# BUDGET INSTITUTIONS AND MACRO-FISCAL FORECAST ERRORS IN SUB-SAHARAN AFRICA: INDICATOR-LEVEL ANALYSIS

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## ABSTRACT

*The annual fiscal budget of any economy gives projections about key economic indicators. Forecasts of these key variables are often at variance with actual realisations at the end of the fiscal year, thereby inducing animal spirits in Sub-Saharan Africa. Past studies focused on the roles of budget institutions and considered only two indicators of budget institutions-centralization and rules and control, thereby ignoring other indicators-transparency, comprehensiveness, and credibility and sustainability indices. This study therefore investigated the roles of budget institutions on macro-fiscal forecast errors, using all existing indicators of budget institutions in SSA. This study was based on rational expectations theory. Empirical models were formulated for growth, inflation, and fiscal balance forecast errors. A panel of data that spanned 2006 to 2021 for 43 countries was gathered. Forecast values were estimated from country's annual budget speeches, World Development Indicators and Fiscal Space Database. Indices of various indicators of budget institutions were constructed using information from the Collaborative African Budget Reforms Initiative (CABRI), Open Budget Index of the International Business Partnership (IBP) and Public Expenditure and Financial Analysis (PEFA). The models were estimated using GMM System) estimation technique. Estimated results show that only budget procedural rules and credibility and sustainability indices have significant and negative effect on fiscal balance forecast error. No evidence was found that growth and inflation forecast errors were influenced by budget institutions. The implication of this finding is that fiscal budgets based on established procedures and with some level of credibility and sustainability matter for reducing fiscal balance forecast error.*

**Keywords:** *Budget Forecasts, National Budget, Institutions*
**JEL: H68; H61; E02**

## Introduction

The annual fiscal budget of each economy includes forecasts for key fiscal and economic indicators, particularly the inflation rate, unemployment rate, fiscal deficit, and GDP growth rate, among others. Fiscal forecasting originated from the government's obligation to manage limited resources responsibly in democratic systems (Leal et al., 2008). Many countries in Sub-

Saharan Africa (SSA) have shown discrepancies between their forecasts and actual outcomes over several years. For instance, Botswana projected a real GDP growth rate of 13% in 2009 but ultimately experienced a contraction of 7.7%. Similarly, Nigeria anticipated a growth rate of 2.9% for 2020 but instead recorded a decline of 1.7% and fell into recession. In that same year, Seychelles had forecasted a real GDP growth of 3.5%, but the reality was a negative growth rate of 7.7%.

An important indicator of fiscal discipline is fiscal deficit-GDP ratio (Gollwitzer, 2011). Most economies consider a benchmarked fiscal deficit-GDP ratio as one of the key target variables in national budget forecasts. Reliable statistics reveal a wide disparity in some SSA economies between budget forecasts and actual outcomes of this indicator. For instance, Zambia in 2018, recorded fiscal deficit of 8.4% as opposed to initial forecast of 6.1%, Ghana had 7.25% deficit compared with budget forecast of 4.5%, Nigeria had deficit of 4.52% against 1.77% in its forecast. Also, actual inflation rates at the end of fiscal year usually overshoot the forecasts for many Sub-Sahara countries. For example, in 2018 fiscal year, South Africa forecasted inflation rate of 1.5% but actual inflation rate recorded at the end of the fiscal year was 4.5%. Sierra Leone, in 2018 projected inflation rate of 14% but recorded 16%, and Malawi who had forecasted a single digit inflation rate realised 12.4% at the end of the fiscal year.

Economies with strong budget institutions tend to show a relatively small difference between macro-fiscal forecasts and actual outcomes, resulting in low macro-fiscal forecast errors. For instance, the United States projected a real GDP growth of 3.1% in its 2018 budget document, and the actual growth recorded was 3%. Similarly, the United Kingdom had both its forecast and actual real GDP growth rate equal at 1.3% for the 2018 fiscal year. The United States and the United Kingdom are recognized as leading countries in terms of the strength and quality of their budget institutions, reflected in their scores on the fiscal transparency index; in the 2021 Open Budget Index, the US scored 0.68, while the UK scored 0.74.

Most studies on budget institutions focus on the impact of budget institutions on fiscal performance (see for example, Alesina et al., 1999; Gollwitzer, 2011; Dabla Norris, 2010). These studies have convincingly established the fact that budget institutions matter for fiscal performance. Again, few studies that assessed the nexus between budget institutions and macro-fiscal forecast errors focus on European countries and considered only two of the indicators of budget institutions. For instance, we found that Gilbert & de Jong (2017); Frankel & Schreger (2013); Debrun & Kinda (2017); Picchio & Santolini (2020); Frankel (2011); Giuriato et al. (2016) and others demonstrated that strong fiscal rules yield lower macro-fiscal forecast errors. In addition, a few studies identified roles for both fiscal rules and forms of fiscal governance (centralisation) as influencing macro-fiscal forecast errors and they include: von Hagen (2010); Palloviita & Ikonem (2016); Pina & Venes (2011); Strauch et al. (2004). All these studies were conducted in European countries, and we are not aware of any studies conducted so far on the impact of budget institutions and macro-fiscal forecast errors in SSA; hence, there is a need for this study.

Meanwhile, reliable budget forecasts are necessary to guide various economic agents in their decision-making and boost consumer and business confidence. However, large macro-fiscal forecast errors are undesirable for the economy because they tend to undermine budget effectiveness (Siregar & Susanti, 2019). The consequence is loss of consumer and business confidence.

Therefore, the objective of this study is to examine the role of each category indicator of budget institutions on macro-fiscal forecast errors in SSA.

