A Work Project, presented as part of the requirements for the Award of a Master's degree in **Economics** from the Nova School of Business and Economics.

Assessment of Hyperinflation in Turkey: A Comparative Study of Normal and Augmented Taylor Rules

João António Sousa Pinto

Work project carried out under the supervision of:

Miguel de Lebre Freitas

20/12/2023

Abstract

This study looks into Turkey's hyperinflation crisis, which is marked by a worrisome inflation rate that exceeded 60% in 2023. It particularly tests if the Central Bank of Turkey comply with the modified Taylor Rule amid the factors like COVID-19, political unrest, and the Global Financial Crisis of 2008. Using the quarterly data which spans over 2000Q1 to 2022Q4, this study finds that monetary policy in Turkey is aberrant from what is predicted by the Taylor rule. The study's findings are crucial for formulating nuanced monetary policies that balance price stability with economic growth.

Keywords

Taylor Rule; Turkish Central Bank; Inflation Gap; Output Gap; monetary policy; economic growth;

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

Table of contents

1. Introduction

The investigation into hyperinflation in Turkey aims to dissect the intricate web of economic, fiscal, and governmental factors propelling the rapid surge in prices and currency devaluation, delineating its profound impact on citizens' livelihoods and societal structures. This inquiry seeks to unravel the root causes behind this destabilizing economic phenomenon. While, also evaluating the repercussions on various socio-economic segments, international relations, and global financial stability. The ultimate goal is to devise actionable insights and potential solutions to address Turkey's hyperinflation crisis, considering multifaceted strategies encompassing monetary reforms, policy adjustments, and potential international cooperation for stabilization.

The aim of the study is to thoroughly investigate the hyperinflation in Turkey. By aligning investigation objectives, a comprehensive analysis of hyperinflation in Turkey can be conducted, enabling a nuanced understanding of its causes, impacts, and potential pathways towards stabilization and recovery. Following are the key objectives of this study:

- To examine the if central bank of Turkey follows augmented or normal Taylor rule
- To determine the additional factors that causes the hyperinflation in Turkey.
- To determine if GFC (2008), political turbulence and COVID 19 has impact on hyperinflation in Turkey.

The ongoing inflation crisis in Turkey, with an inflation rate of 61.98% in November 2023 and the central bank's expectation of 65% year-end inflation for 2023, underscores the challenges faced by the country's monetary policymakers. According to the Taylor Rule, central banks typically adjust interest rates in response to deviations of inflation from the target and the output gap. In Turkey's case, the substantial and persistent inflationary pressures have likely prompted the central bank to consider aggressive monetary policy measures. The rule suggests that a central bank might respond to high and rising inflation by raising interest rates to combat inflationary pressures and stabilize the economy. However, the effectiveness of this approach could be constrained by various factors, including external economic conditions and the central bank's credibility. Moreover, the anticipation of continued high inflation rates for 2024, at 36%, suggests that the central bank faces a complex trade-off between stabilizing prices and supporting economic growth. The central bank's challenge is further exacerbated by external factors, such as elevated food and energy import prices, which can amplify inflationary pressures beyond domestic control. In light of these circumstances, the central bank's policy decisions will be closely scrutinized and may require a nuanced approach that goes beyond the traditional Taylor Rule framework to address the unique challenges presented by Turkey's inflationary environment.

This study brings value through its comprehensive exploration of hyperinflation in Turkey, incorporating historical, theoretical, and empirical dimensions. By synthesizing diverse theoretical frameworks, the research offers a nuanced understanding of the intricate dynamics driving hyperinflation. Furthermore, the study's examination of the Taylor Rule, particularly its adaptation to include the exchange rate as results of Clarida, Galí, and Gertler (2002) underscore that incorporating exchange rate deviations into the Taylor rule can enhance overall macroeconomic performance and exchange rate also reflects a contemporary engagement with ongoing economic models, addressing the unique challenges posed by hyperinflation in Turkey. The interdisciplinary approach and comparative analyses contribute to bridging gaps in existing research, making the findings relevant for policymakers and academia alike. In essence, this study significantly enhances our understanding of hyperinflation in Turkey and provides practical insights for effective policy responses to foster economic stability and development in the country.

