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The Impact of Budget Revenue and Expenditure Forecasting Errors on Inflation in Turkey: An Analysis of the 1975-2021 Period

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Abstract: The forecasts embedded in the state budget both influence and are influenced by economic indicators. The divergence of budget forecasts from reality or the occurrence of inaccuracies due to various reasons significantly affects specific economic indicators. In the majority of cases, inaccurate forecasts lead to deviations in certain economic indicators. This study addresses this issue within the context of Turkey for the period 1975-2021. Budget forecasts in Turkey often yield inaccurate results. The Prais-Winsten regression method is employed to analyze whether errors in revenue and expenditure have any impact on inflation. The analysis reveals that expenditure errors have an inflationary impact. This situation is consistent with the tendency in Turkey for expenditure errors to result in higher-than-forecasted. While there are studies in the literature examining the impact of inflation on forecasting errors, there is a notable gap in research focusing on the reverse scenario. This study aims to fill this gap and contribute significantly to the existing literature.

Keywords: Revenue Forecasting Error, Expenditure Forecasting Error, Inflation, Turkey, Prais-Winsten

1. Introduction

The state budget, a foundational document for the upcoming fiscal year and subsequent periods, serves as a comprehensive projection of forecasted revenue, expenditure, and the equilibrium between the two. These forecasts encapsulate the financial strategies and objectives of the government, and their efficacy is gauged by the precision and realism of the budget forecasts. The realism of these forecasts is appraised through the quantification of deviations from actualized values.

The formulation of the budget requires a strategic orientation to support macroeconomic development and optimizing the judicious utilization of public resources [1]. Specifically, budget forecasts must be precise, reliable, and encompass meaningful components within a designated time frame, with a focus on clarity, comprehensibility, and implement ability [2]. Governments articulate their fiscal policy outlook through budget forecasts, fundamentally composed of predictions regarding revenue, expenditure, and budgetary balance. There is a particular emphasis on the pivotal roles played by revenue and expenditure forecasts in outlining annual budgets and establishing objectives [3].

Effectively managing the public economy necessitates the development of prudent budget plans, intrinsically linked to the intricate interplay between macroeconomic variables, fiscal policy dynamics, and the relationship between budgetary revenues and expenditures. Unbiased, comprehensive, and accurate information is not only imperative for the formulation of budget plans but also crucial for the timely and effective implementation of fiscal policy measures [4].

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Forecasting errors, in many instances, exert adverse effects on various macroeconomic variables, with inflation holding a distinct position[1]. The literature underscores inflation as a significant factor contributing to inaccuracies in budget forecasts [5] [6] [7] [8] [9]. Maintaining inflation at a predictable and acceptable level is, therefore, imperative. Consequently, a comprehensive study addressing all facets of inflation becomes paramount.

Inflation's significance extends beyond its impact on budget forecasts to include its susceptibility to forecasting errors. Unrealistically prepared forecasts can have varied implications for inflation over the fiscal year. Exceeding budgeted expenditures may trigger an expansive effect in the market, leading to an inflationary upswing. Conversely, underspending in comparison to the planned budget may exert contractionary effects, mitigating inflation. Similar scenarios unfold in revenue forecasts, where surpassing anticipated revenue can curb inflation, while significantly falling short of forecasted revenue may contribute to an inflationary surge.

Especially in developing economies such as Turkey, dealing with inflation adds to the challenges already presented by structural issues, further complicating efforts to combat inflation. Therefore, among the measures required to tackle inflation, the prevention of forecast errors that intensify inflation becomes critically important.

The existing literature primarily focuses on the impact of inflation on budget forecast errors. This study conducted an analysis to examine the impact of budget forecasting errors in revenue and expenditure on inflation in Turkey. Considering diverse factors, including data availability, the study spans the period from 1975 to 2021. Due to the presence of a unit root problem in the dependent variable and autocorrelation issues among the variables, the Prais-Winsten regression model was employed in the study. The results indicates that an increase in expenditure forecasting error contributes to an inflationary effect. On the other hand, it did not identify a relationship between revenue forecast errors and inflation.

