.003088)	0.0054551* (0.0031564)	0.0039715* (0.0305491)
GDP	0.0762876*** (0.0266865)	0.0792512*** (0.0267074)	0.2587221*** (0.0307612)
Debt	-0.0213913*** (0.0039776)	-0.0211518*** (0.0047)	-0.0404391*** (0.0048962)
Inflation	-0.1760622*** (0.0404439)	-0.1499847*** (0.0417588)	0.0006838* (0.0369771)
Crisis	-2.117455*** (0.2311232)	-2.106728*** (0.2308245)	-1.715712*** (0.2723602)
_cons	-1.288159 (0.4485349)	-1.61765 (0.4006482)	-1.164491 (0.5480467)
sigma_u	1.511782	1.79571	1.535713
sigma_e	2.2214392	2.221439	2.2214321
rho	0.316537	0.395199	0.326537
R-sq	0.2342	0.2790	0.2360
Obs.	850	850	850

note: ( ) st. dev, *** p⟨0.01, ** p⟨0.05, * p⟨0.10

[Table 8] presents the results of analyzing the effect of the level of fiscal rules on the fiscal balance using the system GMM. Model 1 is the level of fiscal rules (ΔFRI) as an explanatory variable, Model 2 is the level of independent financial institutions (ΔIFII) as an explanatory variable, Model 3 is the level of fiscal rules and the level of independent financial institutions as explanatory variables, and Model 4 is the fiscal rules as explanatory variables. This model additionally includes interaction variables between the level and the IFI level (ΔFRI × IFII).

In the system GMM model, the level of fiscal rules (ΔFRI) was found to have a statistically significant positive (+) effect on the cyclical adjusted fiscal balance (Adjusted). However, it was confirmed that the IFI level (ΔIFII) and the cross-variable between the fiscal rule level and IFI level (ΔFRI × IFII) did not have a significant effect on the cyclically adjusted fiscal balance (Adjusted).

So, which types of financial rules have a significant impact on improving financial soundness? [Table 9] shows the results of analysis using system GMM. Model 1 applied the expenditure rule level (ΔERI), and the interaction term (ΔERI × IFII). Model 2 applied the revenue rule level (RRI) and the interaction term (ΔRRI × IFII). Model 3 applied the fiscal balance rule level (ΔBBRI), an interaction term (ΔBBRI× IFII). Model 4 applies the debt rule level(ΔDRI) and the interaction term (ΔDRI × IFII). Model 5 applied only the fiscal rule types: expenditure rule level (ΔERI), revenue rule level (ΔRRI), fiscal balance rule level (ΔBBRI), and debt rule level (ΔDRI), and Model 6 applied independent fiscal organization to the fiscal rule type. Lastly, Model 7 is a model that applies all interaction terms across each type of fiscal rule and the level of IFI.

As a result of the analysis, it is a model that additionally includes an interaction variable (ΔFRI × IFII) at the level of fiscal rules and the level of independent financial institutions as an explanatory variable. The expenditure rule level (ERI) was found to have a positive (+) effect on the cyclically adjusted fiscal balance (Adjusted), and the interaction term (ΔERI× IFII) was also found to have a positive (+) effect on the balance (Adjusted). In other words, in countries with a high expenditure rule level (ERI), the impact of the independent financial institution level (IFII) on the cyclically adjusted fiscal balance (Adjusted) increases.

Ⅴ. Conclusion and policy implications

The previous government's expansionary fiscal policy was in response to some of the needs of the times, such as responding to the unprecedented crisis called the pandemic. Although many countries say that fiscal spending due to the pandemic was inevitable, as the situation calms down, questions are being raised about the normalization or recovery of finances. In particular, the new government is setting fiscal reform for fiscal efficiency and soundness as a national task and is also proposing conflicting macroeconomic goals of economic stability and price stability.

Accordingly, this study seeks to discuss improving fiscal soundness through three major discourses: fiscal rules, independent fiscal institutions, and fiscal balance. Specifically, by examining the relationship between the level of fiscal rule, the level of independent financial institution, and the fiscal balance of OECD member countries through