The study is organized into sections: Section 2 discusses the paper's literature review. Section 3 presents the empirical approach, Section 4 discusses results and analysis, and Section 5 presents conclusions by discussing the findings, restrictions, and recommendations.

2. Literature Review

The literature on hyperinflation in Turkey reveals a multifaceted and dynamic field of study. Turkey has historically experienced periods of hyperinflation, prompting researchers to investigate various aspects of this economic phenomenon. Scholars have investigated the historical context of Turkey's hyperinflation, identifying key factors such as fiscal policies, external imbalances, and political instability as contributors to inflationary pressures. In the Turkish context, theoretical frameworks such as the quantity theory of money, inflation targeting, and the Phillips curve have been used to examine the relationships between money supply, inflation, and economic output. Furthermore, the literature has investigated the effectiveness of central bank policies, the impact of hyperinflation on economic indicators, and policy recommendations to mitigate its negative effects. This review underscores the breadth of research contributing to our understanding of hyperinflation in Turkey and highlights the complexity of addressing this economic challenge.

Transitioning to theoretical frameworks, the Quantity Theory of Money, Inflation Targeting, and the Phillips Curve are crucial lenses for understanding hyperinflation dynamics. Based on the equation of exchange, the Quantity Theory of Money proposes a direct relationship between the money supply and the price level, providing insights into the role of monetary factors in inflation (Barone, 2022). Inflation targeting, on the other hand, is a deliberate central bank strategy in which explicit inflation targets are set and monetary policy is adjusted to achieve and maintain those targets. This framework takes a forward-thinking approach, emphasizing the importance of having clear objectives when it comes to controlling inflation. The Phillips Curve, which depicts the trade-off between inflation and unemployment, provides insight into an economy's short-run dynamics, implying that policymakers must choose between these two variables. A study conducted by Uslu and Karahan (2018) examine the Phillips curve in the Turkish economy (1996-2016) using the Bound test and the ARDL method. Co-integration is confirmed, indicating that unemployment has a significant long-term negative impact on inflation. While the effects are limited in the short run, a distinct inflation-unemployment trade-off emerges in the long run. The Kalman Filter model shows that the impact of unemployment on inflation has increased significantly since 2002, coinciding with the implementation of the inflation targeting regime.

Moreover, over the last decade, there has been a significant increase in studies evaluating the Taylor Rule's relevance to the Turkish economy. Researchers such as Berument and Taşç (2004), Yazgan and Ylmazkuday (2007), Adanur-Aklan and Nargelecekenler (2008), and others have used various econometric methodologies throughout various time periods to prove the Taylor Rule's applicability in Turkey. Their research intended to ascertain the rule's efficacy in directing monetary policy decisions. Kesriyeli and Yalcin (1998), and Us (2004, 2007) on the other hand, found limited evidence supporting the Taylor Rule's validity in the Turkish setting. According to Kesriyeli and Yalcin (1998), the Taylor Rule may be better appropriate for countries with low inflation rates. Recent studies have broadened its scope by including the exchange rate into the Taylor Rule framework. Lebe and Bayat (2011), Yaprakli (2011), Uslu and Özçam (2014), and others have extended the Taylor Rule by incorporating the currency rate into the policy reaction function. Furthermore, Bulut (2017) explored how the Central Bank of Turkey responded to asset price variations following the global crisis, discovering that, while the stock market index had limited statistical significance, the exchange rate had a critical influence in interest rate adjustments.

2.1 Recent Path of Turkey

After 1980, Turkey began implementing externally focused economic strategies aimed at liberalization. Within the framework of the economic stabilization program, which went into effect on January 24, 1980, practices to encourage foreign capital and exportation were implemented, price controls were lifted, a flexible exchange rate regime was adopted, the Turkish Lira was devalued, and a strict fiscal policy was started. Imports were liberalized within this framework (Oktayer, 2010). Therefore, fluctuations in supply-demand balance of foreign exchange can lead to inflation and devaluation. Countries use interest rates to minimize negative consequences of such impacts. Changes in interest rates may lead to various changes in exchange rates based on country's exchange rate regime (Kaygisiz & İşcan, 2019). The Central Bank influences inflation through various channels. One fundamental instrument frequently employed to guarantee price stability is the interest rate. Within the framework of initiatives intended to control inflation, monetary policies of nations are developed in accordance to control the inflation (Bernanke & Mishkin, 1997). Future inflation targets are determined in order to reduce uncertainties and foster positive expectations that are not influenced by past or current rates.