2. Materials and Methods

In numerous countries with emerging economies grappling with economic and political vulnerabilities, such as Turkey, the propensity for budget forecasts to exhibit inaccuracies is a recurrent phenomenon. The existing literature has extensively delved into the causes and consequences of these forecasting errors within the Turkish context, as evidenced by studies such as those conducted by Bağdigen (2002; 2005), Aslan and Bilge (2009), Özcan (2017), Özcan and Tosun (2014), Yılmaz (2019), Erdoğdu and Yorulmaz (2019), Ünsal et al. (2020), and Yaşa et al. (2020) [10-18]. Despite the comprehensive exploration of various aspects of forecasting errors, a notable gap exists in the literature, as none of these studies has undertaken an analysis to ascertain whether forecasting inaccuracies exert an influence on inflation dynamics. Recognizing this gap, the present study endeavors to contribute to the existing body of knowledge by specifically scrutinizing the impact of forecasting inaccuracies on inflation, thereby providing a nuanced understanding of this intricate relationship and enhancing the comprehensiveness of the literature on economic forecasting and inflation dynamics in Turkey.

The data in this study have been compiled from sources including the Central Bank of the Republic of Turkey, the Ministry of Treasury and Finance of Turkey, and the Presidency of Strategy and Budget. Information pertaining to the data is presented in the table below.

Table 1. Abbreviations and Explanations

Data	Abbreviation	Source	Explanation
Inflation	INF	The Central Bank	Annual inflation rate.
Expenditure Forecasting Error	EXP	The Ministry of Treasury and Finance	Current year expenditure forecasting error.
Revenue Forecasting Error	REV	And	Current year revenue forecasting error.

[1] Instances in which the government deviates from systematically planned budget forecasts are, of course, exceptions to this. For example, when a government seeks to engender an expansive or contractionary effect in the economy, straying from budget forecasts can yield results that are not adverse but, on the contrary, remedial in addressing issues.

Lagged Expenditure Forecasting Error	ELG	The Presidency of Strategy and Budget	Previous year expenditure forecasting error.
Lagged Revenue Forecasting Error	RLG		Previous year revenue forecasting error.

The calculation of errors has been methodically executed by assessing the ratio of the deviation amount of the actual outcomes from the forecasted values[2]. To further fortify the credibility of the interpretation of the relationship and the robustness of the analytical outcomes, the incorporation of data from the previous year has been deemed imperative. This strategic inclusion is motivated by the intention to avoid incongruence with existing studies in the literature that posit inflation as a consequence of forecasting errors. By incorporating data from the preceding year, the analysis aims to provide a comprehensive perspective on the temporal dynamics of the observed relationship, thereby ascertaining whether the impact of errors on inflation persists over a period longer than one year.

Prior to delving into the intricacies of the analyses, it is imperative to present a visual representation of the relationships between the pertinent data points. To this end, A table containing the data and a series of graphs have been meticulously crafted to illustrate the interplay and trends among the variables, laying a solid foundation for the subsequent analytical exploration.

Table 2. Inflation and Current and Prior Revenue & Expenditure Forecasting Errors in Turkey

PERIOD	INF	EXP	ELG	REV	RLG	PERIOD	INF	EXP	ELG	REV	RLG
1975	19.8	10.6	0.3	19.0	1.3	**1999**	68.8	2.7	4.6	3.9	8.1
1976	16.4	5.3	10.6	11.1	19.0	**2000**	39	0.4	2.7	1.7	3.9
1977	28	9.9	5.3	14.0	11.1	**2001**	68.5	40.0	0.4	4.3	1.7
1978	47.2	35.7	9.9	34.4	14.0	**2002**	29.7	14.9	40.0	5.1	4.3
1979	56.8	55.5	35.7	51.1	34.4	**2003**	18.4	1.6	14.9	1.7	5.1
1980	107.2	49.0	55.5	37.9	51.1	**2004**	9.3	7.1	1.6	5.4	1.7
1981	36.8	4.7	49.0	2.0	37.9	**2005**	7.72	6.8	7.1	9.1	5.4
1982	27	2.2	4.7	7.2	2.0	**2006**	9.65	2.8	6.8	7.8	9.1
1983	30.5	12.1	2.2	9.3	7.2	**2007**	8.39	0.3	2.8	0.7	7.8
1984	49.7	23.0	12.1	26.8	9.3	**2008**	10.06	1.6	0.3	1.8	0.7
1985	44.2	13.7	23.0	17.1	26.8	**2009**	6.53	3.0	1.6	14.1	1.8
1986	30.7	9.4	13.7	0.4	17.1	**2010**	6.4	2.1	3.0	7.0	14.1
1987	55.1	11.3	9.4	0.6	0.4	**2011**	10.45	0.1	2.1	5.4	7.0
1988	75.2	0.8	11.3	7.8	0.6	**2012**	6.16	2.5	0.1	0.1	5.4
1989	68.8	13.2	0.8	6.9	7.8	**2013**	7.4	0.1	2.5	3.9	0.1
1990	60.6	4.3	13.2	3.1	6.9	**2014**	8.17	1.3	0.1	4.1	3.9
1991	71.1	22.2	4.3	7.8	3.1	**2015**	8.81	5.6	1.3	5.4	4.1
1992	67.9	6.4	22.2	0.4	7.8	**2016**	8.53	1.4	5.6	1.1	5.4
1993	71.4	18.2	6.4	3.7	0.4	**2017**	11.92	3.8	1.4	4.0	1.1
1994	125.5	8.3	18.2	2.5	3.7	**2018**	20.3	6.6	3.8	7.0	4.0
1995	76	22.2	8.3	1.0	2.5	**2019**	11.84	3.0	6.6	1.7	7.0
1996	79.8	10.6	22.2	1.7	1.0	**2020**	14.6	8.5	3.0	7.5	1.7
1997	99.1	21.9	10.6	8.1	1.7	**2021**	36.08	15.5	8.5	27.3	7.5
1998	69.7	4.6	21.9	8.1	8.1						

