The role of economic and political factors in budget forecasting errors: evidence from Turkey's metropolitan municipalities for the period 2011-2022

BERAT KARA, Ph.D.*

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Berat KARA
Istanbul Medeniyet University, Faculty of Political Sciences, Department of Public Finance, Ünalan Neighborhood, D-100 Highway, North Campus, P.O. Box 34700, Üsküdar/Istanbul, Turkey
e-mail: berat.kara@medeniyet.edu.tr
ORCiD: 0000-0002-6948-2197

PUBLIC SECTOR ECONOMICS
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Abstract

This study examines budget forecasting errors in 15 major metropolitan municipalities in Turkey for the period 2011-2022 using a random effects panel regression model. The dependent variables include budget surplus, inflation, population growth, unemployment, GDP per capita, export-to-import ratio, mayor's political party, mayor's re-candidacy status, and election periods. Findings show that in the revenue model, budget surplus and unemployment reduce errors, while inflation, population growth, and election years increase them. In the expenditure model, unemployment reduces errors, whereas inflation and election periods increase them. This research is the first of its kind in Turkey, aiming to fill a gap in the literature by identifying factors contributing to budget errors. It highlights the importance of local influences on budget accuracy and seeks to guide budget preparers in improving their forecasts, ultimately enhancing fiscal management and public service delivery.

Keywords: budget forecasting, Turkey, revenue, expenditure, panel regression, municipality

1 INTRODUCTION

The financial structures and budgets of local governments are fundamental components of public administration. Municipalities provide a significant portion of services that directly affect the daily lives of local residents, and the effective delivery of these services heavily relies on the proper and efficient management of financial resources. The budget serves as a crucial tool for planning and managing a municipality's financial resources. However, errors in budget forecasts can lead to significant problems in financial management. The magnitude and frequency of these errors can severely impact the fiscal discipline and service delivery capacity of local governments.

Understanding and addressing budget forecasting errors is essential for several reasons. These errors can result in resource misallocation, inefficiencies, and an inability to meet community needs effectively. The central question this study seeks to answer is: *What are the underlying economic and political factors contributing to budget forecasting errors in Turkey's metropolitan municipalities, and how can these factors be mitigated?* This question is crucial, because identifying and understanding these factors can help local governments improve their financial management practices and service delivery.

In recent years, there has been an increasing body of literature dedicated to analysing budget forecasting errors. These studies aim to understand the underlying causes of such errors and to develop methods to enhance forecasting accuracy. This trend reflects a growing recognition of the importance of accurate budget forecasts in maintaining fiscal health and delivering public services efficiently. By contributing to this body of knowledge, this study aims to provide valuable insights that can aid local governments in improving their budget forecasting practices.

The study focuses on the budget forecasting errors of 15 selected metropolitan municipalities in Turkey, analysed through panel regression using a random effects model. The investigation centres on the following research questions: (1) What are the specific economic and political determinants of budget forecasting errors in Turkish metropolitan municipalities? (2) How do these determinants impact the accuracy of budget forecasts? By addressing these questions, the study seeks to provide empirical evidence and insights that can guide local governments in refining their budget forecasting processes.

Inspired by existing literature, the dependent variables include budget surplus, inflation, population growth, unemployment, GDP per capita, the export-to-import ratio, the mayor's political party, the mayor's re-candidacy status, and election periods. The findings indicate that in the revenue model, budget surplus and unemployment reduce forecasting errors, while inflation, population growth, and election years increase them. Conversely, in the expenditure model, unemployment reduces forecasting errors, whereas inflation and election periods increase them.

Prior to these analyses, the mean absolute percentage error (MAPE) of forecasting errors for these metropolitan municipalities was examined for the period from 2011 to 2022, alongside the frequency of positive and negative errors. This comprehensive approach provides a detailed understanding of the nature and determinants of budget forecasting errors in Turkey's major cities.

One notable observation is that local governments in Turkey tend to produce significantly more erroneous forecasts than the central government. This discrepancy highlights the unique challenges faced by local governments in budgeting, which may stem from both national and local factors. While national economic conditions undoubtedly influence local budgets, local factors such as regional economic activity, local governance practices, and specific demographic trends may also play a crucial role. This study aims to uncover the extent to which these local factors contribute to budget forecasting errors, thereby providing a more nuanced understanding of the issue.

The importance of this study lies in its potential to fill a significant gap in the literature on budget forecasting errors in Turkey. By providing empirical evidence and insights, this research aims to guide budget preparers about the sources of their errors and prompt further studies to enhance forecasting accuracy. It is the first study of its kind in Turkey, addressing the critical need for reliable budget forecasts in local governments. Through this contribution, it seeks to improve fiscal management practices and support the sustainable delivery of public services at the local level.

Moreover, the findings of this study have broader implications for public administration and fiscal policy. By identifying the factors that lead to budget forecasting errors, policymakers can develop targeted interventions to mitigate these errors. For

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

instance, if inflation and population growth are found to significantly increase forecasting errors, local governments could implement more robust economic analysis and demographic modelling techniques in their budget preparation processes. Additionally, understanding the impact of political and electoral cycles on budget accuracy can help in the design of more stable and consistent fiscal policies.

In conclusion, this study not only addresses a critical issue in the field of public administration but also paves the way for future research. By highlighting the importance of both national and local factors in budget forecasting, it opens new avenues for exploring how different variables interact and thus influence fiscal outcomes. This, in turn, can lead to the development of more sophisticated models and tools for budget forecasting, ultimately enhancing the financial stability and service delivery capabilities of local governments.

2 THEORETICAL BASIS, PRACTICAL SIGNIFICANCE AND METHODOLOGY OF BUDGET FORECASTS

Public institutions, commercial enterprises, large or small organizations, and nearly all institutions and organizations, whether technically advanced or underdeveloped, utilize forecasts in their decision-making and policy-formulation processes (Jones, Bretschneider and Gorr, 1997: 241). Local governments also express their views and plans regarding the general outlook of fiscal policy through budget forecasts. These include revenue, expenditure, and balance forecasts. Revenue and expenditure forecasts, in particular, play a key role in detailing annual budgets and setting targets (Leal et al., 2008: 349). Budget forecasting is not merely a simple prediction affecting macroeconomic variables. It is based on the identification of various goals and instruments such as monetary policy, fiscal policy, tax administration, and trade volume (Lazar and Andrei, 2006: 43). In this respect, budget forecasts are significant in many aspects.

2.1 MACROECONOMIC PERSPECTIVE

The success of budget forecasts, which form the foundation of fiscal planning, is critically important from a macroeconomic perspective in six key areas. First, it concerns the efficient use of scarce resources. High-quality forecasts are needed to allocate scarce public resources efficiently and to enable successful public-private sector planning (Krause and Corder, 2007: 130). Second, it pertains to the relationship between the accuracy of budget forecasts and fiscal policy and their importance in ensuring fiscal discipline. Careful attention during both the planning and implementation stages of the budget process is necessary to achieve and maintain fiscal discipline. This is because the path of fiscal policy is seen as synonymous with the budget. According to Davis (1980: 187), the analysis of the accuracy of budget forecasts is related not only to the impact of fiscal policy on the economy but also to the impact of the economy on the budget. Third, it concerns the sectoral impacts of the success of forecasts. The local government budget, through its forecasts, regulates economic activities both collectively and sectorally, shaping monetary and fiscal policies (Bhattacharya and Kumari, 1988: 1327).

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

Considering the increasing share of the public sector in the economy, both directly and as a regulator, and the importance of resource allocation to the private sector for a country's development, it becomes clear that budget forecasts are highly significant in this regard.

Fourth, budget forecasts also serve as indicators. Forecasts are accepted as indicators by economic actors, influencing various financial indicators, particularly interest rates. Households and financial market agents make long-term decisions based on economic forecasts, and central banks targeting inflation use these forecasts for policy decisions. Fifth and finally, the preparation of budget forecasts entails its own costs. Bureaucratic processes, departmental approvals, and mid-fiscal year revisions require significant time, money, and effort (Zakaria and Ali, 2010: 113). This highlights the economic importance of the technical aspect of the budget. Therefore, to make efficient use of valuable public resources, budget forecasts must be prepared carefully and realistically.

2.2 ISSUE OF LONG-TERM PLANNING

Budget forecasting is important not only from a macroeconomic perspective but also for long-term planning. Without realistic budget forecasts and strong fiscal discipline, it is challenging to instil discipline in other areas critical for economic growth and development, thereby making it difficult to bridge the gap between the formulation and implementation of long-term plans (Asher, 1978: 431; Zakaria and Ali, 2010: 114). Long-term planning inherently relies on forecasts, the accuracy of which is critical, particularly for the efficient financing of significant future public expenditures (Auld, 1970: 507). Multi-year expenditure forecasts estimate the cost of providing a certain level of public service (Schroeder, 2007: 65). Hence, budget items should align with medium-term plans and relate to available resources. Adequate knowledge of current resources ensures more effective management of the budget process for long-term programs and projects. Accurate evaluation of this information guides project and program selection and helps determine feasible options in the medium term (Jena, 2006: 3975). In this context, a country's forecasts for key sectors provide an informed basis for strategic planning (Fedotov, 2017: 416).

The success of forecasts is vital also for long-term planning in the private economy. The stability objective of budget policy aims to maintain internal economic balance, preserve the equilibrium between aggregate supply and demand, ensure stable price levels, and achieve high employment in the long term. Assuming the local government's economic assessment and planning are reasonably acceptable, deficiencies in private sector plans and forecasts need to be corrected through budget policy. These corrections are crucial for maintaining internal economic balance (Auld, 1970: 507).

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

2.3 POLITICAL STANDPOINT

Budget forecasting is important not only from a macroeconomic and long-term planning perspective but also from a political standpoint. Forecasting fiscal variables is considered both an economic and a political issue (Botrić and Vizek, 2012: 35). For a local government to achieve its planned objectives, realistic budget forecasts are essential (Khan, Hussain and Malik, 2018: 21). As observed in modern economies, the ability of a local government to respond effectively to any crisis depends on the information, particularly of a financial nature, available to government officials, policymakers, and public managers (Willoughby and Guo, 2008: 28). Policymakers consider the financial information presented to them when making fiscal decisions (Botrić and Vizek, 2012: 35).