One of the primary features of the Turkish economy since the 1980s is the persistently high inflationary environment that governs the behavior of all other economic aggregates. In contrast to comparable developing economies, these phenomena have not been well addressed, and this process is also accompanied by an uncertain macroeconomic growth performance (Saatcioglu & Korap, 2006). In 1989, complete capital liberalization and a notable surge in foreign capital influx into the nation occurred. Between 1989 and 1990, the real exchange rate appreciated in value at a pace of about 15-20% (Sahin & Dereli, 2019). But after 1989, financing policies that relied on high interest rates, artificially high exchange rates, and short-term capital inflows exposed the economy to a catastrophic crisis in 1993 that was followed by volatility in financial markets and exchange rates. In 1994, the Turkish economy plunged into the crisis with a high current account deficit and serious public deficits (Ülgen, 2005). The consumer price index rose to 115% in 1980 and subsequently to 125% in 1994 when a crisis broke out, having been consistently below 20% until 1977 in the pre-1980 period (Kalayci, 2002). To maintain economic stability, the Economic Measures Implementation Plan was implemented on April 5, 1994. This plan aimed to reduce the inflation rate, which had reached to 120%, down to manageable levels in the short term; and restoring the equilibrium of the financial system and exchange rates, and, in the medium term, fostering sustainable growth by offering a long-term solution to the public debt and current account deficit. In 1995, within the framework of the agreement signed with IMF, it was intended to increase the foreign currency basket by anticipated monthly inflation rates (Central Bank of the Republic of Turkey, 2013). Some encouraging developments were made in 1994 and 1995 as a result of these actions. However, the stabilization program introduced in 1994 could not achieved lasting success and the country's economy went through a new shrinkage due to negative effects of the Asian and Russian crisis in 1998 (Yeldan, 2003). In 1999, a stand-by agreement was signed with IMF aiming to secure a solution. Furthermore, the goal of combating inflation in the economy gained prominence with the implementation of the three-year "Inflation reduction program" (Oktayer, 2010). The goal of the exchange rate anchor-based inflation reduction program was to lower inflation by 25% by the end of 2000, 12% by the end of 2001, and 7% by the end of 2002. Up to November 2000, the Turkish economy saw a successful implementation of the Inflation Reduction Program. During this time, the nation's domestic demand showed an upward trend, output volume increased, and public finance maintained budgetary discipline. As a result, the non-interest surplus objective was exceeded. Nevertheless, in spite of these encouraging advancements, the initiative fell short of its ultimate inflation goals. The CPI fell from 67% to 38% in 2000, yet it was still over the target.

A new program named the "Transition to a Strong Economy Program" was launched in 2001, marking the beginning of a new era in the Turkish economy following the end of the country's economic crisis (Stoupos et al., 2023). Investors' investment risks were reduced by the Turkish economy's growth, political stability, and the stabilization of interest rates and inflation. As a result, investors felt sufficiently protected regarding the discounted rates of their future cash flows and their potential returns. The Central Bank adopted an open inflation targeting strategy at the end of 2005. Following 2006, Turkey was negatively impacted by events in the world economy. Turkish capital outflows were mostly caused by changes in global capital circumstances that favored emerging nations. The analysis of the years 2006–2018, when open inflation targeting was first implemented shows that the targets have not been achieved, except for the years 2009 and 2010. The Turkish Central Bank began utilizing new instruments to combat inflation. With the effect of foreign and domestic political changes, socio-political and global economic factors encountered after this period which contributed to the inflation that peaked in 2017 at 11.9% and in 2018 at 20.3%, the highest levels in the previous 15 years (Fenira, 2014). Since 1980, Turkey has faced high and fluctuating inflation. Despite the implementation of several stabilization programs over the years the World Bank estimates that Turkey's inflation rate is 72.3%. As of FY 2022. These programs only provided temporary relief, inflation has remained a major aspect of the Turkish economy (Papi & Lim, 1997).