## Literature Review

### *Theoretical Framework*

Theories of common pool, agency problem, and rational expectations were combined to form the theoretical reviews explored in this study. While theories of common pool phenomenon and agency problem form the basis for the explanation of the nexus between budgetary institutions, and macro-fiscal forecast errors, rational expectations theory helps in the formulation of models adopted for the estimation of macro-fiscal forecast errors.

The central belief surrounding the theory of common pool is that common pool resources are susceptible to overuse, abuse, and waste and hence institutional constraints are required to curtail the problems inherent in the tragedy of the commons. The theory is credited to Hardin (1968) who demonstrated a tendency for herdsmen to overgraze on land owned by many. He showed that as each herdsman increases his herd by one additional animal, he alone gains extra utility but imposes disutility on the land, via overgrazing. In the budgeting perspective, a common pool problem results when competition for limited public resources by various budget actors-minister of finance, line ministers, heads of agencies, and lawmakers, creates decision externalities that tend to impact negatively budgetary outcomes, thereby creating distortions in macro-fiscal outcomes. Research has shown that the common pool phenomenon can induce excessive government spending and fiscal biases in debt and deficit (Gollwitzer, 2011). Also, by creating unhealthy competition for limited national resources, the common pool problem has a huge potential to produce inefficient budget content and poor budgetary outcomes.

Consequently, weak budgetary institutions promote scenarios of common pool problems, thereby generating unhealthy competition, waste of public resources, and situations of misplaced priorities. An economy with weak budgetary institutions produces forecasts that will not be guaranteed due to the negative impacts of the activities of budget actors resulting from their unhealthy practices on public resources. Consequently, macro-fiscal forecasts become unreliable, as ex-post realizations of forecast variables fall short of projections. The result is high macro-fiscal forecast errors.

Agency theory, also known as principal–agent theory has multiple ancestries. While it is a known fact that the theory was anticipated by various authors, it began in earnest with major contributions from the works of Jensen & Meckling (1976), Mirrlees (1976), Ross (1973), and Stiglitz (1975). It was well-reviewed by Prendergast (1999) In the context of budgetary and political institutions, this agency problem involves an important relationship: The relationship between citizens who are principals and politicians in government who are agents. Voters are interested in maximizing their welfare through obtaining maximum utility from government fiscal policies. Specifically, citizens desire high GDP growth, low inflation rate, low public deficit, low unemployment rate, and so on. An agency problem arises when there is a tendency for those in government or its agents (budget actors) to allocate public resources to fulfill their selfish interests at the expense of the interests of voters (citizens) that the government should naturally represent.

The agency problem manifests through illegal, inappropriate, and irrational appropriations, leading to the conversion of public resources into personal gains. This misappropriation occurs through access to manipulations during budgeting, estimating, and allocating projects. The conflict of interests between the individual interests of the government (or its budget actors) and those of the aggregate economy suggests that weak budgetary and

political institutions may result in poor macro-fiscal performance and hence high macro-fiscal forecast errors.

Strong budgetary institutions play a vital role in addressing agency problems. One key way they do this is by allowing proposed budgets to be subjected to public debate. During this process, members of the public from various backgrounds can provide input, making them 'real principals' in the budget process. This inclusion gives more weight to their contributions during budget consideration and passage. Additionally, strong budgetary institutions ensure that budget contents and documents are comprehensive and credible. A well-structured budget institution provides detailed budget documents that include specific information on different economic sectors and sub-sectors, along with timelines and metrics for measuring impacts. This level of transparency helps prevent issues such as hidden budgets and budget padding, ultimately leading to improved budget performance.

Consequently, if budget actors deliver budget documents that are transparent, credible, comprehensive, centralized, and rules-bound, budget outcomes should be reflective of the forecasts in the budget documents, thereby generating little or no macro-fiscal forecast errors. This is because budgets with these features minimize tendencies for abuse, waste, manipulations, budget padding, and other corrupt practices. Analogously, agency problems lead to poorer fiscal outcomes as actual macro-fiscal outcomes fall short of projections in the presence of weak budgetary and political institutions. This results in higher macro-fiscal forecast errors.

These theories-common pool and agency, however, have a major limitation-absence of models that are important for estimating the impacts of budgetary and political institutions on macro-fiscal forecast error. This is where rational expectation theory stands out for this study. Pioneered by Muth (1961), popularised and developed by Lucas, Phelps, and Sargent in the 1970s, rational expectations theory was designed to analyze expectations inherent in economic models. The proponents of this theory opine that a complete and comprehensive analysis of economic phenomenon employs, not only past information as contained in backward-looking models most notably distributed lag models and adaptive expectations models, but also all other available information sets in its forecasting.

The central idea of rational expectations theory hinges that economic agents need to be forward-looking and use all available information, including past facts and information, to arrive at optimally rational forecasts and decisions. Forecasts based on rational expectations, by making use of all available information, are rational and have the highest tendency to be error-free or at worst generate lower forecast error when compared with adaptive expectation.

***Empirical Review***

A number of studies have analysed the impact of some category indicators of budget institutions on forecast errors of some macro-fiscal variables. Specifically, Chakraborty et al. (2020); Chakraborty & Sinha (2018); Gilbert & de Jong (2017); Frankel & Schreger (2013); Debrun & Kinda (2017); Picchio & Santolini (2020); Frankel (2011); Luechinger & Schaltegger (2013); Giuriato et al. (2016) and others demonstrated that strong fiscal rules yield lower macro-fiscal forecast errors. However, a few studies identified roles for both fiscal rules and forms of fiscal governance (centralisation) as influencing macro-fiscal forecast errors and they include: von Hagen (2010); Palloviita & Ikonem (2016); Pina & Venes (2011); Strauch et al. (2004). Also, fiscal credibility was found by ElBerry & Geominne (2020) and Calitz et al. (2013), technical process of budgeting by Siregar & Susanti (2019), and medium-term budgetary

framework by Beetsma et al. (2009) and Beetsma et al. (2012) as inducing lower macro-fiscal forecast errors.