Budgeting, situated at the intersection of economics and politics, aligns the local government's political goals with its financial resources and its sources and targets are the subject of continued debate (Lazar and Andrei, 2006: 41). These debates occur during the preparation, implementation, and outcome phases of the budget. Initial and final stage debates focus on the accuracy of budget forecasts and on the outcomes, highlighting forecasting errors.

The state of public resources defines the boundaries of debates during the budget preparation stage. As financial pressures intensify, the realism, reliability, and informativeness of budget forecasts become more critical in the budget process (Agostini, 1991: 13). In democratic countries, budgets are discussed and approved in parliaments. Unreliable budget forecasts can obstruct budget approval, as has happened in many countries, including Turkey, leading to numerous economic and political issues.

Discussions on budget outcomes typically arise from forecasting errors, especially when expenditures exceed predictions or budget deficits are higher than expected. These discussions are crucial for identifying the causes of forecasting errors and implementing measures to reduce errors in future forecasts.

Moreover, budget forecasts have political implications for the public, including voters and pressure groups. Forecasts are assumed to reflect the local government's fiscal stance, and examining their accuracy is considered a criterion for evaluating the success of budget policy (Asher, 1978: 423). In other words, the success of forecasts shapes public opinion regarding the effectiveness of the local government's fiscal policy (Leal et al., 2008: 381).

2.4 FORECASTING METHODOLOGY

Predictive activities are a natural part of life. In this flow, individuals may make predictions using their instincts if necessary. However, organizations and professionals cannot make predictions using such simple methods. They require sufficient information and must resort to systematic and complex materials to make accurate forecasts (Bağdigen, 2002: 30). The budget is the primary tool for

implementing policies developed at the government level. Strategic budget planning is not a static or temporary event; it involves continuity in the production and management of programs. Therefore, it is to be expected that forecasting models, which consider national accounts and the current economic situation, will be used in budget forecasting. Naturally, the complexity of these models may vary from country to country (Lazar and Andrei, 2006: 45). Generally, there are four basic forecasting methods in use, and three new alternative methods are being discussed in the current literature.

The first fundamental forecasting method is the judgmental method. Sometimes referred to as the expert method or the naive method, the judgmental method involves preparing forecasts based on the evaluation of data collected from various personnel such as managers, experts, practitioners, and researchers (Stevenson, 2012: 80). In this method, no econometric analysis is conducted; the forecast is prepared directly by individuals. As such, the judgmental method is considered the oldest and most basic method. Indeed, this method is also applied in the budgets of both national and local public institutions in Turkey.

The second fundamental forecasting method, that of time series models, simply attempts to project the past into the future by using historical data to make predictions (Stevenson, 2012: 80). The third model, that of econometric methods, generally involves producing forecasts by relating a series of independent variables to a dependent variable through regression (Williams and Calabrese, 2016: 136-138).

The first of the alternative methods discussed in the literature is the use of independent forecasting institutions. Recently, it has been proposed that in many European Union (EU) countries, the task of budget forecasting be transferred to independent institutions or that these institutions at least actively participate in the forecasting process. The second method is a relatively easy and inexpensive way to estimate economic variables more realistically by systematically and linearly combining alternative forecasts of these variables into a new forecast (Fullerton, 1989: 373). The literature suggests preparing forecasts using multiple different methods and then combining them to obtain the final forecast, a process known as the "combination of forecasts" method. The third and final method is the consensus forecasting method. Initiated in Florida, USA, in 1970, the consensus forecasting method involves multiple institutions or groups jointly being responsible for creating the forecast. At first glance, this method resembles the practices of independent forecasting institutions and combining forecasts; however, it differs in that both institutions involved are public authorities and a single forecast is produced. The institutions in question are mostly the executive and legislative branches, and the method involves these entities jointly preparing and approving the budget forecast through consensus.

The literature includes various studies on the effects of forecasting methods, comparative cases, and recommendations on which method should be applied. These

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

are not covered within the scope of this study. However, for detailed information on this topic, see: Penner (2001), Beckett-Camarata (2006), Bretschneider et al. (1989), Grizzle and Klay (1994), Feenberg et al. (1989), Botrić and Vizek (2012), McCollough and Frank (1992), Geys, Goeminne and Smolders (2008), Khan (2019), Forrester (1991).

3 THE LEGISLATIVE FRAMEWORK FOR MUNICIPAL BUDGETS IN TURKEY

The preparation of municipal budgets in Turkey is governed by the Municipal Law No. 5393 and the Public Financial Management and Control Law No. 5018. According to Article 61 of Law No. 5393, a municipal budget is a council decision that authorizes the collection of revenues and expenditures in line with the strategic plan and performance program for the financial year and the subsequent two years. The strategic plan and performance program are fundamental to the municipal budgeting process, as stipulated in Article 41 of the same law. This mandates that the strategic plan and performance program must form the basis for budget preparation and must be approved by the municipal council before the budget itself.

The budget preparation process involves principles of frugality, efficiency, and effectiveness, ensuring cost-benefit considerations are met. Like central government institutions, municipalities follow a structured process comprising the preparation, implementation, and auditing phases of the budget. The mayor, acting as the chief executive, initiates the budget preparation process by calling upon departments to prepare their expenditure budgets aligned with the strategic plan and performance program by the end of June. Departments then prepare their budget proposals, including expenditure forecasts and detailed expenditure programs, and submit them to the financial services unit by the end of July. The financial services unit consolidates the departmental expenditure proposals and prepares the revenue budget and the draft budget of the institution. This draft, including detailed expenditure and financing programs, is submitted for review and correction to the chief executive by the end of August for municipalities and by early September for special provincial administrations.

The draft budget is sent to the council, where it is reviewed along with the forecast revenues and expenditures for the following two years. The draft is then sent to the Ministry of Interior for inclusion in the central government budget. The council's planning and budget committee, the membership of which is proportional to the council's political composition, reviews the draft budget. This committee's primary function is to examine the draft budget and prepare a report. The council discusses and votes on the budget in its meetings in October for district municipalities within metropolitan cities and in November for other municipalities. The budget must be approved within a maximum of twenty days, including the committee's review period.

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

The mayor is responsible for the execution of the budget. The authority to spend can be delegated to deputies and department heads, though the mayor retains ultimate responsibility. Expenditures must comply with budgetary principles and legal provisions, and any unused appropriations at the end of the year are cancelled unless they are to be carried over to the next fiscal year due to specific conditions. If the new year's budget is not finalized, the previous year's budget continues to be in effect until the new budget is approved. In summary, the municipal budgeting process in Turkey is a comprehensive and regulated procedure that ensures alignment with strategic planning, efficient allocation of resources, and compliance with legal and financial regulations.

4 LITERATURE REVIEW AND HYPOTHESES

Many studies in the literature have demonstrated that budgets in local governments are often significantly inaccurate and biased. Examples of such studies include Gentry (1989), Larkey and Smith (1989), Mayper, Granof and Giroux (1991), Reddick (2008), Voorhees (2006), Calabrese and Williams (2019), Lago-Peñas and Lago-Peñas (2008), Benito, Guillamon and Bastida (2015), Ríos et al. (2018), Geys, Goeminne and Smolders (20089, Sedmihradská and Čabla (2013), Boukari and Veiga (2018), Lee and Kwak (2020), Kara (2024a).

Considering the insufficient number and capacity of personnel preparing budget forecasts in metropolitan municipalities in Turkey, it is believed that the forecasts will be highly inaccurate and predominantly negative. Therefore, this study calculates PE, MPE, and MAPE values to test the following two hypotheses.

Hypothesis 1: The budgets of metropolitan municipalities in Turkey are significantly inaccurately forecasted.

Hypothesis 2: The forecasting errors of metropolitan municipalities in Turkey are predominantly negative.

No studies have been identified in the literature that test the impact of budget surpluses on revenue and expenditure forecasting errors. However, it is believed that in metropolitan municipalities in Turkey, there is a spilover effect from balance to revenue and expenditure errors, especially when the balance is positive. Therefore, a dummy variable, where 1 indicates periods with budget surplus and 0 indicates periods with budget deficit, has been included in the analyses.

Hypothesis 3: A budget surplus in metropolitan municipalities positively affects the revenue and expenditure forecasts.

Studies (Gentry, 1989; Allan, 1965; Islam, 1999; Afonso and Silva, 2012; Sedmihradská and Čabla, 2013; Kara, 2024b; and Aizenman & Hausmann, 2000) have identified that inflation affects forecasting errors. Krol (2013) also included inflation as a control variable in the analysis. It is believed that metropolitan municipalities in Turkey spend more and generate more revenue than forecasted

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

due to local inflation. Therefore, the inflation rates of cities have been included in the analyses in this study.

Hypothesis 4: An increase in city's inflation positively affects the forecasting error. Gentry (1989), Mayper, Granof and Giroux (1991), Boukari and Veiga (2018), and Brogan (2012) have found a correlation between unemployment and forecasting errors. On the other hand, Sedmihradská and Čabla (2013) and Afonso and Silva (2012) did not find a significant relationship. It is sometimes wondered, in Turkey particularly, whether local unemployment rates have an impact on revenue forecasting errors. The theoretical expectation is that as unemployment increases, revenue forecasting errors will trend negatively and expenditure forecasting errors positively. This is because metropolitan municipalities incur expenses to combat unemployment, while an increase in unemployment reduces household spending and thereby reduces the revenue of metropolitan municipalities. Therefore, unemployment rates of cities have been included in the analysis in this study.

Hypothesis 5: An increase in a city's unemployment rate affects revenue forecasting errors negatively and expenditure forecasting errors positively.
Boukari and Veiga (2018), Brogan (2012), Buettner and Kauder (2015), Sedmihradská and Čabla (2013), Merola and Pérez (2013) and Boukari and Veiga (2018) have found a significant relationship between GDP per capita and forecasting errors. Bağdigen (2002) has partly confirmed this relationship. However, Ríos et al. (2018) did not find such a relationship. It is deemed necessary to analyse this situation in Turkey as well. It is thought that as GDP per capita increases, expenditures will increase, leading metropolitan municipalities to generate more revenue than forecast and consequently spend more than forecast.