Due to current economic circumstances, reporting organizations in Turkey must now abide by the guidelines provided in IAS 29 "Financial Reporting in Hyperinflationary Economies". In light of this, all organizations that must report on an interim or annual basis by June 30, 2022, or later, must include this Standard in their financial statements. With Turkey included, there are currently eleven nations worldwide where IAS 29 should be used when firms declare they are fully compliant with IFRS as of the publishing date. These countries are: Iran, Argentina, South Sudan, Lebanon, Sudan, Syria, Suriname, Turkey, Yemen, Venezuela and Zimbabwe.

The Standard enumerates the signs of a hyperinflationary economy. When cumulative inflation over a three-year period reaches or exceeds 100%, it is one of the markers of hyperinflation. The International Practices Task Force (IPTF) of the Centre for Audit Quality (CAQ) in the US independently determined that Turkey has hyperinflationary economy.

3. Empirical Analysis approach

3.1 Research Hypothesis

The study posits the following hypotheses, these hypotheses form the foundation for an in-depth examination of the Central Bank of Turkey's approach to interest rate determination, especially concerning the potential impact of hyperinflation on its policy strategies.

H_1: The Central Bank of Turkey consistently follows the augmented Taylor Rule for establishing interest rates.

H_2: The coefficients linked to hyperinflation variables in the augmented Taylor Rule exhibit statistical significance, implying a customized response to hyperinflationary conditions.

H_3: Interest rates obtained from the augmented Taylor Rule significantly differ from those determined by the traditional Taylor Rule, indicating distinct policy responses to hyperinflation.

H_4: There exists a statistically significant relationship between the Global Financial Crisis (GFC) of 2008, political turbulence, and the COVID-19 pandemic as factors affecting hyperinflation variables.

3.2 Econometric Model

The research incorporated both the standard Taylor Rule and an augmented version to evaluate the influence of hyperinflation on interest rates. The central focus of this study is to examine the approach taken by the Central Bank of Turkey in shaping its interest rate policies, specifically whether it adheres to the conventional Taylor Rule or employs an adapted version tailored to its unique circumstances. To achieve this objective, a comparative analysis is conducted, considering interest rates calculated from both models, while also taking into account the impact of significant economic shocks such as the Global Financial Crisis (GFC) of 2008, political turbulence, and the COVID-19 pandemic. This comprehensive assessment provides a deep understanding of the Central Bank's decision-making processes in the face of hyperinflation. The research design is thoughtfully designed to unveil the intricacies of applying monetary policy rules in a high inflation environment, thereby contributing valuable insights to the broader discourse surrounding economic policymaking.

Normal Taylor Rule

The Taylor Rule, developed by economist Taylor (1993), serves as a guiding concept for monetary policy, defining proposed interest rate modifications based on current economic conditions. The rule, which is widely accepted and implemented, provides a framework for central banks to respond to changes in inflation and output. The Taylor Rule's fundamental expression along with economic shock is as follows:

$$i_t = r + p\pi_t(\pi_t - \pi *) + py_t(y_t - y *) + \mathrm{dummy.GFC} + \mathrm{dummy.political\_stability} + \mathrm{dummy.Covid19} + \in_t$$

Here, i_t denotes the central bank's set interest rate, r represents the natural rate of interest. It is the interest rate that would prevail in the economy in the long run if there were no inflation or output gaps, $\pi *$ is the expected inflation rate, y_t -y* characterizes the output gap, and π_t- π* signifies the inflation rate gap. This rule provides a systematic approach for monetary authorities to navigate economic conditions through interest rate adjustments.