Chakraborty et al. (2020) analyze the fiscal forecasting errors for 28 states in India for the period 2011 to 2016. The study employed Theil's U technique and found that the forecast errors in revenue receipts were greater than those in revenue expenditure. The study also found that in majority of the states considered, sources of error are systemic rather than random in the case of a few macro-fiscal variables. This finding differs a little from Chakraborty & Sinha (2018) which evidenced the fact that although the degree of errors in forecasting receipts was relatively higher than that of expenditure forecast, the bias in forecast errors reduced ex-post in response to fiscal rules

Luechinger & Schaltegger (2013) analyzed the role of fiscal rules on the probability of having budget deficit in Swiss cantons in Switzerland. Data for the analysis spanned the period of 1984-2005 and the estimation technique adopted was OLS and instrumental variable regressions. Findings from the study showed that fiscal rules had significant negative effect on the probability of a projected budget deficit, suggesting that strong fiscal rules reduced budget forecast error. It was also found that strong fiscal rules helped reduce over-pessimism in budget deficit projections.

Beetsma et al. (2023) studied fiscal errors in one year ahead of budgetary projections of EU member states. Data for the study emanated from Stability and Convergence Programme of 27 EU countries over the period 1998–2020. The study used OLS and IV estimation techniques and found that optimism in GDP projections resulted in optimism in projections of budget balance and that well-designed and independent fiscal institutions generated lower budget optimism and hence lower forecast error. Key lessons from the study were that institutional settings that are conducive to more accurate GDP growth forecasts would lead to more accurate fiscal projections.

A study by Elberry & Geominne (2020) analyzed the impact of fiscal transparency on budget credibility and how budget credibility affects budget forecast errors in selected developing countries. The period covered in the analysis varied as the Open Budget Index of 2012 was used source of data for fiscal transparency began in 2008 while PEFA criteria questions for budget credibility were taken from the 2014 assessment. Using the OLS estimations, the cross-sectional analysis revealed that the aggregate fiscal transparency index has a positive impact on budget credibility. In the disaggregated analysis, fiscal disclosure on fiscal risks exerted the most significant impact on budget credibility. The author observed from the data that budgets of the developing countries generally lack credibility as the deviation between actual and forecasted aggregate primary expenditure in developing countries hovering above 10%. The major limitation of this study was neglect of the time dimensional impact of budget credibility on budget forecast error.

Another study by Rullán & Villalonga (2018) examined the impact of institutional and political factors on expenditure forecast errors and revenue forecast errors in 17 regional governments of Spain over the period 1995-2013. The authors explained that budget institutions were ignored because they induced institutional disloyalty rather than ensuring fiscal coordination in budgetary outcome. Using the three-stage estimation technique of the system of simultaneous equations, the study obtained evidence that expenditure and revenue forecast errors had a significant positive effect on each other. Further analysis also revealed that over-estimation of economic growth results in lower expenditure forecast error

and higher revenue forecast error. No role was however found with political and institutional factors on these forecast errors.

Ratu et al. (2021) attempted investigate the effect of institutional, political and economic factors on budget forecast error in 197 local governments of Indonesia in 2015. Using both simple and multiple linear regression estimation, the study showed that political competition, population, government complexity and fiscal space had positive influence on the budget forecast errors. In addition, the result also indicated that budget forecast error had negative consequence on economic growth.

The need to investigate the impact of the specific fiscal rule of a 3% budget deficit to GDP threshold on the accuracy of fiscal forecasts in the European Union (EC) countries motivated the study by Gilbert & de Jong (2017). This fiscal rule was contained in what is called the Stability and Growth Pact (SGP) adopted by European Monetary Union (EMU) member countries of the EU as a means of avoiding falling into the Excessive Deficit Procedure (EDP) trap. The study controlled for crisis-induced budgetary challenges and made use of national forecasts against actual realization data of budget balance for the EU countries between the periods of 2001-2012. The study found some interesting results in the EMU countries, Fiscal forecasts yield fewer forecast errors when the 3% threshold is binding (and exhibits positive bias when the EMU countries are expected to exceed the threshold) but this finding could not be established for non-EMU countries where the threshold is not binding. The study also found that the presence of independent fiscal councils in the EMU helped to reduce bias in the forecasts. The study, however, noted that the results should be treated with caution because of the tendency of endogeneity in that countries with fiscal discipline are likely to have independent fiscal authority. In a similar study by Frankel & Schreger (2013), fiscal caps provided by SGP in the Eurozone were the basis of the fiscal rules used in the study. Data for the study consists of the period 1999 to 2011 and contains 17 European Countries and 7 non-European countries for comparison. Evidence of optimistic bias in government forecasts (budget balance, real GDP growth rate, inflation rate, revenue, and expenditure), especially in periods of economic expansion, was established. The study also found that the bias is smaller in countries with certain fiscal rules and independent fiscal institutions producing the forecasts.

Debrun & Kinda (2017) analyzed the role of independent fiscal councils in fiscal discipline measured in terms of primary balance and reliability of budgetary forecasts. Data for the study consists of a sample of 26 advanced and emerging European countries. The study concentrated on key characteristics of an effective fiscal council identified as independence from politics, monitoring of compliance with fiscal rules, allowing public assessment of budgetary forecasts, and presence of public debate. Using simple, pooled, and least square dummy variable (LSDV) dynamic panel regression analyses on datasets from 1998-2010, the study found that well-designed fiscal councils helped achieve stronger fiscal performance. In terms of the resultant quality of budgetary forecasts, the study found that independent fiscal institutions yield unbiased forecasts for primary balance, small biases in both real GDP growth (though somewhat over-optimistic), and budget balance forecasts. The results suggest that independent fiscal institutions generate strong fiscal rules which in turn induce less biased, more accurate forecasts, and hence lower fiscal forecast errors. This study also raised caution because of unobserved factors that could influence forecast errors beyond the scope of fiscal councils.