Hypothesis 6: An increase in a city's GDP per capita positively increases forecasting errors.
In examining the causes of budget forecasting errors in metropolitan municipalities in Turkey, I have introduced the export-to-import ratio as a variable. The literature does not show any study that includes foreign trade in the analysis of forecasting errors. Despite this absence, I chose to include it, considering Turkey's status as a developing country where both exports and imports significantly contribute to the industrialization and development of cities. The aim is to determine whether this effect exists in Turkey. Due to the observed autocorrelation in import and export data, they could not be included separately in the models. Attempts to build models using the difference between them, the balance of trade, also resulted in the same error. Therefore, the study includes the export-to-import ratio instead. By incorporating this variable, I aim to explore its potential impact on municipal budgetary performance, thereby offering a novel contribution to the literature. This approach seeks to fill a gap in existing research and provide a deeper understanding of the factors influencing budgetary accuracy in developing economies.

Hypothesis 7: As the export-to-import ratio of a city increases, forecasting errors increase.

Gentry (1989), Mayper, Granof and Giroux (1991), Lago-Peñas and Lago-Peñas (2008), Benito, Guillamon and Bastida (2015), Deus and de Mendonça (2017) have found a relationship between population and forecasting errors. The population growth rates of cities have been added to the analysis in this study.

Hypothesis 8: As the population growth rate of a city increases, forecasting errors increase.

Numerous studies have indicated that the political affiliation of political officials impacts forecast bias (Bischoff and Gohout, 2006; Bretschneider and Gorr, 1992; Brogan, 2012; Couture and Imbeau, 2009; Krol, 2013; Ríos et al., 2018; Brouthers, 1986; Bretschneider et al., 1989; Oliver and Villalonga, 2018). A dummy variable has been added to the analysis, with a value of 1 for mayors affiliated with right-wing parties and 0 for mayors affiliated with left-wing parties.

Hypothesis 9: The political ideology of the metropolitan mayor's party influences forecast bias.

Numerous studies have demonstrated that political manipulation of revenue forecasts occurs before elections, impacting forecasts. Incumbents seeking re-election tend to favour forecasts showing higher revenue to facilitate increased spending or reduced taxation, thereby enhancing their image during the election period (Alesina and Paradisi, 2017; Bee and Moulton, 2015; Bohn, 2010, 2011; Boukari and Veiga, 2018; Brogan, 2012; Haan and Mink, 2005; Sturm, Jong-A-Pin and de Haan, 2012; Krol, 2013; Lalvani, 1999; Mink and de Haan, 2006; Ríos et al., 2018). A dummy variable has been added to the analysis, with a value of 1 if the mayor is running for re-election and 0 for otherwise.

Hypothesis 10: The re-candidacy of the metropolitan mayor in the upcoming elections affects revenue forecasting errors negatively and expenditure forecasting errors positively.

Brouthers (1986), Boylan (2008), Couture and Imbeau (2009), Lago-Peñas and Lago-Peñas (2008), Benito, Guillamon and Bastida (2015), Ríos et al. (2018), Heinemann (2006), Bischoff and Gohout (2006), Sedmihradská and Čabla (2013), Deus and de Mendonça (2017), Strauch, Hallerberg and Hagen (2004), Brück and Stephan (2005), Pina and Venes (2011), Holm-Hadulla, Hauptmeier and Rother (2012), Merola and Pérez (2013) and Boukari and Veiga (2018) have found that election periods significantly impact budget forecasting errors. On the other hand, Deus and de Mendonça (2015) found them to be ineffective, while Kauder, Potrafke and Schinke (2017) found them to be partially effective. To assess the situation in Turkey, a dummy variable has been included in the analysis, with a value of 1 for election periods and 0 for otherwise.

Hypothesis 11: Local government election periods in Turkey positively impact forecasting errors in metropolitan municipalities.

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

5 DATASET AND METHODOLOGY

Provincial GDP levels, and the possibility of data availability were considered, and fifteen selected metropolitan municipalities (Istanbul, Ankara, Izmir, Kocaeli, Bursa, Antalya, Konya, Adana, Tekirdag, Gaziantep, Kayseri, Sanliurfa, Samsun, Ordu, Erzurum) were addressed[1]. The period from 2011 to 2022 has been considered. Initially, revenue and expenditure forecasting errors were calculated through the following equations[2].

$$PE_t = \frac{(A_t - F_t) * 100}{F_t} \tag{1}$$

$$MPE_t = \frac{1}{T} \sum_{T=1}^{T} \frac{(A_t - F_t) * 100}{F_t} \tag{2}$$

$$MAPE_t = \frac{1}{T} \sum_{T=1}^{T} \frac{|(A_t - F_t)| * 100}{|F_t|} \tag{3}$$

The percent error (PE) measures the difference between forecasted and actual values as a percentage of the actual value, providing a direct measure of error magnitude relative to the actual values. However, PE can be misleading when actual values are very small, as the percentage error may become disproportionately large. The mean percent error (MPE) calculates the average of all percent errors for each forecast, offering insights into the overall bias of the forecasts. Nonetheless, the MPE can be affected by the sign of the errors, potentially cancelling out positive and negative errors and providing a skewed perspective if errors are not evenly distributed. The mean absolute percent error (MAPE) calculates the average of the absolute values of percent errors, providing a measure of forecast accuracy that is not influenced by the direction of the errors. MAPE is widely used due to its interpretability and simplicity, but it is sensitive to cases where actual values are zero or near zero, which can result in disproportionately high errors. Since none of the data considered in the study showed this near-zero condition, it was decided to use the MAPE value.

[1] In Turkey, there are 30 metropolitan municipalities. Thirteen of these were established in 2012, and one was established in 2013. With the regulatory changes made to the Turkish financial system between 2003 and 2006, it was decided that metropolitan municipalities would publish their budget-related documents annually to the public. However, due to the time required to develop the necessary infrastructure and to train personnel on the relevant regulations, compliance with financial legislation by metropolitan municipalities took time. At this point, only a few metropolitan municipalities published information for a few years prior to 2011. The vast majority of the metropolitan municipalities covered in the study only began to publish information from 2011 onward. Indeed, the information for other metropolitan municipalities not included in the study for the years 2011 and later remains inaccessible to the public and researchers. It is believed that the reason the fifteen metropolitan municipalities covered in the study were able to achieve earlier compliance is that they are the fifteen largest metropolitan municipalities economically in Turkey. Finally, considering that the final accounts for the year 2023 have not yet been released, it was deemed appropriate to prepare the study for the period 2011-2023 for these fifteen metropolitan municipalities.

[2] Since metropolitan municipalities forecast a budget balance of 0 (equal revenue and expenditure) for certain periods, the balance error could not be calculated during these periods. Therefore, a model could not be established for the budget balance forecasting errors.

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

Subsequently, considering their presence, correlations with each other, literature on forecasting errors, and theoretical background, the following economic and political variables have been compiled.

Table 1
Explanation and acronyms of variables

Variable	Explanation	Acronym
Revenue forecasting error	Annual budget revenue forecasting absolute error rate	REV
Expenditure forecasting error	Annual budget expenditure forecasting absolute error rate	EXP
Inflation	Annual local inflation rate	INF
Unemployment	Annual local unemployment rate	UNP
Per capita GDP	Annual local per capita GDP	GDP
Export-to-import ratio	Local Export-to-import ratio: (Export/Import)	EIR
Population growth rate	Annual local population growth rate	PGR
Mayor's political party	"1" if mayor's political party is right-wing, "0" otherwise	RLP
Mayor's re-candidacy	"1" if mayor re-candidate for the next election, "0" otherwise	REL
Municipality election periods	"1" if municipality elections were held that year, "0" otherwise	ELC
Budget surplus	"1" if budget surplus, "0" otherwise	BDM

Source: TURKSTAT, Central Bank of the Republic of Turkey, Ministry of Treasury and Finance.

The variables outlined in table 1 were chosen because they represent key economic and political factors that can influence the accuracy of budget forecasts in metropolitan municipalities. Specifically, inflation, unemployment, and per capita GDP were selected as economic variables, reflecting the uncertainties municipalities encounter in their fiscal planning. Higher inflation rates, for example, tend to increase budget unpredictability, while unemployment rates and GDP per capita levels are proxies for regional economic stability, which may also affect revenue and expenditure forecasting accuracy. These variables are commonly utilized in the literature on budget forecasting errors, where economic instability is shown to correlate with greater deviations between forecast and actual budget outcomes (see hypotheses 3 to 8).

Political factors, such as the mayor's political affiliation, re-candidacy status, and election periods, were included to capture the potential influence of political incentives on fiscal decision-making. Mayors who intend to run for re-election, for instance, may be more inclined to present optimistic revenue forecasts or adjust expenditure plans to align with voter expectations. Similarly, election years may introduce biases into forecasts as political parties seek to maximize electoral support, potentially leading to either overestimation or underestimation of revenues and expenditures. Prior research highlights the impact of electoral cycles on fiscal behaviour, particularly in terms of optimistic revenue forecasting in election periods, making these variables relevant for understanding the political drivers of budget forecasting errors (see hypotheses 9 and 10).

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

In the study, the absolute values of the revenue and expenditure forecasting errors of metropolitan municipalities were used as dependent variables in the two different models established. These values were calculated by the author. As independent variables, the following were compiled from the Turkish Statistical Institute and used: regional inflation, regional unemployment, regional per capita GDP, regional export-to-import ratio, regional population growth rate, the size of the budget deficit for the relevant year of the metropolitan municipality budget, the stance of the current president's political party (according to the party's charter), whether the current president will run for the next election, and finally, the years of local administrative elections.

At this point, it has been deemed necessary to provide information about the dataset and models. There is no doubt that national macroeconomic variables such as national inflation, unemployment, and growth, as well as national elections, significantly affect the budget forecasting errors of metropolitan municipalities. However, this study focuses on answering the question, "Do local economic and political factors affect the budget forecasting errors of metropolitan municipalities?" Therefore, national data have been excluded from the scope of the study.

The descriptive statistics of the data used in this study are presented in table 2. The dataset comprises a total of 11 variables, with 180 observations for each variable. The table provides the mean, standard deviation, maximum, and minimum values for each variable. Overall, it can be observed that the deviations from the mean for all variables are relatively low, indicating a consistent distribution of the data. This suggests that the variables used in the analysis exhibit limited variability, which may enhance the reliability of the regression model results by minimizing potential distortions caused by extreme outliers.