[2] [(Actual-Forecast) / Forecast] * 100

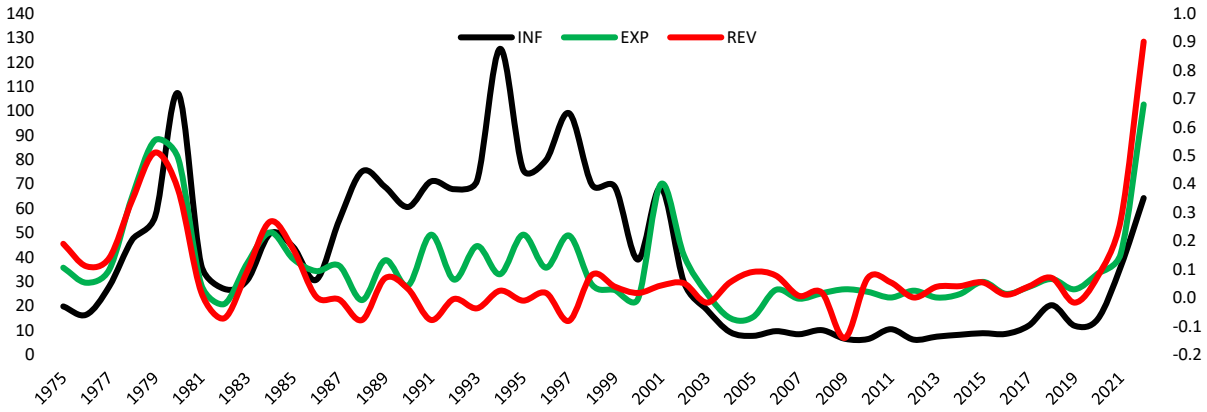

Figure 1. Inflation and Current Forecasting Errors

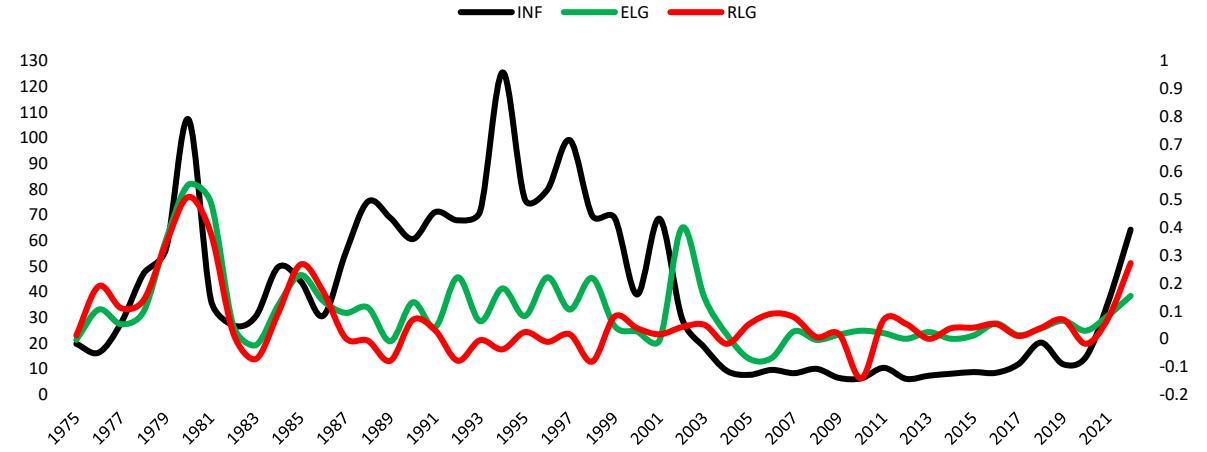

Figure 2. Inflation and Previous Year Forecasting Errors

The graphical representations elucidate a discernible correlation between the errors of both the current year and the previous year and the fluctuations in inflation. Notably, there are intervals where the errors of the current year exhibit a parallel movement with inflation, while in distinct instances, a discernable association is identified between the errors of the previous year and inflation. This variability can be attributed to the unique circumstances that Turkey undergoes during the specified period under investigation. The diverse factors contributing to economic instability in particular periods serve as the underlying cause for the observed dissimilarity in the graphical trends. However, beyond the graphical depiction of this phenomenon, it becomes imperative to bolster these observations econometrically. In doing so, a comprehensive understanding of the intricate dynamics governing the relationship between errors and inflation can be achieved, adding depth and rigor to the analytical framework of the study.

The data were subjected to regression analysis using the "**Stata 15**" software. The descriptive statistics of the data are presented in the table below.

Table 3. Descriptive Statistics

	INF	EXP	ELG	REV	RLG
Mean	39.17468	0.10783	0.104596	0.087681	0.082149
Median	30.5	0.066	0.064	0.054	0.054
Maximum	125.5	0.555	0.555	0.511	0.511
Minimum	6.16	0.001	0.001	0.001	0.001

Std. Dev.	31.05588	0.125474	0.126188	0.106692	0.10357
Skewness	0.786601	1.979992	2.010532	2.251743	2.489634
Kurtosis	2.785776	6.678169	6.742629	7.981393	9.286918
Jarque-Bera	4.936675	57.20369	59.09511	88.31234	125.957
Probability	0.084726	0	0	0	0
Sum	1841.21	5.068	4.916	4.121	3.861
Sum Sq. Dev.	44365.51	0.724209	0.732481	0.52363	0.493426
Observations	47	47	47	47	47