Modified Taylor Rule

The enhanced or modified Taylor Rule is an economic model used by central banks to guide monetary policy. It expands on economist John B. Taylor's original Taylor Rule, which provides a guideline for modifying interest rates based on inflation and production shortfalls. To provide a more comprehensive framework for central banks to make interest rate decisions, the augmented Taylor Rule integrates other variables such as currency rates or financial indices. The modified Taylor Rule is anticipated to include characteristics specific to the Turkish economy in the context of analyzing hyperinflation in Turkey, giving policymakers a more sophisticated approach to managing inflationary pressures. Taylor (1993) proposed an alternative monetary policy rule with a dynamic pattern, as well as a strategy for putting such rules into practice. As a result, it is appropriate to begin by delving into the details of his suggested monetary policy reaction function before going into his proposals for the qualities of a rule and how it should be implemented. In addition to this, Kesriyeli and Yalcin (1998) and Ongan (2004) investigated the applicability of the Taylor Rule to the Turkish economy. Despite looking at the same timeframe, Kesriyeli and Yalcin (1998) determined that the rule might not be sufficient for reducing inflation in Turkey. On the other hand, Ongan (2004) proposed that the Taylor Rule is useful in the context of the Turkish economy. These varied opinions highlight the complexities of tailoring monetary policy frameworks to individual economic conditions and add vital insights to the current debate over the Taylor Rule's usefulness in the Turkish environment. Incorporating data from studies such as Kesriyeli and Yalcin (1998) and Ongan (2004) deepens the discussion and provides a more comprehensive view of the problems.

The augmented Taylor Rule constructed for the study is represented by the following equation:

$$\begin{aligned} i_t = r + p\pi_t * (\pi_t - \pi *) + py_t * (y_t - y *) + \beta_1(x_1 - x_1 *) + \beta_2(x_2 - x_2 *) \\ + \beta_3(x_3 - x_3 *) + \beta_4(x_4 - x_4 *) + \beta_5(x_5 - x_5 *) + \beta_6(x_6 - x_6 *) \\ + \beta_7(x_7 - x_7 *) + \beta_8(x_8 - x_8 *) + \text{dummy.GFC} \\ + \text{dummy.political\_stability} + \text{dummy.Covid19} + \epsilon_t \end{aligned}$$

Where,

i_t is the interest rate set by the central bank, л$_{t}$- л* is the inflation rate gap , y_t - y* is the output gap, x_1 , x_2, x_3, x_4, x_5, x_6 x_7 and x_8 are the independent variables and $p\pi_t$ is the coefficient of inflation gap, py_t is the coefficient of output gap, ,$\beta_1, \beta_2, \ldots\ldots \beta_8$ are the coefficients determining the weight given to remaining independent variable.

3.3 Research Variables

Dependent Variable

The primary focus of this research centers on the dependent variable, the repo interest rate, within the Turkish economic context. This study, inspired by the work of Özcan (2016), meticulously examines the repo interest rate for its fluctuations, underlying determinants, and consequential implications within the Turkish economic landscape. By delving into historical trends and conducting empirical assessments, the aim is to gain comprehensive insights into the intricate processes that exert influence on interest rates in Turkey. The research framework finds its foundation in the seminal work of Taylor (1993), who introduced and extensively discussed the Taylor rule. This rule serves as a fundamental framework for evaluating central bank policy decisions predicated on prevailing economic conditions. Additionally, Sargent (1982), who meticulously investigated the experiences of nations grappling with high inflation. This analysis provides valuable perspectives on the management of interest rates and monetary policy in the midst of such challenging economic episodes.

Independent Variables

In this study, a comprehensive set of 10 independent variables has been carefully selected to examine the multifaceted factors influencing hyperinflation, thereby offering a more nuanced understanding of the economic landscape. Each independent variable is meticulously detailed in Table 2, providing a comprehensive description of its specific characteristics.

The incorporation of these variables allows for a holistic assessment of the myriad factors impacting hyperinflation. It is noteworthy that a positive inflation gap signals the presence of inflationary pressures within the economy. In accordance with the Taylor rule, it is advisable to raise interest rates to mitigate these inflationary expectations and stabilize prices. This aligns with the primary mandate of central banks, which is to maintain price stability. The research by Clarida, Galí, and Gertler (2000) underscores the substantial responsiveness of central banks in G7 countries to the inflation gap when determining interest rates, thereby lending support to the inflation management effectiveness of the Taylor rule. Furthermore, a positive output gap indicates that the economy is operating beyond its potential, potentially leading to overheating and resource constraints. In such scenarios, the Taylor rule suggests increasing interest rates to cool down the economy and avert entrenched inflationary pressures. Orphanides (2000) have demonstrated that incorporating the output gap into the Taylor rule can enhance the stabilization of both inflation and output, emphasizing the rule's efficacy in balancing these twin objectives.