Table 2
Descriptive statistics

Variable		Mean	Std. dev.	Min.	Max.	Obs.	
EXP	overall	0.1887	0.1870	0.0001	1.1190	N	180
	between		0.0693	0.0699	0.3068	n	15
	within		0.1745	-0.0971	1.0452	T	12
REV	overall	0.1707	0.1325	0.0021	0.7005	N	180
	between		0.0673	0.0729	0.3074	n	15
	within		0.1154	-0.0332	0.6644	T	12
BDM	overall	0.3555	0.4800	0	1.0000	N	180
	between		0.2076	0	0.7500	n	15
	within		0.4358	-0.3944	1.1888	T	12
INF	overall	18.4078	18.4690	5.4300	73.3000	N	180
	between		0.4282	17.6466	19.000	n	15
	within		18.4643	4.8787	73.1670	T	12
UNP	overall	10.3150	3.3335	3.6000	23.4000	N	180
	between		2.8017	6.575	15.6083	n	15
	within		1.9351	1.6066	18.1066	T	12

Variable		Mean	Std. dev.	Min.	Max.	Obs.	
GDP	overall	10,464.9800	4,376.7860	3,0430	20,8830	N	180
	between		4,301.0550	3,901.3330	17,653.0800	n	15
	within		1,339.4010	5,983.3940	13,952.6400	T	12
EIR	overall	1.4758	1.6461	0.3546	10.4561	N	180
	between		1.1814	0.6403	5.3017	n	15
	within		1.1831	-2.6785	8.0300	T	12
PGR	overall	14.7243	11.1765	-23.2400	39.0900	N	180
	between		8.6468	-2.1208	29.8908	n	15
	within		7.3986	-13.4640	48.8660	T	12
RLP	overall	0.7444	0.4373	0	1	N	180
	between		0.3542	0	1	n	15
	within		0.2712	-0.0055	1.3277	T	12
REL	overall	0.5888	0.4934	0	1	N	180
	between		0.3556	0	1	n	15
	within		0.3532	-0.3277	1.3388	T	12
ELC	overall	0.1666	0.3737	0	1	N	180
	between		0	0.1666	0.1666	n	15
	within		0.3738	0	1	T	12

Note: For all variables: N=180, n=15, T=12.

Source: Author's calculations.

The dependent and independent variables used to estimate municipal budget errors are presented in table 3. The correlation coefficient ranges between -1 and 1, indicating the linear relationship between the variables. As the absolute value of the correlation coefficient approaches 1, the relationship is considered strong, while values closer to 0 indicate a weak relationship.

Table 3

Correlation matrix

	REV	EXP	BDM	INF	UNP	GDP	EIR	PGR	RLP	REL	ELC
REV	1										
EXP	0.4953	1									
BDM	-0.1505	0.0248	1								
INF	0.1057	0.4426	0.0511	1							
UNP	-0.2229	-0.0935	0.2320	0.0323	1						
GDP	0.0362	0.3941	0.1327	0.8105	0.0975	1					
EIR	0.0329	0.0457	-0.1073	0.0038	-0.1091	-0.1018	1				
PGR	0.0476	-0.0175	0.2151	-0.1706	0.1340	-0.0091	-0.1330	1			
RLP	-0.0326	-0.1492	-0.0171	-0.1224	-0.1905	-0.3044	-0.1116	-0.1572	1		
REL	0.0497	-0.0384	-0.0398	-0.0607	-0.0893	0.0539	-0.1870	0.1035	-0.1789	1	
ELC	0.1203	0.1016	0.0415	-0.2056	0.1235	-0.1068	0.0026	0.0228	-0.0114	-0.0808	1

Source: Author's calculations.

In general, it has been observed that the variables used exhibit a moderate level of correlation. The strongest relationship was found between GDP and INF, with a correlation coefficient of 0.8105. Additionally, the correlation coefficient between REV and EXP was 0.4953, and between INF and EXP, it was 0.4426. The correlation coefficients between the other variables were determined to be moderate to low.

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

After calculating the errors and identifying the variables to be used, the appropriate panel regression model was determined using the Hausman test. The results indicated that random effect should be used for both revenue (p=0.4531) and expenditure (p=0.0957) models (see appendix). Furthermore, the results of the LM tests conducted also demonstrate that the random effect model should be used for both the revenue (p=0.0000) and expenditure (p=0.0352) models. In this regard, two different panel regression models for revenue and expenditure were established using the following equations.

$$REV_{it} = \beta_0 + \beta_1 INF_{it} + \beta_2 UNP_{it} + \beta_3 GDP_{it} + \beta_4 EIR_{it} + \beta_5 PGR_{it} + \beta_6 BDM_{it} + \beta_7 RLP_{it} + \beta_8 REL_{it} + \beta_9 ELC_{it} + u_{it} \quad (4)$$

$$EXP_{it} = \beta_0 + \beta_1 INF_{it} + \beta_2 UNP_{it} + \beta_3 GDP_{it} + \beta_4 EIR_{it} + \beta_5 PGR_{it} + \beta_6 BDM_{it} + \beta_7 RLP_{it} + \beta_8 REL_{it} + \beta_9 ELC_{it} + u_{it} \quad (5)$$

The term (i) in the equations (4 and 5) represents the observation unit, which is the metropolitan municipalities. (t) represents the time periods, that is, years. And (β_0, β_1, β_2,.....,β_9) represent the coefficients. These coefficients specify the impact of each independent variable on REV_{it} or EXP_{it}. Finally, (u_{it}) represents the error term of the model.

6 RESULTS

Before the regression analysis, the MPE and MAPE values of metropolitan municipalities in Turkey were calculated using the above equations (2 and 3) and are shown in the table 4. Additionally, the table includes information on the number of periods with negative and positive errors.

TABLE 4

MPE, MAPE, NoNEP and NoPEP

Municipality	Category	MPE	MAPE	NoNEP	NoPEP
Istanbul	Revenue	11.17	14.42	4	8
	Expenditure	5.78	13.21	6	6
Ankara	Revenue	-4.66	12.62	8	4
	Expenditure	-1.97	16.88	11	1
Izmir	Revenue	-1.62	7.29	8	4
	Expenditure	-7.92	11.92	11	1
Kocaeli	Revenue	-3.09	13.26	7	5
	Expenditure	-6.72	20.91	9	3
Bursa	Revenue	-4.10	10.82	9	3
	Expenditure	3.34	15.68	7	5
Antalya	Revenue	-12.89	30.74	9	3
	Expenditure	-20.06	24.61	10	2
Konya	Revenue	-24.40	26.35	11	1
	Expenditure	-12.54	29.20	11	1
Adana	Revenue	-21.00	23.72	11	1
	Expenditure	-18.51	18.51	12	0
Tekirdag	Revenue	-7.03	20.03	7	5
	Expenditure	-24.99	30.68	11	1

Municipality	Category	MPE	MAPE	NoNEP	NoPEP
Gaziantep	Revenue	-9.11	14.14	9	3
	Expenditure	-10.38	10.38	12	0
Kayseri	Revenue	2.30	20.68	8	4
	Expenditure	-4.95	26.25	10	2
Sanliurfa	Revenue	-7.79	11.99	9	3
	Expenditure	-15.87	15.87	12	0
Samsun	Revenue	-4.95	9.74	9	3
	Expenditure	1.17	6.99	7	5
Ordu	Revenue	-9.86	17.60	11	1
	Expenditure	3.23	18.91	7	5
Erzurum	Revenue	-20.52	22.64	10	2
	Expenditure	-0.75	23.11	10	2

Note: NoNEP: number of negative error periods; NoPEP: number of positive error periods.
Source: Author's calculations based on the Ministry of Treasury and Finance data.

The analysis of the table reveals intriguing insights into the revenue and expenditure forecasting performances of metropolitan municipalities in Turkey. Among these municipalities, Izmir emerges as the standout performer in revenue forecasting, showing a robust and accurate forecasting methodology. On the other hand, Samsun shines in expenditure forecasting, demonstrating a remarkable ability to forecast expenditures accurately. In contrast, Antalya experiences challenges in revenue forecasting, exhibiting the weakest performance in this aspect. Similarly, Tekirdag struggles in expenditure forecasting, displaying the least accurate forecasts among the metropolitan municipalities studied.

The overall picture indicates that, except for Izmir and Samsun, the forecasting errors of the other metropolitan municipalities are notably high, highlighting areas for improvement in their forecasting methodologies. Comparing these municipal errors to the central government's revenue MAPE of 5.65% and expenditure forecast MAPE of 4.41% provides context to the significance of these errors. It becomes evident that the forecasting errors of municipalities are substantial, underscoring the challenges they face in accurately forecasting revenue and expenditure.

Furthermore, a noteworthy observation is that most of these forecasting errors are negative, indicating a consistent tendency to overestimate revenues and expenditures. This pattern of overestimation is a crucial aspect to consider in refining forecasting techniques and ensuring fiscal prudence. During the same period, the central government's revenue forecasting error was negative for only one year, while the expenditure forecast was never negative. These findings shed light on the complexities of forecasting in the municipal context and emphasize the importance of continuous evaluation and refinement of forecasting methodologies.

Directly following the analysis presented above, we delve into the quantitative results of the revenue forecasting errors model, as depicted in the table 5.

Table 5

Panel regression results for revenue model

	Coef.	Std. err	z	P > z	[95% conf.	interval]
BDM	-0.0405	0.0198	-2.04	0.042**	-0.0794	-0.0015
INF	0.0021	0.0010	2.08	0.037**	0.0001	0.0040
UNP	-0.0100	0.0038	-2.62	0.009***	-0.0176	-0.0025
GDP	-0.0004	0.0004	-0.99	0.324	-0.0012	0.0004
EIR	0.0014	0.0068	0.21	0.831	-0.0119	0.0148
PGR	0.0018	0.0010	1.72	0.085*	-0.0002	0.0039
RLP	-0.0265	0.0294	-0.90	0.367	-0.0842	0.0311
REL	-0.0265	0.0228	-1.16	0.245	-0.0713	0.0182
ELC	0.0671	0.0241	2.78	0.006***	0.0197	0.1145
_cons	0.2659	0.0614	4.32	0.000	0.1453	0.3864
R-sq	within	0.1345			min	12
	between	0.0939		Obs. per group	avg	12
	overall	0.1179			max	12
Number of obs.		180		Number of groups		15
Wald chi2(9)						25.1400
Prob > chi2						0.0028
sigma_u						0.0594
sigma_e						0.1147
rho						0.2114

Source: Author's calculations.