The unit root test results for the series are presented in the table below.

Table 4. Unit Root Tests Results

Phillips–Perron (PP) At Level						
		INF	**EXP**	**ELG**	**REV**	**RLG**
With Constant	t-Statistic	-2.2676	-4.1018	-4.25	-2.6424	-3.5588
	Prob.	0.1865	0.0024***	0.0015***	0.0921*	0.0106**
With Constant & Trend	t-Statistic	-2.8841	-5.6357	-7.6201	-2.472	-4.0718
	Prob.	0.1769	0.0001***	0.0000***	0.3399	0.0129**
Without Constant & Trend	t-Statistic	-1.1061	-3.1139	-3.0946	-2.6652	-2.6358
	Prob.	0.24	0.0025***	0.0027***	0.0088***	0.0095***
Phillips–Perron (PP) At First Difference						
		INF	**EXP**	**ELG**	**REV**	**RLG**
With Constant	t-Statistic	-9.5351	-12.7746	-14.9941	-6.0448	-9.6773
	Prob.	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
With Constant & Trend	t-Statistic	-9.4945	-12.5259	-14.6721	-6.5291	-10.112
	Prob.	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
Without Constant & Trend	t-Statistic	-9.6579	-13.2935	-15.1813	-6.2718	-9.4968
	Prob.	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
Augmented Dickey–Fuller (ADF) At Level						
		INF	**EXP**	**ELG**	**REV**	**RLG**
With Constant	t-Statistic	-1.828	-4.0716	-4.1397	-3.8095	-3.934
	Prob.	0.3626	0.0026***	0.0021***	0.0055***	0.0044**
With Constant & Trend	t-Statistic	-3.0603	-4.7305	-4.9557	-4.2136	-3.8306
	Prob.	0.1279	0.0022***	0.0011***	0.0091***	0.0259**
Without Constant & Trend	t-Statistic	-0.9642	-1.5535	-1.2862	-1.5969	-2.2738
	Prob.	0.2944	0.1118	0.1799	0.103	0.0238**
Augmented Dickey–Fuller (ADF) At First Difference						
		INF	**EXP**	**ELG**	**REV**	**RLG**
With Constant	t-Statistic	-9.1081	-8.0672	-7.2382	-6.8915	-6.7717
	Prob.	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
With Constant & Trend	t-Statistic	-9.0428	-7.9605	-7.1674	-6.8764	-6.6752
	Prob.	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
Without Constant & Trend	t-Statistic	-9.2125	-8.156	-7.3304	-6.9821	-6.8504
	Prob.	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***

Note: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%.