Table 8. (system GMM) fiscal rule impact on fiscal soundness

Variables	Model 1	Model 2	Model 3	Model 4
ΔAdjusted L1.	0.520004*** (0.0355572)	0.5700938*** (0.035376)	0.523098*** (0.0356905)	0.5207*** (0.0356566)
ΔFRI	0.065966*** (0.0137222)		0.075975*** (0.0153373)	0.079642*** (0.0169741)
ΔIFII		0.061723 (0.0858174)	0.13714 (0.092846)	0.03521 (0.2031148)
ΔFRI × IFII				0.00279 (0.0050896)
GDP	0.068174*** (0.0215278)	0.088448*** (0.0228236)	0.076392*** (0.0222649)	0.076728*** (0.0222854)
Debt	-0.01271** (0.0058666)	-0.00281 (0.0063944)	-0.00922 (0.0063386)	-0.01017 (0.0064676)
Inflation	-0.01036 (0.0456485)	-0.03133 (0.046901)	-0.01005 (0.0457659)	-0.01104 (0.0456881)
Crisis	-1.44189*** (0.1905762)	-1.42445*** (0.2171327)	-1.30398*** (0.2123857)	-1.29682*** (0.212618)
_cons	-1.72403 (0.4187835)	-0.71642 (0.3925972)	-2.01355 (0.4634344)	-2.04588 (0.4711157)
AR1 test(p-value)	0.0008	0.0005	0.0011	0.0009
AR2test (p-value)	0.4251	0.5335	0.3698	0.3727
Obs.	850	850	850	850

note: () st. dev, *** p⟨0.01, ** p⟨0.05, * p⟨0.10.

country-by-country comparison, we aim to empirically understand the reality surrounding the fiscal soundness and suggest a developmental policy direction for Korea.

To date, many empirical studies on the impact of fiscal systems, such as the operation of fiscal rule and the establishment of independent financial institution, on fiscal performance have neglected the problem of endogeneity (Debrun et al., 2008; Poterba, 1994). It is not easy to establish a causal relationship between institutional variables and the results of financial variables, and if unobserved characteristics that affect the level of the financial system are related to financial performance, endogeneity problem must be corrected because consistent estimators cannot be obtained.

Accordingly, this study used the system GMM model for dynamic panel analysis to control the endogeneity of the fiscal system. ① the level of fiscal rule and the level of independent financial institution were indexed, ② and furthermore, the level of fiscal rules and the level of independent financial organizations are composed of interaction terms, and ③ the rules that affect the improvement of financial soundness among the types of financial rules are analyzed. To analyze the impact of the level of fiscal rule and the level of the independent fiscal institution on the fiscal balance, panel data was constructed by setting the spatial target to 36 OECD countries and the temporal target from 1995 to 2021.

The analysis results of this study are summarized as follows.

First, because of dynamic panel analysis, the level of fiscal rules was found to have a positive (+) effect on fiscal balance. In other words, countries with stricter fiscal rules have better cyclical adjusted fiscal balances.

Second, the IFI level and the interaction variables between the fiscal rule level and IFI level were found to have no statistically significant effect on the fiscal balance.

Third, among the types of fiscal rules, the level of expenditure rule was found to have a positive (+) effect on the fiscal balance. In other words, countries with stricter spending rules have better cyclical adjusted fiscal balances.

Fourth, the cross-variables at the level of expenditure rule and the level of independent financial institutions were found to have a positive (+) effect on the fiscal balance. This means that if a country with strict spending rules gives more roles to independent financial institutions, the impact on fiscal balance increases (+).

In summary, this study found that countries with stricter fiscal rules tend to have lower fiscal deficits, and among the types of fiscal rules, the spending rule has a significant impact on improving the fiscal soundness. Above all, it was confirmed that when a country with strict spending rules improves the function of its independent financial institutions, the impact on the fiscal soundness increases.

Policy implications from the analysis results are as follows.

First, it is necessary to introduce fiscal rules with a strict legal basis. In other words, the stricter the legal basis, the stricter the fiscal rules, such as sanctions and correction mechanisms for violations, and the monitoring system, and the higher the binding force, the better the fiscal balance. Therefore, it is desirable to establish a basis for introducing financial rules in law rather than enforcement decree.

Table 9. Level of fiscal rule by type and independent institution impact on budget balance