The results from the revenue forecasting errors model, as shown in table 5, reveal key insights into the factors affecting revenue forecast accuracy in metropolitan municipalities. Specifically, budget surplus, inflation, unemployment, population growth, and election periods emerge as significant variables. Among these, election periods and unemployment exhibit high statistical significance at the 1% level, underscoring their critical roles in shaping forecast outcomes. Meanwhile, budget surplus and inflation are significant at the 5% level, and population growth reaches marginal significance at the 10% level.

The coefficients suggest that during election periods, municipalities tend to exhibit larger forecasting errors in their revenue estimates. This finding is consistent with the broader literature, which indicates that political pressures often lead to overly optimistic revenue forecasts in pre-election periods, as local governments attempt to gain favour with voters through increased public spending or fiscal promises. The positive effect of election periods on forecasting errors can be attributed to the complex dynamics of electoral cycles, where fiscal prudence may be compromised to accommodate short-term political objectives.

Conversely, unemployment has a negative and significant effect on revenue forecasting errors. This indicates that municipalities facing higher unemployment rates tend to adopt more conservative revenue forecasts, likely due to the economic uncertainty associated with lower employment levels. Municipalities may anticipate reduced tax

revenues and, thus, adjust their revenue expectations downward to avoid budgetary imbalances. Budget surplus also exhibits a negative relationship with forecasting errors, reflecting a more cautious approach to fiscal planning in municipalities that maintain a surplus. This is consistent with fiscal conservatism, where surplus-generating entities are likely more disciplined in their forecasting practices.

Additionally, inflation and population growth both positively influence revenue forecasting errors. Higher inflation rates can erode the accuracy of fiscal projections, as inflationary pressures create volatility in tax revenues and economic activity. The positive impact of population growth on errors likely stems from the challenges municipalities face in predicting the revenue needs of a rapidly expanding population, where infrastructure demands and service provisions become increasingly difficult to estimate. Taken together, these findings underscore the intricate relationship between local economic conditions and revenue forecasting accuracy, as influenced by both political and economic factors.

Table 6

Panel regression results for expenditure model

	Coef.	Std. err	z	P > z	[95% conf. interval]	
BDM	-0.0023	0.0269	-0.09	0.929	-0.0551	0.0503
INF	0.0046	0.0012	3.62	0.000***	0.0021	0.0071
UNP	-0.0089	0.0043	-2.05	0.040**	-0.0173	-0.0004
GDP	0.0001	0.0005	0.22	0.830	-0.0008	0.0011
EIR	0.0017	0.0084	0.20	0.839	-0.0147	0.0181
PGR	0.0008	0.0012	0.70	0.482	-0.0015	0.0033
RLP	-0.0489	0.0346	-1.41	0.158	-0.1167	0.0189
REL	-0.0221	0.0280	-0.79	0.429	-0.0770	0.0327
ELC	0.1060	0.0334	3.17	0.002***	0.0405	0.1715
_cons	0.2063	0.0717	2.88	0.004	0.0657	0.3469
R-sq	within	0.2848		Obs. per group	min	12
	between	0.1755			avg	12
	overall	0.2706			max	12
Number of obs.		180		Number of groups		15
Wald chi2(9)						64.5300
Prob > chi2						0.0000
sigma_u						0.0332
sigma_e						0.1569
rho						0.0429

Source: Author's calculations.

The results of the expenditure forecasting errors model, presented in table 6, provide further evidence of the role that economic and political variables play in determining the accuracy of budget forecasts in metropolitan municipalities. Here, inflation, unemployment, and election periods significantly affect expenditure forecasting errors, with inflation and election periods achieving the highest level of significance at the 1% level, while unemployment is significant at the 5% level.

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

The positive and significant impact of election periods on expenditure forecasting errors highlights the well-documented phenomenon where political cycles lead to increased public spending in the lead-up to elections. This practice, often referred to as "political budget cycles", reflects the tendency of incumbent governments to enhance public expenditures on visible projects or services to attract voter support, often at the expense of long-term fiscal sustainability. The sharp increase in expenditure forecasting errors during election periods suggests that municipalities may face difficulties in accurately predicting the fiscal impact of politically motivated spending, which tends to deviate from normal expenditure patterns.

Inflation also positively contributes to expenditure forecasting errors. As inflation rises, the unpredictability of cost increases for goods, services, and wages complicates budget planning. Municipalities facing high inflation may struggle to adjust their expenditure estimates to reflect real-time price changes, leading to larger discrepancies between forecast and actual expenditures. This is particularly relevant in contexts where inflation rates are volatile, making accurate budgeting even more challenging.

In contrast, unemployment exerts a negative influence on expenditure forecasting errors. Similarly to its effect on revenue forecasts, higher unemployment tends to make municipalities more cautious in their fiscal projections, possibly due to concerns about economic contraction and the resulting need for austerity measures. This conservatism may result in more accurate expenditure forecasts, as municipalities adopt tighter controls over their spending to align with anticipated reductions in revenue or increased demand for social services.

While other variables such as budget surplus, GDP, and population growth do not show significant effects in the expenditure model, the results overall reflect the importance of inflation and electoral cycles in shaping expenditure forecasting accuracy. Election periods, in particular, stand out as a significant disruptor of fiscal discipline, while inflation introduces additional uncertainty into the budgeting process, complicating efforts to maintain accurate and reliable forecasts. These findings contribute to a growing body of literature emphasizing the influence of both economic conditions and political factors on budgetary outcomes in local governments.

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

7 DISCUSSION AND POLICY RECOMMENDATIONS

The findings of this study offer significant insights into the factors influencing budget forecasting errors in Turkish metropolitan municipalities. In the revenue model, budget surpluses and unemployment are found to reduce forecasting errors, while inflation, population growth, and election years increase them. These results align with established literature in several key areas.

Firstly, the impact of inflation on forecasting errors is consistent with previous research that identifies inflation as a critical factor influencing forecast accuracy. Studies have demonstrated that high inflation rates can lead to increased forecasting errors due to the difficulty in predicting economic conditions under volatile price levels (Gentry, 1989; Allan, 1965; Islam, 1999; Afonso and Silva, 2012; Sedmihradská and Čabla, 2013; Aizenman and Hausmann, 2000). This study reinforces these findings by showing that inflation continues to be a significant factor contributing to forecasting inaccuracies.

Secondly, the effect of unemployment on forecasting errors is corroborated by several studies, which suggest that higher unemployment levels can reduce forecasting errors by reflecting economic downturns and reduced fiscal pressures (Gentry, 1989; Mayper, Granof and Giroux, 1991; Boukari and Veiga, 2018; Brogan, 2012). However, some studies have produced mixed results, indicating that the relationship between unemployment and forecasting errors can vary depending on the economic context (Sedmihradská and Čabla, 2013; Afonso and Silva, 2012). This study's findings are in line with the notion that unemployment can act as a stabilizing factor in forecast accuracy.

Regarding population growth, the study's results align with existing literature that highlights the complexity of its impact on forecasting errors. Previous research has shown that rapid population growth can complicate budget forecasting due to the challenges in predicting increased demand for public services and infrastructure (Gentry, 1989; Mayper, Granof and Giroux, 1991; Lago-Peñas and Lago-Peñas, 2008; Benito, Guillamon and Bastida, 2015; Deus and de Mendonça, 2017). The current study supports the view that population growth exacerbates forecasting errors, highlighting the need for accurate demographic projections in budgeting processes.

The influence of election years on forecasting errors is another critical finding of this study. Previous research has extensively documented how political cycles impact forecasting accuracy, with incumbents often manipulating revenue forecasts to enhance their re-election prospects (Alesina and Paradisi, 2017; Bee and Moulton, 2015; Bohn, 2010, 2011; Boukari and Veiga, 2018; Brogan, 2012; Haan and Mink, 2005; Krol, 2013; Lalvani, 1999; Mink and de Haan, 2006; Ríos et al., 2018; Sturm, Jong-A-Pin and de Haan, 2012). This study reinforces the existing evidence by showing that election years significantly increase forecasting errors, underscoring the need for mechanisms to counteract political biases in budget forecasting.

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

The introduction of the export-to-import ratio as a variable is a novel aspect of this study. While the existing literature does not incorporate foreign trade variables into the analysis of forecasting errors, this study's inclusion of the export-to-import ratio reflects Turkey's unique economic context. As a developing country with substantial foreign trade, this variable provides valuable insights into how external trade dynamics might influence local budget forecasting. The inclusion of this variable highlights the potential for expanding traditional forecasting models to include trade-related factors, which could be relevant for other developing economies with significant trade activities.

Based on these findings, several policy recommendations can be made.

Refine forecasting models: Municipalities should enhance their budget forecasting models by incorporating variables such as inflation, population growth, and election cycles. Additionally, integrating foreign trade indicators like the export-to-import ratio could provide a more comprehensive understanding of economic influences on budgeting.

Stabilize economic indicators: Policymakers should focus on managing inflation and supporting sustainable population growth to minimize forecasting errors. Measures aimed at controlling inflation and accurately projecting population changes can improve the reliability of budget forecasts.

Mitigate political influence: To address the impact of election cycles on forecast accuracy, it is essential to ensure transparency and objectivity in budget forecasting processes during election periods. Establishing independent forecasting bodies or committees can help mitigate potential biases introduced by political considerations.

Incorporate trade data: The integration of foreign trade variables into budget forecasting models should be explored. Understanding how trade dynamics, such as the export-to-import ratio, affect local budgets can enhance forecasting accuracy and financial planning.

Enhance capacity building: Investing in training for municipal finance and budgeting officials on advanced forecasting techniques and tools will improve budget prediction accuracy. Continued education in forecasting methodologies will support better financial management and planning.

Implementing these recommendations can help Turkish metropolitan municipalities enhance the accuracy of their budget forecasts and achieve more effective financial management.

8 CONCLUSION

The accuracy of revenue and expenditure forecasts in metropolitan municipalities is critically significant for effective public resource allocation and budget management. Reliable forecasts are essential for sound budget planning and strategic decision-making processes. Inaccurate forecasts, on the other hand, can lead to resource misallocation, budget deficits, and disruptions in public services, which can undermine the operational efficiency and financial sustainability of municipalities. This study addresses a notable gap in the literature by focusing on forecasting errors within Turkish metropolitan municipalities, thereby contributing valuable insights into the factors affecting forecast accuracy and municipal efficiency.