* MacKinnon (1996) one-sided p-values [19].

Due to the non-stationarity of the dependent variable, inflation, and the presence of autocorrelation issues among the variables, it was decided to use the Prais-Winsten regression in the study. The Prais-Winsten model is considered the most suitable regression model for datasets containing non-stationary variables and error terms exhibiting changing variance and autocorrelation in the literature.[20-39]

The Prais-Winsten method is an enhanced version of the Cochrane-Orcutt regression method. In this method, instead of using the Ordinary Least Squares method to estimate the parameters of the regression, the Generalized Least Squares method is applied, assuming that errors follow a first-order autoregressive process. Unlike the Cochrane-Orcutt method, the Prais-Winsten model is able to preserve the first observation and prevent the loss of one of the observations (Prais and Winsten, 1954). Given the relatively small number of observations in the study and its more advanced nature, this method has been deemed appropriate for preference.

The method in question overcomes autocorrelation by considering the "rho" value and error correlation coefficient, and it performs a transformation based on the difference between the original value and the rho value and lag value or previous value, obtaining a new value free from autocorrelation issues through specific calculations while taking the first observation into account to obtain a general observation of the sample. Whether the model eliminates autocorrelation is measured by the Durbin-Watson statistic. A value approaching 2 indicates that autocorrelation issues have been addressed.

Following deciding on the model to be used, the regression analysis was conducted. In the analyses, inflation was modeled as the dependent variable, while revenue and expenditure forecasting errors, along with their one-period lagged forms, were included as independent variables in the model. The results of the regression analysis are presented in the table below.

Table 5. Prais-Winsten Regression Analysis Results

INF	Coefficient	Standard Error	t	P>t	[95% Conf.	Interval]
EXP	99.92515	35.48951	2.82	0.007***	28.35372	171.4966
ELG	64.55501	35.98199	1.79	0.080*	-8.00959	137.1196
REV	26.66801	45.80905	0.58	0.564	-65.71475	119.0508
RLG	-2.816602	49.40126	-0.06	0.955	-102.4437	96.81053
rho			0.6376967			
Durbin-Watson statistic (original)			0.761675			
Durbin-Watson statistic (transformed)			1.817363			
Number of Observations			47			
F (4, 43)			7.83			
Prob > F			0.0001			
R-squared			0.4213			
Root MSE			19.741			

(*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%
*MacKinnon (1996) one-sided p-values [19].

As can be seen from Table 4, the (p) and R^2 values indicate the validity of the established model. The Durbin-Watson statistic approaching 2 demonstrates that autocorrelation issues have been resolved in the model.

Based on the findings derived from the statistical analysis, it is discerned that EXP and ELG exhibit a statistically significant impact. Notably, errors in forecasting expenditure manifest considerable effects on the inflationary dynamics. Considering that EXP is significant at the 1% level and ELG is significant at the 10% level, it is observed that the current year's expenditure forecast error is much more effective than the previous year's forecast error on inflation. When we look at the revenue forecast error, it is

understood that both the current year's and the previous year's forecast errors have no impact on inflation.

When consolidating these outcomes, it becomes evident that the observed relationship between forecasting errors and inflation conforms to theoretical expectations. Specifically, in the context of Turkey, the proclivity for expenditure forecasting errors to predominantly manifest as *higher-than-anticipated expenditures* frequently precipitates inflationary outcomes, owing to the expansive impact of public expenditures on the economy. Indeed, the evidence attests that in Turkey, expenditure forecasting errors exhibit an inflationary proclivity. Moreover, both current-year and prior-year forecasting errors exhibit an equivalent effect on inflation, suggesting a sustained influence persisting for a minimum of two years.

Assessing the econometric robustness of the model, it is ascertained that both the P-value, R-Squared value, and Root MSE value attain statistically commendable levels. Furthermore, as elucidated earlier, the coefficients of the variables align with the extant theoretical literature and yield statistically significant results. Nevertheless, to assert the successful establishment of the model, various additional tests necessitate undertaking. The outcomes of the multicollinearity test conducted for this purpose are delineated in the tables immediately succeeding the correlation matrix table below.