In a related study conducted at the local government level, Picchio & Santorini (2020) assessed the impact of strong fiscal rules on budget forecast errors for Italian municipalities.

The data source for the study was obtained from the local public finance database compiled by the Italian Department of Territorial and Internal Affairs. The database specifically contains the figures as reported in both the official budget forecasts, which municipalities must approve at the start of each fiscal year, and the official final balance sheets, which same municipalities must attest to at the end of the year. Empirical analysis carried out by the study covered 6767 municipalities after satisfying set qualifying criteria, and the period of analysis spanned 1999-2004. Using Ordinary least square and time-fixed effect regression analyses, the study found that municipalities with relaxing fiscal rules experienced more inaccurate revenue and expenditure forecasts, and hence more forecast errors. The study found evidence that tightening fiscal rule based on domestic stability pact sub-central fiscal rule designed to moderate the fiscal liberty of municipalities will help improve budget forecast accuracy.

Von Hagen (2010) undertook an analysis of the roles of budget institutions on deviations of fiscal planning targets from actual realizations, with a focus on the growth rate of real GDP, government budget balances, government revenues, and government expenditure. The study involved 15 European Union Member Countries and the data covered the period of 1998 to 2004. Indicators of budget institutions adopted were fiscal rules and forms of fiscal governance. Evidence of institutional budget factors explaining large variations between budget forecasts and actual realizations was obtained. In terms of fiscal governance, GDP growth, and revenue projections under delegation (Minister of Finance as Central Budgeting Authority) were biased upwards (i.e. forecasts were lower than actual realizations). The study, using panel regression analysis, found evidence that budget institutions explain the fiscal forecast errors, with strong evidence for fiscal rules and delegation forms of fiscal governance conducive to lower fiscal forecast errors. Similar to this finding is a study by Palloviita & Ikonem (2016) which conducted a study aimed at exploring budget planning in the Euro Countries and examining the presence and extent of bias in real-time forecasts of overall budget balance, real GDP growth, and output gap. The data for the study covered the period between 2004 and 2014 and were taken from annual real-time data of the IMF World Economic Outlook for 11 Euro-Area countries. The datasets consist of current year values and corresponding real-time forecasts, from which forecast errors were obtained. The study observed that actual realizations of budget balance, real GDP growth, output gap, and potential output differed from forecasts. Using panel estimations, findings from the study gathered that fiscal forecast errors and real-time uncertainty are minimized through improved fiscal governance and rules-bound tight budgetary monitoring.

Another study by Frankel (2011) aimed at assessing the forecasts of real growth rate and budget balances by official government agencies in 33 selected countries, consisting of 26 European Countries, three advanced commodity-exporting countries- Australia, Canada, New Zealand, three middle-sized emerging market economy- Chile, Mexico, South Africa, and the United States. Using panel data estimation techniques, findings from the study revealed that forecasts are positively biased, more biased recorded at a 3-year horizon than at a shorter period and that budget rules explained much of forecast biases. He concluded that upward biases in official budget forecasts in advanced and developing countries are due to over-optimistic bias in economic assumptions. In another related study, Pina & Venes (2011) attempted to analyze budget balance forecasts prepared by 15 EU Countries in their Excessive Deficit Procedure (EDP) reporting. The data consists of country forecast submissions from the national draft budget to the EDP which used to be made biannually and the study focused on the 1994-2007 period. The study adopted pooled OLS with clustered robust standard errors and gathered that unexpected GDP growth, the institutional framework of fiscal policy,

and opportunistic political motivations drive budget balance forecast error. Specifically, the study obtained strong fiscal rules and a hierarchical form of fiscal governance associated with prudent forecasts and lower forecast errors. This study differs from other studies in that it obtained evidence that upcoming elections induced over-optimism in deficit forecasts.

Strauch et al. (2004) conducted a study to evaluate the performance of budget balance and growth forecasts in the European Stability and Convergence Programme (SCPs). The SCPs program was established in Europe, and member countries present fiscal forecasts to ensure fiscal discipline. The forecast data for the study were budget balance and growth forecasts submitted by the European Union Member States between 1991 and 2002 to the Stability and Convergence Programmes. Using standard OLS estimation techniques, the study found that the economic situation of the economy and the form of fiscal governance are important drivers of biases in budget balance and growth forecasts. The study gathered evidence that lower bias was associated with more centralized budget institutions. The study also obtained evidence of pro-cyclical fiscal behavior but a weak indication of electoral impacts. The weak impact of the election on macro-fiscal forecast errors obtained by this study is in sharp contrast with the study by Pina & Venes (2011) which gathered evidence that upcoming elections significantly influence forecast errors.

A study by Calitz et al. (2013) aimed to compare fiscal forecasts by the South African (SA) Treasury with those of non-governmental projections, all against realizations on budget revenue, expenditure, budget balance, and GDP growth. However, this study went further to analyze the impact of fiscal credibility on forecast errors. The data for the study consisted of the fiscal periods from 2000/2001 to 2010/2011, and the study adopted simple linear regressions. Findings from the study show that forecasts by the SA treasury outperformed those of New Zealand and other 14 selected EU Countries and that margins of forecast errors for budget revenue, budget expenditure, budget balance, and GDP growth were high and coincidental with periods of poor fiscal credibility (Proxied by Open Budget Index). Evidence was also obtained that revenue forecast errors to a lesser extent and GDP forecast errors to a large extent accounted for forecast errors in the budget balance in SA. Another analysis conducted at the local government level by Siregar & Susanti (2019) also lent credence to the role of the budgeting process. The study was aimed at obtaining determinants of budget forecast errors in 444 local governments in Indonesia. The period covered by the study spanned between 2006 and 2013, and the study adopted a partial least square to test the hypothesis about structural relationships between factors inducing budget forecast errors. The study found that the technical process of budgeting causes the bulk of budget fiscal errors. In specific terms, findings revealed that the timing of budget approval has no bearing on budget forecast error and that revenue and expenditure growth influences budget forecast errors greatly.