The analysis reveals substantial errors in both revenue and expenditure forecasts, with a tendency towards overestimation. This overestimation indicates that municipalities frequently project revenues and expenditures that can be seen to have been optimistic when the outcomes can be considered. The magnitude of these forecasting errors is significantly larger than that of errors observed in central government forecasts. This pattern suggests a risk-averse approach in municipal budget planning, where forecasters may prefer to err on the side of caution to avoid potential deficits, thereby constituting a conservative forecasting strategy.

In the revenue forecast model, several key factors were identified as influential. First, the presence of a budget surplus was associated with a reduction in forecasting errors. This finding indicates that during periods of surplus, municipalities might rely on historical revenue trends that reflect higher-than-expected revenues, leading to more accurate forecasts. The reliance on past financial performance during surplus years helps municipalities achieve more conservative forecasts and reduces forecasting errors.

Inflation was found to have a positive impact on revenue forecasting errors. The analysis highlights the significant effect of the inflation surge during the debt/foreign exchange crisis that began in 2018[3]. The astronomical rise in inflation rates during this period likely contributed to substantial forecast inaccuracies as forecasters struggled to adjust their predictions amidst severe economic volatility. This finding underscores the challenge of accurately predicting revenues in the face of high inflation, which creates substantial unpredictability in revenue streams.

The impact of the unemployment rate on revenue forecasting errors was unexpected and diverges from theoretical expectations. Contrary to the assumption that higher

[3] In 2018, Turkey faced a severe currency and debt crisis that significantly impacted its economy. The crisis began with a dramatic fall in the value of the Turkish lira, which plunged against major currencies such as the US dollar and the euro. This depreciation was driven by a combination of factors including high inflation, a large current account deficit, and rising political tensions, particularly with the United States. The Turkish government's response to the crisis included raising interest rates and seeking financial support from international institutions, but the measures had limited success in stabilizing the currency. The crisis exacerbated Turkey's already challenging economic conditions, leading to increased borrowing costs, higher inflation rates, and a strain on both public and private sector finances. This period marked a significant economic downturn, with widespread repercussions for the Turkish economy and its financial stability.

unemployment rates would exacerbate forecasting errors, the results indicate that increased unemployment was associated with reduced forecasting errors. This counterintuitive result may be due to a more conservative approach adopted by forecasters in response to rising unemployment, where they might anticipate lower revenue collection and adjust their forecasts accordingly. This anomaly highlights the need for further investigation into why increased unemployment might lead to more accurate revenue forecasts. Possible explanations could include adjustments in forecasting methods or shifts in revenue expectations that better align with economic realities during periods of high unemployment. Further comprehensive analyses are required to validate this interpretation and explore the underlying mechanisms.

Population growth was found to increase revenue forecasting errors, consistently with theoretical expectations. Rapid population growth imposes additional pressure on municipal resources, complicating accurate revenue forecasting. As municipalities face the challenge of accommodating a growing population, managing resources and services becomes increasingly complex, leading to larger forecasting errors. The increased demand for public services and infrastructure due to population growth amplifies the difficulties in predicting revenue needs accurately.

Election periods emerged as a significant factor affecting revenue forecasting errors, supporting the election cycle theory observed in the literature. The substantial impact of election cycles on forecast accuracy suggests that municipalities may adjust their forecasts during election years to present a more favourable fiscal outlook or align with political objectives. This manipulation reflects the broader influence of political cycles on financial planning and forecasting accuracy, highlighting how electoral considerations can shape municipal budget forecasts.

Turning to the expenditure forecasting model, inflation again demonstrated a positive relationship with forecasting errors. The findings suggest that inflation exacerbates expenditure forecasting inaccuracies, particularly concerning current expenditures, which are inflexible and challenging to adjust. The high forecasting errors observed post-2018 are attributed to inflationary pressures that complicate the prediction of expenditure needs, reflecting the difficulties in managing budgets during periods of high inflation.

The impact of the unemployment rate on expenditure forecasting errors was similarly unexpected. Contrary to theoretical expectations that higher unemployment would lead to increased social expenditures and, consequently, greater forecasting inaccuracies, the results show that higher unemployment rates were associated with reduced expenditure forecasting errors. This finding diverges from the conventional belief that increased unemployment would inflate social spending and complicate budget forecasting. This discrepancy warrants further analysis to understand why unemployment might lead to more accurate expenditure

forecasts. Potential reasons could include adjustments in budget allocations or changes in expenditure patterns during periods of high unemployment. Detailed investigations are needed to reconcile these findings with theoretical models and understand the underlying dynamics.

Election periods were also found to significantly influence expenditure forecasting errors, with election periods proving to be the most influential variable in the expenditure model. This result aligns with the notion that municipalities may manipulate expenditure forecasts during election years to present a favourable fiscal situation. The significant impact of election periods on expenditure forecasts underscores the political dimensions of budget management in Turkey, highlighting how political cycles can influence financial planning and forecast accuracy.

Table 7

Results of hypothesis

No	Hypothesis	Status	
		Revenue	Expenditure
1	Budgets are forecasted with a high degree of inaccuracy	Accept	Accept
2	Forecasting errors are mostly in the negative direction	Accept	Accept
3	A budget surplus affects budget forecasting errors	Accept	Reject
4	An increase in inflation affects the forecasting error in a positive direction	Accept	Accept
5	An increase in the unemployment rate affects revenue forecasting errors negatively and expenditure forecasting errors positively	Accept	Accept
6	An increase in per capita GDP increases errors in a positive direction	Reject	Reject
7	As the export-to-import ratio increases, forecasting errors also increase in a positive direction	Reject	Reject
8	As the population growth rate increases, forecasting errors also increase in a positive direction	Accept	Reject
9	Mayor's political party affiliations affect the forecasting error	Reject	Reject
10	Mayor's candidacy in the next elections affects revenue forecasting errors negatively and expenditure forecasting errors positively	Reject	Reject
11	Election periods affect revenue forecasting errors negatively and expenditure forecasting errors positively	Accept	Accept

Source: Author's calculations based on tables 4, 5 and 6 results.

In summary, the findings from this study illustrate that budget forecasting errors in Turkish metropolitan municipalities are significantly influenced by a range of macroeconomic variables and political factors. While the impact of inflation and election periods on forecasting errors aligns with theoretical expectations, the role of unemployment presents a noteworthy deviation from conventional wisdom. The unexpected negative relationship between unemployment and revenue forecasting errors suggests that forecasters may adopt more conservative strategies

during periods of high unemployment, warranting further investigation to understand the underlying mechanisms. Similarly, the reduction of forecasting errors in expenditure models during a period of high unemployment contradict theoretical predictions, indicating potential shifts in expenditure patterns or forecasting approaches.

To address these complexities and enhance the accuracy of budget forecasts, several recommendations can be made. Firstly, municipalities should consider incorporating more nuanced economic indicators and forecasting methods that account for the unique dynamics of unemployment and inflation. Developing adaptive forecasting models that can better handle economic volatility and demographic changes may lead to more reliable predictions. Additionally, increasing transparency in the budgeting process and incorporating regular reviews can help mitigate the impact of political cycles on forecasting accuracy. Policymakers should also focus on improving data collection and analysis techniques to better capture the effects of macroeconomic variables on budget forecasts. Further research is essential to explore the observed anomalies and refine forecasting practices, ultimately contributing to more effective budget management and financial sustainability in metropolitan municipalities.

Disclosure statement

The author has no conflict of interest to declare.

REFERENCES

1. Afonso, A. and Silva, J., 2012. The Fiscal Forecasting Track Record of the European Commission and Portugal. *Lisbon: ISEG Economics Working Paper*, No. 37/2012/DE/UECE. https://doi.org/10.2139/ssrn.2181117
2. Agostini, S. J., 1991. Searching for a Better Forecast: San Francisco's Revenue Forecasting Model. *Government Finance Review*, 7, pp. 13-16.
3. Aizenman, J. and Hausmann, R., 2000. The Impact of Inflation on Budgetary Discipline. *Journal of Development Economics,* 63(2), pp. 425-449. https://doi.org/10.1016/S0304-3878(00)00111-5
4. Alesina, A. and Paradisi, M., 2017. Political Budget Cycles: Evidence from Italian Cities. *Economics & Politics,* 29(2), pp. 157-177. https://doi.org/10.1111/ecpo.12091
5. Allan, C. M., 1965. Fiscal Marksmanship, 1951-1963. *Oxford Economic Papers,* 17(2), pp. 317-327. https://doi.org/10.1093/oxfordjournals.oep.a040992
6. Asher, M. G., 1978. Accuracy of Budgetary Forecasts of Central Government, 1967-68 to 1975-76. *Economic and Political Weekly,* 13(8), pp. 423-432.
7. Auld, D. A., 1970. Fiscal Marksmanship in Canada. *The Canadian Journal of Economics,* 3(3), pp. 507-511. https://doi.org/10.2307/133664
8. Bağdigen, M., 2002. How Accurate is Revenue Forecasting in Turkey? An Empirical Analysis. *Yapi Kredi Economic Review,* 13(2), pp. 29-37.
9. Beckett-Camarata, J., 2006. Revenue Forecasting Accuracy in Ohio Local Governments. *Journal of Public Budgeting, Accounting & Financial Management,* 18(1), pp. 77-99. https://doi.org/10.1108/JPBAFM-18-01-2006-B004
10. Bee, A. and Moulton, S., 2015. Political Budget Cycles in U.S. Municipalities. *Economics of Governance*, 16(4), pp. 379-403. https://doi.org/10.1007/s10101-015-0171-z
11. Benito, B., Guillamon, M.-D. and Bastida, F., 2015. Budget Forecast Deviations in Municipal Governments: Determinants and Implications. *Australian Accounting Review,* 25(1), pp. 45-70. https://doi.org/10.1111/auar.12071
12. Bhattacharya, B. B. and Kumari, A., 1988. Budget Forecasts of Central Government Revenue and Expenditure: A Test of Rational Expectation. *Economic and Political Weekly,* 23(26), pp. 1323-1327.
13. Bischoff, I. and Gohout, W., 2006. Tax Projections in German States – Manipulated by Opportunistic Incumbent Parties? *Finanzwissenschaftliche Arbeitspapiere,* No. 74.
14. Bohn, F., 2010. *Disinformation and Political Budget Cycles.*
15. Bohn, F., 2011. *Political Budget Cycles: Can Disinformation Explain Country Group Differences.*
16. Botrić, V. and Vizek, M., 2012. Forecasting Fiscal Revenues in a Transition Country: The Case of Croatia. *Zagreb International Review of Economics & Business,* 15(1), pp. 23-36.
17. Boukari, M. and Veiga, F. J., 2018. Disentangling Political and Institutional Determinants of Budget Forecast Errors: A Comparative Approach. *Journal of Comparative Economics,* 46(4), pp. 1030-1045. https://doi.org/10.1016/j.jce.2018.03.002