Table 6. Correlation Matrix

	INF	EXP	ELG	REV	RLG
INF	1				
EXP	0.5175	1			
	0.0002				
ELG	0.4456	0.4474	1		
	0.0017	0.0016			
REV	0.1783	0.7373	0.3795	1	
	0.2306	0.0000	0.0085		
RLG	0.1882	0.4900	0.7523	0.5776	1
	0.2053	0.0005	0.0000	0.0000	

Table 7. Multicollinearity Tests Results

Variable	VIF	1/VIF
REV	3.03	0.330521
EXP	2.70	0.370293
RLG	2.50	0.399413
ELG	2.39	0.418703
Mean VIF		2.65

As can be observed from Table 6, the results of the Multicollinearity (VIF) test indicate that there is no issue of multicollinearity in the model. This is evident as none of the values in the first column exceed 10, and none of the values in the second column are below 0.10.

3. Conclusion

The state budget stands as a paramount document within modern economies, and particularly in developing and deemed fragile economies like Turkey. It is acknowledged as a critical instrument due to its role in guiding economic decisions and shaping the fiscal landscape of the future. The forecasts embedded in the budget, beyond being a reflection of the economic outcomes of the past period, assume the character of a guiding document providing insights into the contours of the forthcoming economic landscape. Functioning as a guiding beacon for economic decision-makers, the budget is heavily influenced by the prevailing economic conjuncture and economic indicators. Consequently, the

budget, viewed as an outcome of these factors, concurrently serves as an instrument for addressing certain challenges that arise within the economic conjuncture and economic indicators.

In this context, the budget, influenced by the economic environment and indicators, becomes an indispensable tool for resolving various issues. Notably, the achievement of this resolution is often realized through the medium of forecasts embedded within the budget.

Although budget forecasts are heavily influenced by macroeconomic indicators, it is crucial to recognize that these forecasts also exert an impact on the indicators themselves. The significance of this impact becomes more pronounced, particularly when budget forecasts yield inaccurate results. This reciprocal relationship between budget forecasts, macroeconomic indicators and economic conjuncture is a natural outcome. Indeed, the utilization of the budget as a tool to influence macroeconomic indicators, as mentioned above, is reflective of the inherent characteristic and scope of its impact.

The inherent relationship between budget forecasts and macroeconomic indicators underscores the intricate interplay between these elements. Furthermore, when budget forecasts are inaccurately realized, the repercussions reverberate through the macroeconomic landscape, influencing economic indicators and the overall economic conjuncture. This dynamic interaction exemplifies the multifaceted nature of the budget, extending beyond its role as a predictive tool to a more active participant in shaping the economic landscape.

In the context of this study, the aforementioned scenario has been examined within the scope of Turkey for the period spanning from 1975 to 2021. The selection of this timeframe is primarily predicated upon the economic robustness of the data and its econometric validity, coupled with the frequency of publication. The consideration of this timeframe is contingent upon the availability of data reflecting the economic health and the econometric soundness, in addition to the regularity of publication.

To undertake this analysis, diverse datasets sourced from various official channels were compiled, and a rigorous examination of these data ensued through the application of the regression method. This analytical approach was chosen to discern and interpret the intricate relationships between budgetary forecasting errors and their subsequent impact on inflation within the specified temporal framework.

Within the analysis, inflation has been modeled as the dependent variable, while forecasting errors in income and expenditure for both the current year and the preceding year have been modeled as independent variables. The statistical analysis reveals that expenditure forecasting errors yielded significant results in the model. The analysis results have shown that while the forecast errors of current year and past year expenditure have an inflation-enhancing effect, both the forecast errors of current year revenue and the forecast error of the previous year's revenue have no impact on inflation.

The observed relationship aligns with theoretical expectations, indicating that expenditure forecasting errors tend to drive inflation in Turkey due to higher-than-anticipated expenditures' impact. The weaker but still significant and effective impact of the forecast error in expenditure from the previous year compared to the forecast error in expenditure for the current year demonstrates that the effect of expenditure forecast errors on inflation begins to decrease after one year.

In summary, the analysis results indicate that forecasting errors, consistent with theoretical expectations, exert a significant influence on inflation in Turkey. In this study, this phenomenon has been analyzed with a one-year lag. However, the significance of the lagged values emerging even after one year suggests that the relationship persists for a minimum of two years. Considering this inference, it is believed that conducting analyses with additional lagged values in future studies will contribute significantly to the literature.