Beetsma et al. (2013) analyzed different errors arising from different stages of budgeting processes, in an attempt to explain the causes of fiscal forecast errors in budget balance. The main motives were concentrated on identifying the roles of fiscal institutions with a specific interest in fiscal rules index and medium-term budgetary framework. Political distortion proxied by election was also included while real GDP forecast error represented the role of economic shocks in driving fiscal forecast error. The data for the study included budgetary and macroeconomic planning framework/planning and nowcasts data taken from the EU Stability and Convergence Programmes (SCPs) on 14 European Countries for the years 1998-2008. The study obtained evidence of bias in budget balance implementation error, in the direction of optimism (under-prediction of budget balance figure). It also found that improved quality of budget institutions reduced over-optimism in forecasts and helped reduce forecast errors

while election raised the errors as over-optimism in forecasts by the government was aimed at signaling her competence and seriousness in handling the economy. Earlier, Beetsma et al. (2009) analyzed the relationship between fiscal plans and outcomes in the European Union with much emphasis on the modelling of the planning stage of budgeting. The data covered the period 1999 to 2008. The study observed that implementation errors rise with budget horizon and that much of the variability in fiscal outcomes is accounted for by implementation errors. The dominant finding of this study is that it established that planned budgetary adjustment and adherence to associated fiscal plans are positively related to the strength of national fiscal institutions in terms of a strong medium-term budgetary framework and tight numerical fiscal rules. The study recommended enforcement of fiscal rules as key to minimizing implementation errors.

In a related study by Giuriato et al. (2016), the focus was on identifying institutional and constitutional settings/factors that could help reduce manipulations of fiscal forecasts. This study investigated this motive by assessing the quality of fiscal forecasts at distinct stages of the budget process in 13 European Union countries. The data for the study consist of annual forecast vintages (1999–2013) obtained from Stability and Convergence Programmes. The study found that budget balance forecasts in 13 EU countries were too optimistic while opportunistic motivations such as upcoming elections, change of government, and government resignation significantly induce more forecast bias in deficit. The study, however, noted that this over-optimism is greatly reduced under a presidential system and also under a strong parliamentary system where there are profoundly strong checks and balances and bicameralism in practice between the executive and legislative arms of government. Similarly, the study found that strong fiscal rules and contract-type budget procedures are conducive to reducing forecast errors and that unlimited legislative powers in budget amendment can worsen fiscal forecast bias.

It can be concluded from these literatures that the roles of other indicators of budget institutions-budget procedural rules, comprehensiveness, and credibility & sustainability have not been subjected to empirical tests in the analysis of macro-fiscal forecast errors. This is in addition to the fact that previous studies not only neglected SSA but also mostly focused on cross-sectional analysis, thereby ignoring time-dimensional impact of various indicators of budget institutions, hence the need for this study.

**Data and Research Methods**

*Research Methods*

This study adopts rational expectations theory as its theoretical framework in the formulation of models adopted for the estimation of macro-fiscal forecast errors. Mostly popularised by Lucas, the theory was designed to analyse expectations inherent in economic models.

Model:

$$e_t = e_{t-1} + u_t \tag{1}$$

Forecasts are not always perfect and there is a need for exploring potential candidate variables. Macro-fiscal forecasts are products of budget documents prepared under certain institutional framework-budget institutions (BI). The main explanatory variable is now introduced into equation (1) to form:

$$e_t = e_{t-1} + u_t + BI_t \tag{2}$$

Denoting the vector of other control variables by C and the normal error term by u, the model transforms to:

$$e_t = e_{t-1}u_t + BI_t + C_t + u_t \tag{3}$$

Equation (3) forms the main theoretical framework for the main models of the study

$$GFE_{it} = a_o + a_1 GFE_{it-1} + a_2 BI_{it} + a_3 CAPB_{it} + a_4 UEMPT_{it} + a_5 POPGROWTH_{it} + u_t + v_i + e_{it} \tag{4}$$

$$FBFE_{it} = b_o + b_1 FBFE_{it-1} + b_2 BI_{it} + b_3 GFE_{it} + b_4 UEMPT_{it} + b_5 POPGROWTH_{it} + \eta_t + \tau_i + w_{it} \tag{5}$$

$$IFE_{it} = c_o + c_1 IFE_{it-1} + c_2 BI_{it} + c_3 GFE_{it} + c_4 UEMPT_{it} + c_5 POPGROWTH_{it} + s_t + t_i + z_{it} \tag{6}$$

Where

| | |
|---|---|
| $GFE$ | = Growth forecast error |
| $FBFE$ | = Fiscal balance forecast error |
| $IFE$ | = Inflation forecast error |
| $BI$ | = Budget institutional indicator |
| $CAPB$ | = Cyclically adjusted primary balance |
| $UEMPT$ | = Unemployment |
| $POPGROWTH$ | = Population growth. |

Empirical works have made justifications for the inclusion of relevant variables such as economic, politics, and institutional factors, in the models for macro-fiscal forecast errors. The inclusion of one-year lagged value of the dependent variable as one of the explanatory variables in model specifications (4)-(6) is to reflect the presence of autocorrelation (and persistency) of forecast error in the models (See for example, Kauder et al., 2017). Another justification for the inclusion of the lagged value of the dependent variable as one of the explanatory variables flows directly from the baseline model for the analysis. First-order autocorrelation is a realistic assumption to incorporate in the model given the nature of forecasting that dwells on using all available information, including past information and experience.