18. Boylan, R. T., 2008. Political Distortions in State Forecasts. *Public Choice,* 136(3), pp. 411-427. https://doi.org/10.2139/ssrn.941227
19. Bretschneider, S. and Gorr, W. L., 1992. Economic, Organizational, and Political Influences on Biases in Forecasting State Sales Tax Receipts. *International Journal of Forecasting,* 7(4), pp. 457-466. https://doi.org/10.1016/0169-2070(92)90029-9
20. Bretschneider, S. [et al.], 1989. Political and Organizational Influences on the Accuracy of Forecasting State Government Revenues. *International Journal of Forecasting,* 5(3), pp. 307-319. https://doi.org/10.1016/0169-2070(89)90035-6
21. Brogan, M., 2012. The Politics of Budgeting: Evaluating the Effects of the Political Election Cycle on State-Level Budget Forecast Errors. *Public Administration Quarterly,* 36(1), pp. 84-115.
22. Brouthers, L. E., 1986. Parties, Ideology and Elections: The Politics of Federal Revenues and Expenditures Forecasting. *International Journal of Public Administration,* 8(3), pp. 289-314. https://doi.org/10.1080/01900698608524519
23. Brück, T. and Stephan, A., 2005. Do Eurozone Countries Cheat with their Budget Deficit Forecasts? *European University Viadrina Working Paper Series,* No. 2005, 5.
24. Buettner, T. and Kauder, B., 2015. Political Biases Despite External Expert Participation: An Empirical Analysis of Tax Revenue Forecasts in Germany. *Public Choice,* 164(3), pp. 287-307. https://doi.org/10.1007/s11127-015-0279-2
25. Calabrese, T. and Williams, D., 2019. Bias Associated with Centrally Budgeted Expenditure Forecasts. In: D. Williams and T. Calabrese, eds. *The Palgrave Handbook of Government Budget Forecasting*. Cham: Palgrave MacMillan, pp. 201-215. https://doi.org/10.1007/978-3-030-18195-6_10
26. Couture, J. and Imbeau, L., 2009. Do Governments Manipulate Their Revenue Forecasts? Budget Speech and Budget Outcomes in the Canadian Provinces. In: L. M. Imbeau, ed. *Do They Walk Like They Talk? Speech and Action in Policy Processes*. New York: Springer, pp. 155-166. https://doi.org/10.1007/978-0-387-89672-4_9
27. Davis, J. M., 1980. Fiscal Marksmanship in the United Kingdom, 1951-78. *The Manchester School,* 48(2), pp. 187-202. https://doi.org/10.1111/j.1467-9957.1980.tb00719.x
28. Deus, J. D. and de Mendonça, H., 2017. Fiscal Forecasting Performance in an Emerging Economy: An Empirical Assessment of Brazil. *Economic Systems,* 41(3), pp. 408-419. https://doi.org/10.1016/j.ecosys.2016.10.004
29. Deus, J. D. and de Mendonça, H. F., 2015. Empirical Evidence on Fiscal Forecasting in Eurozone Countries. *Journal of Economic Studies,* 42(5), pp. 838-860. https://doi.org/10.1108/JES-04-2014-0054
30. Fedotov, D. Y., 2017. Forecasting of Regional Economic Development and Budget Based on the Example of Irkutsk Oblast. *Studies on Russian Economic Development,* 28(4), pp. 416-422. https://doi.org/10.1134/S1075700717040050
31. Feenberg, D. [et al.], 1989. Testing The Rationality of State Revenue Forecasts. *The Review of Economics and Statistics,* 71(2), pp. 300-308. https://doi.org/10.2307/1926976

32. Forrester, J. P., 1991. Budgetary Constraints and Municipal Revenue Forecasting. *Policy Sciences,* 24(4), pp. 333-356. https://doi.org/10.1007/BF00135880
33. Fullerton, T., 1989. A Composite Approach to Forecasting State Government Revenues: Case Study of the Idaho Sales Tax. *International Journal of Forecasting,* 5(3), pp. 373-380. https://doi.org/10.1016/0169-2070(89)90040-X
34. Gentry, W. M., 1989. Do State Revenue Forecasters Utilize Available Information? *National Tax Journal,* 42(4), pp. 429-439. https://doi.org/10.1086/NTJ41788812
35. Geys, B., Goeminne, S. and Smolders, C., 2008. Political Fragmentation and Projected Tax Revenues: Evidence from Flemish Municipalities. *International Tax and Public Finance,* 15(3), pp. 297-315. https://doi.org/10.1007/s10797-007-9021-4
36. Grizzle, G. and Klay, W. E., 1994. Forecasting State Sales Tax Revenues: Comparing the Accuracy of Different Methods. *State & Local Government Review,* 26(3), pp. 142-152.
37. Haan, J. D. and Mink, M., 2005. Has the Stability and Growth Pact Impeded Political Budget Cycles in the European Union? *CESifo Working Paper Series*, No. 1532. https://doi.org/10.2139/ssrn.812329
38. Heinemann, F., 2006. Planning or Propaganda? An Evaluation of Germany's Medium-term Budgetary Planning. *FinanzArchiv / Public Finance Analysis,* 62(4), pp. 551-578. https://doi.org/10.1628/001522106X172698
39. Holm-Hadulla, F., Hauptmeier, S. and Rother, P., 2012. The Impact of Expenditure Rules on Budgetary Discipline over the Cycle. *Applied Economics,* 44(25), pp. 3287-3296. https://doi.org/10.1080/00036846.2011.572855
40. Islam, A. R., 1999. *Forecast Performances of Provincial Government Revenue Estimates in Canada.* Simon Fraser University, Doctoral Thesis.
41. Jena, P. R., 2006. Fiscal Marksmanship: Link between Forecasting Central Tax Revenues and State Fiscal Management. *Economic and Political Weekly,* 41(37), 3971-3976.
42. Jones, V. D., Bretschneider, S. and Gorr, W., 1997. Organizational Pressures on Forecast Evaluation: Managerial, Political, and Procedural Influences. *Journal of Forecasting,* 16(4), pp. 241-254. https://doi.org/10.1002/(SICI)1099-131X(199707)16:4<241::AID-FOR658>3.0.CO;2-P
43. Kara, B., 2024a. The Performance of Medium-Term Budgeting in Türkiye: An Analysis of Budget Forecasts. *Yönetim ve Ekonomi Dergisi*, 31(4), pp. 659-676. https://doi.org/10.18657/yonveek.1521261
44. Kara, B., 2024b. *Türkiye'de Kamu Bütçesi Tahminlerinin Gerçekliği*. Ankara: Gazi Kitabevi.
45. Kauder, B., Potrafke, N. and Schinke, C., 2017. Manipulating Fiscal Forecasts: Evidence from the German States. *CESifo Working Paper*, No. 6310. https://doi.org/10.2139/ssrn.2920679
46. Khan, A., 2019. *Fundamentals of Public Budgeting and Finance.* Palgrave Macmillan. https://doi.org/10.1007/978-3-030-19226-6

47. Khan, T., Hussain, A. and Malik, Z. K., 2018. Fiscal Marksmanship in Pakistan: With Special Focus on Province Khyber Pakhtunkhwa. *Pakistan Journal of Economic Studies,* 1(1), pp. 21-43.
48. Krause, G. A. and Corder, J., 2007. Explaining Bureaucratic Optimism: Theory and Evidence from U.S. Executive Agency Macroeconomic Forecasts. *The American Political Science Review,* 101(1), pp. 129-142. https://doi.org/10.1017/S0003055407070074
49. Krol, R., 2013. Evaluating State Revenue Forecasting under a Flexible Loss Function. *International Journal of Forecasting,* 29(2), pp. 282-289. https://doi.org/10.1016/j.ijforecast.2012.11.003
50. Lago-Peñas, I. and Lago-Peñas, S., 2008. Explaining Budgetary Indiscipline: Evidence from Spanish Municipalities. *Public Finance and Management,* 8(1), pp. 1-43. https://doi.org/10.1177/152397210800800102
51. Lalvani, M., 1999. Elections and Macropolicy Signals: Political Budget Cycle Hypothesis. *Economic and Political Weekly*, pp. 2676-2681.
52. Larkey, P. and Smith, R., 1989. Bias in the Formulation of Local Government Budget Problems. *Policy Sciences,* (22), pp. 123-166. https://doi.org/10.1007/BF00141382
53. Lazar, C. and Andrei, J., 2006. The Budget – an Instrument for Forecasting. Multiyear Budgeting. *Economic Insights – Trends and Challenges,* 3, pp. 41-46.
54. Leal, T. [et al.], 2008. Fiscal Forecasting: Lessons from the Literature and Challenges. *Fiscal Studies,* 29(3), pp. 347-386. https://doi.org/10.1111/j.1475-5890.2008.00078.x
55. Lee, T.-H. and Kwak, S., 2020. Revenue Volatility and Forecast Errors: Evidence From Korean Local Governments. *Local Government Studies,* 46(1), pp. 1-16. https://doi.org/10.1080/03003930.2019.1708726
56. Mayper, A. G., Granof, M. and Giroux, G., 1991. An Analysis of Municipal Budget Variances. *Accounting, Auditing & Accountability Journal,* 4(1), pp. 29-50. https://doi.org/10.1108/09513579110003358
57. McCollough, J. and Frank, H., 1992. Incentives for Forecasting Reform Among Local Finance Officers. *Public Budgeting and Financial Management,* 4(2), pp. 407-429.
58. Merola, R. and Pérez, J., 2013. Fiscal Forecast Errors: Governments versus Independent Agencies? *European Journal of Political Economy,* 32, pp. 285-299. https://doi.org/10.1016/j.ejpoleco.2013.09.002
59. Mink, M. and de Haan, J., 2006. Are There Political Budget Cycles in the Euro Area? *European Union Politics,* 7(2), pp. 191-211. https://doi.org/10.1177/1465116506063706
60. Oliver, X. and Villalonga, J., 2018. The Determinants of Regional Budget Forecast Errors in Federal Economies: Spain 1995-2013. *Hacienda Pública Española / Review of Public Economics,* 226(3), pp. 85-121. https://doi.org/10.7866/HPE-RPE.18.3.4
61. Penner, R. G., 2001. *Errors in Budget Forecasting.* Washington D.C.: The Urban Institute.