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References

[1] P. Ulla, "Assessing Fiscal Risks through Long-Term Budget Projections," OECD Journal on Budgeting, vol. 6, no. 1, pp. 127-187, 2006.

[2] W. J. Stevenson, Operations Management, 11 ed., New York: The McGraw-Hill Irwin, 2012.

[3] T. Leal, J. J. Pérez, M. Tujula and J.-P. Vidal, "Fiscal Forecasting: Lessons from the Literature and Challenges," Fiscal Studies, vol. 29, no. 3, p. 347–386, 2008.

[4] V. Botrić and M. Vizek, "Forecasting Fiscal Revenues in a Transition Country: The Case of Croatia," Zagreb International Review of Economics & Business, vol. 15, no. 1, pp. 23-36, 2012.

[5] W. M. Gentry, "Do State Revenue Forecasters Utilize Available Information?," National Tax Journal, vol. 42, no. 4, pp. 429-439, 1989.

[6] C. M. Allan, "Fiscal Marksmanship, 1951-1963," Oxford Economic Papers, vol. 17, no. 2, pp. 317-327, 1965.

[7] A. Afonso and J. Silva, "The Fiscal Forecasting Track Record of the European Commission and Portugal," ISEG Economics Working Paper No. 37/2012/DE/UECE, Lisbon, 2012.

[8] L. Sedmihradská and A. Čabla, "Budget Accuracy in Czech Municipalities and the Determinants of Tax Revenue Forecasting Errors," Ekonomická revue - Central European Review of Economic Issues, vol. 16, no. 4, p. 197–206, 2013.

[9] J. Aizenman and R. Hausmann, "The Impact of Inflation on Budgetary Discipline," Journal of Development Economics, vol. 63, no. 2, p. 425–449, 2000.

[10] M. Bağdigen, "How Accurate is Revenue Forecasting in Turkey? An Empirical Analysis," Yapi Kredi Economic Review, vol. 13, no. 2, pp. 29-37, 2002.

[11] M. Bağdigen, "An Empirical Analysis of Accurate Budget Forecasting in Turkey," Doğuş Üniversitesi Dergisi, vol. 6, no. 2, pp. 190-201, 2005.

[12] M. Aslan and S. Bilge, "Türkiye de 1950 2006 Döneminde Bütçe Gelir Gider Yönetimi Üzerine Ampirik Bir Çalışma: Tek Parti ve Koalisyon Hükümetlerinin Karşılaştırması," Süleyman Demirel Üniversitesi İktisadi ve İdari BilimlerFakültesi Dergisi, vol. 14, no. 3, pp. 265-288, 2009.

[13] S. Özcan, "Türkiye'de 1924-2012 Yılları Arası Genel Bütçe Gelir ve Gider Tahminlerinin Doğruluğunun Değerlendirilmesi," Gazi Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, vol. 19, no. 2, pp. 701 - 724, 2017.

[14] S. Özcan and M. Tosun, "MilliEğitim Bakanlığı Bütçe Tahminlerinin Doğruluk İlkesi Açısından Değerlendirilmesi," Sosyoekonomi, vol. 22, no. 22, pp. 367-384, 2014.

[15] E. Yılmaz, "Vergi Gelirlerinin Tahminlenmesine Yönelik Ekonometrik Model," Vergi Dünyası, vol. 449, pp. 38-47, 2019.

[16] H. Erdoğdu and R. Yorulmaz, "Comparison of Tax Revenue Forecasting Models for Turkey," in 34. International Public Finance Conference , Antalya, 2019.

[17] H. Ünsal, A. Çalışkan, D. Koçak and Y. Ertürk, "Kamu Mali Yönetimi Kapsamında Çok Değişkenli Gri Tahmin Modeli ile Vergi Gelirleri Tahmini," Mehmet Akif Ersoy Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, vol. 7, no. Özel Sayı, pp. 1104-1120, 2020.

[18] A. A. Yaşa, S. Şanlısoy and A. Özen, "Bütçe Tutarlılığı ile Politik İstikrarsızlık İlişkisi: Türkiye'de 1984- 2018 Dönemi Analizi," Sosyoekonomi, vol. 28, no. 44, pp. 337-354, 2020.

[19] J. G. MacKinnon, "Numerical Distribution Functions for Unit Root and Cointegration Tests," Journal of Applied Econometrics, vol. 11, no. 6, pp. 601-618, 1996.