Relevant controls in the macro-fiscal forecast error models include unemployment, population growth, cyclically adjusted primary balance, and GDP growth forecast errors. The inclusion of unemployment rate and population growth in models (4-6) is to account for incentives to change forecasts in both good and bad economic situations. This follows directly from suggestion given by IMF economists (Leal et al., 2007; Kauder et al., 2017). Cyclically adjusted primary balance (fiscal consolidation) was included in model (4) to account for changes in fiscal policy due to changes in business cycle (Blanchard & Leigh, 2013). The inclusion of growth forecast error in models (4) and (5) is to account for the impact of unexpected changes in the economy as suggested by von Hagen (2010). Time-fixed effect is included to account for cyclical movements and economic shocks. Also, country-fixed effect is included due to time-changing indicators of budget institutions and also helps account for cross-sectional heterogeneity among the countries.

It is expected that the stronger the budget institutions, the lower the macro-fiscal forecast error, hence negative relationship should be expected of various indicators of budget institutions.

### Data Sources and Measurements

Different sources will be explored for different indicators in the construction of budget institution index. In the construction of centralisation sub-index, the study uses information from the Budget Practices and Procedures in Africa, supervised by the Collaborative Africa Budget Reform Initiative (CABRI) and African Development Bank, while transparency sub-index is constructed from the Open Budget Index of the International Business Partnership. Fiscal rules sub-index comes from the IMF Fiscal Rules Database, which gathers information on the presence and enforcement of government revenue, expenditure, deficit, and debt rules. Finally, information on the construction of sub-indices for other indicators of budget institution- budget procedural rules, comprehensiveness and sustainability, and credibility are sourced and constructed from Public Expenditure and Financial Analysis (PEFA). Criteria questions and scoring schemes for various indicators of budget institutions can be found in Appendix I.

Annual realisations of real GDP growth, unemployment, population growth and inflation rates are sourced from World Development Indicator (WDI) while fiscal balance and cyclically adjusted primary balance are taken from Fiscal Space Database of the World Bank. To arrive at macro-fiscal forecast errors of these variables, which are the dependent variable in the models to be estimated, the forecast values are deducted from their annual realisations. Forecast real GDP growth, inflation rate and fiscal balance are taken from individual countries' annual budget statements and/or speeches as published on CABRI's website and individual countries' websites. Forecast sources for macro-fiscal variables are contained in Appendix II

### Finding and Discussion

### Descriptive Analysis

### Table 1: Presentation of Basic Statistics of Key Variables-Budget Institutions and Macro-Fiscal Forecast Errors

| Variable | Observation | Mean | Std. Dev | Minimum | Maximum |
|---|---|---|---|---|---|
| Centralization | 322 | 0.5402 | 0.2002 | 0.13 | 0.93 |
| Transparency | 306 | 0.3091 | 0.2141 | 0 | 0.92 |
| Fiscal Rules | 400 | 0.2725 | 0.1237 | 0 | 0.5 |
| Budget Procedural Rules | 508 | 0.5702 | 0.1317 | 0.32 | 0.96 |
| Comprehensiveness | 508 | 0.5786 | 0.1396 | 0.33 | 1 |
| Credibility and Sustainability | 508 | 0.5837 | 0.1209 | 0.33 | 0.91 |
| Aggregate Budget Institution | 631 | 0.4640 | 0.1469 | 0 | 0.85 |
| Growth Forecast Error | 215 | -1.2947 | 4.6702 | -34.8182 | 11.9753 |
| Inflation Forecast Error | 151 | 1.6383 | 4.8511 | -7.2461 | 34.3567 |

Table 1 provides basic statistics of key variables considered in this study. It is important to state that each category of budget institutions has its value on the scale of 0-1. Of all

the six categories of budget institutions considered in the study, two exhibit weak average values, transparency (0.3091) and fiscal rules (0.2725). While other categories score relatively a little above average values, centralisation (0.5402), budget procedural rules (0.5702), comprehensiveness (0.5786) and credibility and sustainability (0.5837). At the aggregate level, Sub-Sahara Africa countries have weak budget institutions; its average is 0.4640. On measures of political institutions, democracy has average value at 4.6126, on a scale of 0 to 10, and that reveals that SSA countries are behind on democratic tenets, although the region appears better in terms of constraint on executive rating with an average score of 4.4584 on a scale of 1-7. Growth forecast errors, inflation forecast errors and fiscal balance forecast errors have -1.2947, 7.5995 and 0.4603, respectively. The mean values of these macro-fiscal forecast errors suggest that while growth forecast errors and inflation forecast errors exhibit optimistic forecasts, fiscal balance forecast error is overly pessimistic for SSA.

### *Spearman Rank Correlations*

Table 2 below presents correlation results among various categories of budget institutions. It is very important to examine how they are correlated, given that each of them contributes to aggregate index of budget institutions used in the empirical analysis. Results from the table reveal that each category has positive correlations with other categories, except for transparency and centralization, which have weak and insignificant negative relationship with each other, and budget procedural rules and transparency, which also have negative and significant relationship with each other. While fiscal rules and transparency have a significant relationship with budget procedural rules only, budget procedural rules stand out as they maintain significant relationships with all other categories. It can also be observed that centralization, comprehensiveness, and credibility & sustainability have significant relationships with two or more of other categories, but not with all categories. It is also noted that aggregate budget institution index has positive significant relationship with all sub-categories of budget institutions.