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
ΔAdjusted L1.	0.4971*** (0.0361059)	0.5725*** (0.0356136)	0.55855*** (0.0353078)	0.553711*** (0.0354058)	0.498773*** (0.0361089)	0.501966*** (0.0362808)	0.493503*** (0.0362895)
ΔERI	0.194757*** (0.0363579)				0.135519*** (0.0299602)	0.14659*** (0.0310981)	0.188294*** (0.0387735)
ΔRRI		-0.23223 (0.2035807)			-0.19818 (0.1502592)	-0.1873 (0.1509731)	-0.25069 (0.1963043)
ΔBBRI			0.103008** (0.0401766)		0.00974 (0.0433165)	0.026053 (0.0450348)	0.036504 (0.0587376)
ΔDRI				0.137951*** (0.0465348)	0.084034 (0.0559551)	0.079547 (0.0562366)	0.060887 (0.0697311)
ΔIFII	0.033933 (0.1265336)	0.061667 (0.0877537)	0.036401 (0.2144028)	0.14969 (0.2062164)		0.12643 (0.0913808)	0.14937 (0.2330615)
ΔERI × IFII	0.01581 (0.0113555)						0.02745* (0.0153206)
ΔRRI × IFII		0.018446 (0.0526552)					0.024946 (0.0508484)
ΔBBRI × IFII			-0.00399 (0.0135366)				0.005965 (0.0212623)
ΔDRI × IFII				0.013872 (0.0173683)			0.01381 (0.0234746)
GDP	0.080728*** (0.0219669)	0.088561*** (0.022907)	0.080576*** (0.022949)	0.086926*** (0.0226172)	0.06938*** (0.0215227)	0.076607*** (0.0221936)	0.078262*** (0.0222811)
Debt	-0.0192*** (0.0068436)	-0.00326 (0.0064509)	-0.0023 (0.0064545)	-0.00512 (0.0063797)	-0.02003*** (0.0062561)	-0.01662** (0.0067449)	-0.01928*** (0.0069144)
Inflation	-0.03608 (0.0449749)	-0.03085 (0.0470815)	-0.01204 (0.0472827)	-0.02684 (0.0465482)	-0.0239 (0.0457184)	-0.02299 (0.0458665)	-0.02822 (0.0457887)
Crisis	-1.23103***	-1.43033*** (0.2179529)	-1.42257*** (0.216202)	-1.34567*** (0.2167068)	-1.38267*** (0.1916274)	-1.25965*** (0.211455)	-1.20176*** (0.2138927)
_cons	-0.50416 (0.2111858)	-0.6011 (0.4073709)	-1.7514 (0.5551294)	-1.5631 (0.4886548)	-0.96472 (0.5137999)	-1.21221 (0.5457102)	-1.1597 (0.5511905)
AR1 test(p-value)	0.0011	0.0005	0.0005	0.0006	0.0010	0.0014	0.0013
AR2test (p-value)	0.3529	0.5229	0.4933	0.4595	0.3442	0.3117	0.3168
Obs.	850	850	850	850	850	850	850

note: ( ) st. dev, *** p⟨0.01, ** p⟨0.05, * p⟨0.10

Second, there is a need to consider introducing additional spending rule that can directly control the fiscal spending. Expenditure rule is a rule that directly limits the growth rate of government expenditure and the scale of fiscal expenditure. In the case of the United States, an annual limit on discretionary spending is set and expenditure rule is operated in addition to the balance rules. Expenditure rule can directly control reckless fiscal expenditures and is also convenient to operate because they have vivid fiscal indicators that the government can manage. This study empirically supports the discussion on the need to introduce additional spending rule at the Fiscal Rule Conference on October 8, 2022.

Lastly, there is a need to upgrade the level of independent financial institutions. There is a need to give independent financial institutions the ability to monitor existing fiscal rules and perform not only empirical analysis but also normative analysis. In this study, we additionally indexed the functions performed by IFIs in OECD countries during the pandemic crisis in 2020. Although the correlation between the level of IFIs and the fiscal balance was not statistically proven, it was found that strengthening the IFI function in countries with strict spending rule increases the impact on the fiscal balance. Therefore, there is a need to give independent financial institutions the ability to review financial plans and forecasts, and even apply exception provisions in the event of a financial crisis and institutionalize them so that the normative evaluations and policy matters made by them are reflected in actual policies. In other words, the executive branch and the legislative body, through a deliberation process, guarantee the authority and independence to decide on fiscal policy, such as whether to apply exception clauses, so that the suggestions of independent financial institutions can be reflected in policies, and establish the precondition that political partisanship can be avoided.

In September 2022, the new government announced a plan to introduce fiscal rules at the Emergency Economic Ministers' Meeting. Explaining that it is urgent to introduce fiscal rules to maintain fiscal sustainability, it is stated that it will strengthen fiscal control, base it on the law, and supplement the balance of payments rules commonly used in the international community with additional indicators. However, in the case of balance rules, if the business cycle

affects the application of fiscal rules, the rigidity inherent in the rules may prevent immediate response to the economy, and there may be a risk of accounting manipulation to achieve fiscal balance. Therefore, it is necessary to consider what rules can efficiently manage and improve our country's financial conditions, and there is a need to further discussion about the role of independent financial institutions along with legislating fiscal rules.

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