[20] E. Mehic, S. Silajdzic and V. Babic-Hodovic, "The Impact of FDI on Economic Growth: Some Evidence from Southeast Europe," Emerging Markets Finance and Trade, vol. 49, no. Supplement 1: Domestic and Global Policy Issues in Emerging Economies (January–February 2013), pp. 5-20, 2013.

[21] G. Önder and Z. Karal Önder, "Determinants of Foreign Direct Investments Outflow From a Developing Country: the Case of Turkey," Business Management and Education, vol. 11, no. 2, pp. 241-255, 2013.

[22] A. Thomas, L. Spataro and N. Mathew, "Pension funds and stock market volatility: An empirical analysis of OECD countries," Journal of Financial Stability, vol. 11, pp. 92-103, 2014.

[23] N. Beck and J. N. Katz, "What to do (and not to do) with Time-Series Cross-Section Data," The American Political Science Review, vol. 89, no. 3, pp. 634-647, 1995.

[24] J. J. D. Langoyan and N. S. Ereno, "On the Efficiency of the Cochrane-Orcutt and Prais-Winsten Regression for AR (1) Model," in Proceedings 2nd ISI Regional Statistics Conference, Indonesia, 2017.

[25] H. Bimanto, H. B. Notobroto and S. Melaniani, "Application of the Prais Winsten Method in Overcoming Autocorrelation on Life Expectation Factors," Jurnal Biometrika dan Kependudukan, vol. 12, no. 1, pp. 32-40, 2023.

[26] E. Canjels and M. W. Watson, "Estimating Deterministic Trends in the Presence of Serially Correlated Errors," The Review of Economics and Statistics, vol. 79, no. 2, p. 184–200, 1997.

[27] D. V. Vougas, "Prais–Winsten Algorithm for Regression with Second or Higher Order Autoregressive Errors," Econometrics, vol. 9, no. 3, 2021.

[28] K. R. Fabrizio, "Institutions, Capabilities, and Contracts: Make or Buy in the Electric Utility Industry," Organization Science, vol. 23, no. 5, pp. 1264-1281, 2012.

[29] A. K. Jorgenson and B. Clark, "Are the Economy and the Environment Decoupling? A Comparative International Study, 1960–2005," American Journal of Sociology, vol. 118, no. 1, pp. 1-44, 2012.

[30] C. Bottomley, M. Ooko, A. Gasparrini and R. Keogh, "In praise of Prais-Winsten: An Evaluation of Methods Used to Account for Autocorrelation in Interrupted Time Series," Statistics in Medicine, vol. 42, no. 8, pp. 1277-1288, 2023.

[31] R. Engle and J. G. Rangel, "The Spline-GARCH Model for Low-Frequency Volatility and Its Global Macroeconomic Causes," The Review of Financial Studies, vol. 21, no. 3, pp. 1187-1222, 2008.

[32] B. Falk and A. Roy, "Forecasting Using the Trend Model with Autoregressive Errors," International Journal of Forecasting, no. 21, p. 291 – 302, 2005.
[33] P. Mishra, "Forecasting Natural Gas Price - Time Series and Nonparametric Approach," in World Congress on Engineering, London, 2012.
[34] L. Bernardelli and G. H. de Castro, "Stock Market and Macroeconomic Variables: Evidence for Brazil," Revista Catarinense da Ciência Contábil, vol. 19, pp. 1-15, 2020.
[35] R. Fried and U. Gather, "Robust Trend Estimation for AR(1) Disturbances," Austrian Journal of Statistics, vol. 34, pp. 139-151, 2005.
[36] S. T. Akhter and H. Imran, "Geopolitics of International Relations for Pakistan, US Political Regimes and the US Bilateral Aid to Pakistan," GSTF Journal of Law and Social Sciences, vol. 4, no. 8, 2014.
[37] C. Anderson, Yayınlanmamış Doktora Tezi, 2021.
[38] R. Çelik, A. Keskin, and A. Keskin, "Türkiye'de Ekonomik Büyüme, İşsizlik ve Enflasyonun Kayıt Dışı İstihdam Üzerindeki Etkisi: ARDL Sınır Testi Yaklaşımı", *Journal of Social Policy Conferences*, no. 80, pp. 451–474, July 2021.
[39] M. A. Lapré and N. Tsikriktsis, "Organizational Learning Curves for Customer Dissatisfaction: Heterogeneity Across Airlines," Management Science, vol. 52, no. 3, pp. 352-366, 2006.