62. Pina, Á. M. and Venes, N., 2011. The Political Economy of EDP Fiscal Forecasts: An Empirical Assessment. *European Journal of Political Economy,* 27(3), pp. 534-546. https://doi.org/10.1016/j.ejpoleco.2011.01.005
63. Reddick, C. G., 2008. Evaluating Revenue Forecasting in City Governments: A Survey of Texas Finance Directors. In: J. Sun and T. Lynch, eds. *Government Budget Forecasting Theory and Practice*. New York: Taylor & Francis Group, pp. 305-324. https://doi.org/10.4324/9781315093444
64. Ríos, A.-M. [et al.], 2018. The Influence of Transparency on Budget Forecast Deviations in Municipal Governments. *Journal of Forecasting,* 37(4), pp. 457-474. https://doi.org/10.1002/for.2513
65. Schroeder, L., 2007. Forecasting Local Revenues and Expenditures. In: A. Shah, ed. *Local Budgeting*. Washington: The World Bank, pp. 53-79. https://doi.org/10.1596/978-0-8213-6945-6
66. Sedmihradská, L. and Čabla, A., 2013. Budget Accuracy in Czech Municipalities and the Determinants of Tax Revenue Forecasting Errors. *Ekonomická revue – Central European Review of Economic Issues,* 16(4), pp. 197-206. https://doi.org/10.7327/cerei.2013.12.01
67. Stevenson, W. J., 2012. *Operations Management*. New York: The McGraw-Hill Irwin.
68. Strauch, R., Hallerberg, M. and Hagen, J., 2004. Budgetary Forecasts in Europe – the Track Record of Stability and Convergence Programmes. *European Central Bank Working Papers,* No. 307. https://doi.org/10.2139/ssrn.515069
69. Sturm, J.-E., Jong-A-Pin, R. and de Haan, J., 2012. Using Real-Time Data to Test for Political Budget Cycles. *KOF Working papers*, No 12-313. https://doi.org/10.2139/ssrn.2152268
70. Voorhees, W., 2006. Consistent Underestimation Bias, the Asymmetrical Loss Function, and Homogeneous Sources of Bias in State Revenue Forecasts. *Journal of Public Budgeting, Accounting & Financial Management,* 18(1), pp. 61-76. https://doi.org/10.1108/JPBAFM-18-01-2006-B003
71. Williams, D. W. and Calabrese, T., 2016. The Status of Budget Forecasting. *Journal of Public and Nonprofit Affairs,* 2(2), pp. 127-160. https://doi.org/10.20899/jpna.2.2.127-160
72. Willoughby, K. and Guo, H., 2008. The State of the Art: Revenue Forecasting in US State Governments. In: J. Sun and T. Lynch, eds. *Government Budget Forecasting: Theory and Practice*, pp. 27-42. https://doi.org/10.1201/9781420045833.ch3
73. Zakaria, M. and Ali, S., 2010. Fiscal Marksmanship in Pakistan. *The Lahore Journal of Economics,* 15(2), pp. 113-133. https://doi.org/10.35536/lje.2010.v15.i2.a6

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

APPENDIX

HAUSMAN TEST RESULTS FOR REVENUE MODEL

The Hausman test, developed by Jerry A. Hausman in 1978, is a statistical test used in econometrics to evaluate the consistency of estimators in panel data models. Specifically, it is employed to determine whether a fixed effects model or a random effects model is more appropriate for the data at hand. The test compares the estimators from both models under the null hypothesis that the preferred model is the random effects model, which assumes that individual-specific effects are uncorrelated with the explanatory variables. If the null hypothesis is rejected, it indicates that the random effects model is inconsistent, due to the correlation between the individual effects and the regressors, thus favouring the fixed effects model. The test statistic is calculated as the difference between the estimators, scaled by their respective variances, and follows a chi-square distribution. A significant Hausman test result suggests the presence of endogeneity, affirming that the fixed effects model should be used to obtain unbiased and consistent parameter estimates. This test is crucial for ensuring the reliability of inferences drawn from panel data analyses. In this context, a test was first conducted for revenue models, and the results are shown in the table A1.

TABLE A1

Hausman test results for revenue model

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	Fixed	**Random**	**Difference**	**S.E.**
BDM	-0.0426	-0.0405	-0.0021	0.0046
INF	0.0021	0.0021	0.0000	0.0004
UNP	-0.0107	-0.0100	-0.0006	0.0028
GDP	-0.0004	-0.0004	-0.0000	0.0002
EIR	0.0029	0.0014	0.0015	0.0034
PGR	0.0018	0.0018	-0.0000	0.0006
RLP	-0.0316	-0.0265	-0.0051	0.0177
REL	-0.0484	-0.0265	-0.0218	0.0112
ELC	0.0652	0.0671	-0.0018	0.0037
chi2(8)				7.8000
Prob>chi2				0.4531

According to the test results ($p<0.05$), it was determined that the random effects model should be used for the revenue model.

HAUSMAN TEST RESULTS FOR EXPENDITURE MODEL

Subsequently, the same test was conducted for the expenditure models.

Table A2

Hausman test results for expenditure model

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	Fixed	**Random**	**Difference**	**S.E.**
BDM	-0.0184	-0.0023	-0.0161	0.0091
INF	0.0050	0.0046	0.0003	0.0008
UNP	-0.0062	-0.0089	0.0026	0.0050
GDP	-0.0001	0.0001	-0.0002	0.0004
EIR	-0.0010	0.0017	-0.0027	0.0066
PGR	-0.0002	0.0008	-0.0011	0.0011
RLP	-0.0625	-0.0489	-0.0135	0.0330
REL	-0.0621	-0.0221	-0.0400	0.0218
ELC	0.1001	0.1060	-0.0058	0.0067
chi2(8)				13.5000
Prob>chi2				0.0957

The test result for the expenditure model ($p<0.05$) also indicated that the random effects model should be used.

BREUSCH AND PAGAN LAGRANGIAN MULTIPLIER TEST FOR RANDOM EFFECTS

The Breusch-Pagan Lagrange Multiplier (BP-LM) test assesses the presence of random effects. Its null hypothesis posits that the error variance components specific to individuals or time are zero. If the null hypothesis is accepted, it suggests a preference for pooled ordinary least squares (OLS) estimation; however, rejection of the null hypothesis indicates the superiority of the random effects model. This test is instrumental in determining the appropriate model for the dataset, providing valuable insights into the potential impact of individual or time-specific factors on the observed outcomes. The results of the test for both revenue and expenditure models are shown in the table A3.

Table A3

BP-LM test results

	Models				
	Revenue			**Expenditure**	
	Var	**sd = sqrt(Var)**		**Var**	**sd = sqrt(Var)**
REV	0.0175	0.1325	EXP	0.0349	0.1870
e	0.0131	0.1147	e	0.0246	0.1569
u	0.0035	0.0594	u	0.0011	0.0332
chibar2(01)		18.8800	chibar2(01)		3.2800
Prob > chibar2		0.0000	Prob > chibar2		0.0352

According to the test results, both for revenue and expenditure, we reject the null hypothesis in favour of the random group effect model ($p<0.05$).

PUBLIC SECTOR ECONOMICS
49 (2) 273-307 (2025)

LAGRAM-MULTIPLIER (WOOLDRIDGE AUTOCORRELATION) TEST RESULTS

The Lagrange Multiplier (Wooldridge Autocorrelation) test is employed to detect the presence of serial correlation in panel data models. The test evaluates whether the error terms are serially correlated, which can lead to inefficient estimates and biased standard errors if not addressed. The null hypothesis of the Wooldridge Autocorrelation Test posits no first-order autocorrelation among the residuals. A significant test result, indicated by a p-value less than the chosen significance level, leads to the rejection of the null hypothesis, thereby confirming the existence of serial correlation. Addressing serial correlation is crucial for ensuring the reliability and accuracy of panel data model estimations. The results of the test for both revenue and expenditure models are shown in the table A4.

Table A4

The Lagrange Multiplier (Wooldridge Autocorrelation) test results

	Models	
	Revenue	**Expenditure**
F (1, 14)	0.463	2.032
Prob > F	0.507	0.176

The results of the Lagrange Multiplier test indicate that both mowdels have p-values greater than 0.10. This suggests that, based on the Lagrange Multiplier test, there is no significant evidence of the issue tested (e.g., heteroscedasticity, omitted variable bias, or other specification errors) in either model at the 10% significance level. Consequently, the models do not exhibit significant evidence of the specified problem, supporting the robustness of the model specifications.

PESARAN'S CROSS-SECTIONAL DEPENDENCE TEST (CD)

Pesaran CD test is utilized to detect the presence of cross-sectional dependence in panel data models. This test assesses whether the residuals are correlated across cross-sectional units, which can compromise the efficiency and consistency of the estimators if unaddressed. The null hypothesis of the Pesaran CD Test posits no cross-sectional dependence among the residuals. A significant test result, indicated by a p-value less than the chosen significance level, leads to the rejection of the null hypothesis, thus confirming the presence of cross-sectional dependence. Recognizing and addressing cross-sectional dependence is essential for ensuring the validity and robustness of panel data model estimations. The results of the test for both revenue and expenditure models are shown in the table A5.

Table A5

Pesaran CD test results

	Models	
	Revenue	**Expenditure**
Pr	0.177	0.112
Average absolute value of the off-diagonal elements	0.306	0.418

The results of Pesaran's CD test for both models indicate that the p-values exceed 0.1. This suggests that there is no statistically significant evidence to reject the null hypothesis of no cross-sectional dependence among the residuals. Consequently, we can infer that the residuals of the models are not correlated across the cross-sectional units. This lack of cross-sectional dependence implies that the estimators used in these panel data models are likely to be efficient and consistent, ensuring the reliability of the model estimations.