### Table 2: Presentation of Spearman Rank Correlation Result

|  | Centralisation | Transparency | Fiscal rules | Budget Procedural rules | Comprehensiveness | Credibility & Sustainability |
|---|---|---|---|---|---|---|
| Centralisation | 1.0000 |  |  |  |  |  |
| Transparency | -0.0936 | 1.0000 |  |  |  |  |
| Fiscal rules | 0.1591 | 0.0307 | 1.0000 |  |  |  |
| Budget procedural rules | 0.3117*** | -0.2814*** | 0.7236*** | 1.0000 |  |  |
| Comprehensiveness | 0.4414*** | -0.0763 | -0.1567 | 0.1945* | 1.0000 |  |
| Credibility and sustainability | 0.5697*** | 0.0328 | 0.0676 | 0.3888*** | 0.5874*** | 1.0000 |
| Aggregate budget institution | 0.5825*** | 0.2346** | 0.5398*** | 0.6434*** | 0.6111*** | 0.6693*** |

Note: *10%, ** 5%, ***1% level of significance

### *Empirical Results and Discussion of Findings*

Tables 3-5 below present estimation results of the impact of various indicators of budget institutions on growth forecast error, fiscal balance forecast error and inflation forecast errors. From Table 3, it can be seen that none of the indicators of budget institutions significantly influences growth forecast error, although transparency and fiscal rules are correctly signed.

In contrast to this, estimation results from Table 4 show that although all indicators of budget institutions have negative co-efficient, only budget procedural rules index, and credibility and sustainability index have significant impact on fiscal balance forecast error. Finally, in the case of inflation forecast errors shown in Table 5, coefficients of centralisation, budget procedural rules, comprehensiveness, and credibility and sustainability are negative but insignificant.

In all the models, the significance of lagged dependent variables lends support to the dynamic nature of the baseline model adopted in this study. All these estimates are valid based on reported Hansen's over-identification test, showing that instruments used are not over-identified. It should also be pointed out that the estimation results presented in Model 3 of Table 5 are invalid because only four countries were identified for estimation. Consequently, a case of over-identification was observed.

From the estimation results presented in Tables 3-5, it can be inferred that budget institutions based on laid-down budget procedural rules, as well as credible and sustainable criteria are instrumental in reducing fiscal balance forecast errors. Strong budget procedural rules ensures strict compliance with the contents of the fiscal budget in a manner that helps reduce tendencies for common pool and agency problems.

### Table 3: Impact of Budget Institutions on Growth Forecast Error

| Variables/Models | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| L.gfe | -0.429*** | -0.271** | -0.875*** | -0.240** | -0.244** | -0.236** |
| | (0.0889) | (0.117) | (0.205) | (0.105) | (0.110) | (0.105) |
| Capb | 0.426* | 0.413 | 0.145 | 0.831 | 0.414* | 0.425* |
| | (0.224) | (0.415) | (0.133) | (0.228) | (0.251) | (0.240) |
| uempt | 0.0536 | 0.0189 | | -0.0850 | -0.120* | -0.124** |
| | (0.0782) | (0.191) | | (0.101) | (0.0654) | (0.0548) |
| popgrowth | -0.103 | -0.142 | | -0.120 | -0.0442 | 0.0669 |
| | (0.524) | (1.547) | | (0.226) | (0.304) | (0.370) |
| Centralisation | 5.779 | | | | | |
| | (3.696) | | | | | |
| Transparency | | -0.629 | | | | |
| | | (1.801) | | | | |
| Fiscal Rules | | | -1.905 | | | |
| | | | (2.360) | | | |
| Budget Procedural Rules | | | | 0.831 | | |
| | | | | (4.018) | | |
| Comprehensiveness | | | | | 3.073 | |
| | | | | | (2.171) | |
| Credibility and Sustainability | | | | | | 4.384 |
| | | | | | | (3.050) |
| Constant | -3.653 | 0.762 | -1.223 | 1.077 | -0.143 | -1.168 |
| | (2.787) | (6.019) | (1.004) | (3.836) | (2.283) | (2.730) |

| Variables/Models | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Observations | 157 | 104 | 75 | 128 | 128 | 128 |
| Number of Countries | 13 | 12 | 6 | 12 | 12 | 12 |
| No of Instruments | 10 | 8 | 5 | 8 | 8 | 8 |
| Wald/Chi-Square | 49.56*** | 13.20** | 29.53*** | 10.22* | 15.77*** | 11.36** |
| Hansen Stat | 7.64 | 4.45 | 0.94 | 2.95 | 3.33 | 2.97 |
| (p-value) | (0.106) | (0.1080) | (0.333) | (0.2290) | (0.1900) | (0.2260) |

Note: Standard error in parenthesis *10%, ** 5%, ***1% level of significance

### Table 4: Impact of Budget Institutions on Fiscal Balance Forecast Error

| Variables/Models | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| L.fbfe | 0.333*** | -1.088*** | -0.548*** | 0.0149** | 0.383 | -0.0850* |
| | (0.0789) | (0.367) | (0.188) | (0.450) | (0.256) | (0.792) |
| gfe | 0.126 | 0.0753 | 0.460*** | 0.220 | 0.303* | 0.304** |
| | (0.203) | (0.0840) | (0.0367) | (0.167) | (0.173) | (0.130) |
| uempt | 0.0145 | 0.0932 | | 0.117* | 0.0569 | 0.123*** |
| | (0.0376) | (0.0714) | | (0.0662) | (0.0505) | (0.0394) |
| popgrowth | -0.212 | 0.291 | | -0.440* | -0.419 | -0.457 |
| | (0.397) | (0.865) | | (0.262) | (0.365) | (0.298) |
| Centralisation | -1.075 | | | | | |
| | (1.924) | | | | | |
| Transparency | | -1.352 | | | | |
| | | (1.828) | | | | |
| Fiscal Rules | | | -0.909 | | | |
| | | | (4.481) | | | |
| Budget Procedural Rules | | | | -6.622* | | |
| | | | | (3.994) | | |
| Comprehensiveness | | | | | -1.560 | |
| | | | | | (2.466) | |
| Credibility and Sustainability | | | | | | -6.502** |
| | | | | | | (2.956) |
| Constant | 1.125 | -1.247 | 1.169 | 0.841 | 1.538 | 4.141* |
| | (1.726) | (2.662) | (1.754) | (3.085) | (1.936) | (2.315) |
| | | | | | | |
| Observations | 154 | 96 | 73 | 129 | 129 | 129 |
| Number of Countries | 14 | 13 | 6 | 13 | 13 | 13 |
| No of Instruments | 8 | 8 | 5 | 9 | 10 | 9 |
| Wald/Chi-Square | 38.92*** | 38.92*** | 182.56*** | 13.05** | 85.07*** | 17.24*** |
| Hansen Stat | 2.57 | 2.57 | 2.04 | 3.20 | 2.64 | 4.13 |
| (p-value) | (0.2760) | (0.276) | (0.153) | (0.3160) | (0.619) | (0.247) |

Note: Standard error in parenthesis *10%, ** 5%, ***1% level of significance

### Table 5: Impact of Budget Institutions on Inflation Forecast Error

| Variables/Models | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| L.ife | 0.489*** | -1.205** | -0.858 | 0.487*** | 0.499*** | 0.541*** |
| | (0.135) | (0.600) | (1.178) | (0.153) | (0.172) | (0.128) |
| gfe | -0.0433 | 0.0542 | -0.341 | -0.0311 | 0.0373 | -0.0295 |
| | (0.134) | (0.0377) | (0.253) | (0.147) | (0.145) | (0.0803) |
| uempt | -0.0641** | -0.154 | -0.620 | -0.0513 | -0.0390 | -0.0609 |
| | (0.0318) | (0.210) | (0.566) | (0.0482) | (0.0635) | (0.0554) |
| popgrowth | 0.293 | 2.013* | 0.376 | 0.513 | 0.623 | 0.365 |
| | (0.193) | (1.217) | (0.775) | (0.369) | (0.425) | (0.300) |
| Centralisation | -0.131 | | | | | |
| | (1.935) | | | | | |
| Transparency | | 1.184 | | | | |
| | | (7.157) | | | | |
| Fiscal Rules | | | 11.35 | | | |
| | | | (9.016) | | | |
| Budget Procedural Rules | | | | -0.378 | | |
| | | | | (3.355) | | |
| Comprehensiveness | | | | | -0.0496 | |
| | | | | | (2.539) | |
| Credibility and Sustainability | | | | | | -0.366 |
| | | | | | | (2.587) |
| Constant | 0.995 | -1.080 | 1.689 | 0.658 | 0.197 | 0.908 |
| | (1.367) | (3.830) | (1.496) | (2.218) | (1.426) | (1.429) |
| | | | | | | |
| Observations | 109 | 74 | 34 | 102 | 102 | 102 |
| Number of Countries | 13 | 11 | 4 | 13 | 13 | 13 |
| No of Instruments | 8 | 9 | 7 | 8 | 11 | 7 |
| Wald/Chi-Square | 40.99*** | 12.10*** | 25.19*** | 46.05*** | 33.86*** | 71.65*** |
| Hansen Stat | 1.26 | 2.04 | 0.00 | 2.84 | 6.41 | 0.70 |
| (p-value) | (0.5330) | (0.564) | (1.000) | (0.241) | (0.268) | (0.401) |

Note: Standard error in parenthesis *10%, ** 5%, ***1% level of significance

## Conclusion

This study has added to the empirical literature on the nexus between budget institutions and macro-fiscal forecast errors. In terms of individual category indicators of budget institutions considered in this study, both growth forecast error and inflation forecast error are not influenced by any budget institutional indicator. However, two of the indicators- budget procedural rule, and budget credibility and sustainability negatively and significantly influence fiscal balance forecast error.

The implication is that a rule-based, credible and sustainable budgeting procedure helps ensure that fiscal balance forecasts tend towards being reliable, efficient and unbiased. This is based on the fact that strong budget procedural rules ensure that fiscal budgets conform with laid down procedural rules that help to ensure that budget actors do not act in a manner that jeopardizes the overall objective of fiscal discipline. This finding conforms to several studies such as von Hagen (2010); Palloviita & Ikonem (2016); Chakraborty & Sinha (2018); Pina & Venes (2011); Strauch et al. (2004); Gilbert & de Jong (2017); Frankel & Schreger (2013); Debrun & Kinda (2017); Picchio & Santorini (2020); Frankel (2011); Giuriato et al. (2016); Luechinger & Schaltegger (2013). This study, by splitting rules and control in Gollwitzer (2011) and Dabla-Norris et al. (2010) into fiscal rules and budget procedural rules, has shown that the more important component of rules and control is the budget procedural rules.

In addition, this study has added to empirical literature with empirical evidence on another category indicator of budget institutions-budget credibility and sustainability that matters for reducing fiscal balance forecast errors. This study therefore holds that budget procedural rules, and budget credibility and sustainability are important drivers of macro-fiscal performance due to their contributions to reducing fiscal balance forecast errors.

## Declaration

### Conflict of Interest

The authors declare that there is no significant competing financial, professional, or personal interests that might have affected the performance.

### Availability of Data and Materials

Data and material research can be provided upon request.

### Authors' Contribution

Alade conceptualized the study, designed the methodology, wrote and reviewed the work. Kilishi did the editing while Alade wrote the original draft.

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