It is worth noting that, while acknowledging the effectiveness of the Taylor rule, it has been observed that some countries with significant financial imbalances experienced larger fluctuations in inflation and output. This observation underscores the necessity for additional considerations beyond the core rule. In line with this perspective, the present study integrates several supplementary variables such as exchange rates, government expenditure, current account balance, trade balance, debt-to-GDP ratio, tax revenue, money supply, and budget deficit. Fluctuations in exchange rates can exert an impact on inflation through imported goods. Depreciation can render imports more expensive, potentially fueling domestic inflation. Clarida, Galí, and Gertler (2002) have conducted an extensive analysis, which encompassed a broader spectrum of countries, and have affirmed the significant role of exchange rates in shaping monetary policy decisions, particularly in emerging markets. Their findings underscore that incorporating exchange rate deviations into the Taylor rule can enhance overall macroeconomic performance. Furthermore, heightened government spending can stimulate aggregate demand, potentially generating inflationary pressures unless accompanied by increased productivity. In such instances, the Taylor rule may advocate for raising interest rates. A sustained current account deficit can signify heavy reliance on foreign capital, rendering the economy susceptible to external shocks and influencing monetary policy decisions. This indicator reflects the balance between a country's exports and imports, and a chronic trade deficit can raise concerns regarding competitiveness and long-term growth, thus impacting the application of the Taylor rule. Additionally, a high debt-to-GDP ratio can raise apprehensions about the government's capacity to service its debt and the potential fiscal burdens in the future. This can limit the central bank's flexibility in setting interest rates. The research conducted by Brandao-Marques et al. (2023) investigates whether elevated government debt levels pose a challenge to inflation containment. Their findings suggest that unanticipated increases in debt levels have a lasting impact on inflation expectations in emerging market economies, particularly when initial debt levels are high, initial inflation levels are elevated, and debt dollarization is significant. The increased tax revenue provides the government with greater fiscal space to manage budgets and reduce reliance on debt. This affords the central bank increased flexibility in making interest rate decisions. The rapid growth of the money supply can fuel inflation as an excess of money chases the same pool of goods and services. In such instances, the Taylor rule recommends raising interest rates to counter this potential risk. Orphanides (2000) have identified a positive correlation between money supply growth and inflation and have highlighted the significant impact of monetary policy, as reflected in changes in interest rates, on inflation. Lastly, a substantial and persistent budget deficit can raise concerns about fiscal sustainability and inflationary pressures. This can limit the options available to the central bank in terms of monetary policy. The independent variables considered in this study collectively contribute to a comprehensive analysis of the factors influencing hyperinflation. (*See table 1*)

3.4 Data Set

This study employs rigorous econometric methodology, incorporating quantitative analysis of macroeconomic data sourced from reputable secondary institutions such as the Turkish Central Bank (Türkiye Cumhuriyet Merkez Bankas - TCMB), the Turkish Statistical Institute, Borsa Istanbul (BIST), the OECD Economic Outlook, and the World Bank. This broad spectrum of data sources ensures the dataset's reliability and authenticity.

The dataset encompasses a comprehensive range of quarterly time series data from 2000 to 2022, providing an impeccable temporal framework for in-depth study. This study thoroughly investigates eleven critical variables to measure the influence of hyperinflation on interest rates and to determine whether the Central Bank of Turkey uses the normal Taylor rule or an augmented Taylor rule to combat inflation. These variables include repo interest rates, the inflation gap (the difference between current inflation and the targeted inflation rate as measured by the GDP deflator), the output gap (the difference between real GDP and potential GDP), exchange rates, tax revenue, trade balance, government expenditures, debt-to-GDP ratios, money supply growth, budget deficit, and current account balances.

3.5 Descriptive Statistics

The descriptive statistics provided in the Table 2 serve as an initial foundation for gaining insight into the major variables under consideration. These statistical measurements are critical for understanding the central trends and degree of variability inherent in the dataset, laying the groundwork for subsequent analytical pursuits. The mean interest rate across the 92 observations is determined to be 24.573%, with a standard deviation of 17.279%. The observed interest rate spans a spectrum from a minimum of 8.750% to a maximum of 60%. The average value of the output gap, which is a metric used to quantify the difference between actual and potential output, is 10.402, with a 57,351.170-standard deviation. The values of this variable span a range from -102,642 at the lowest to 119,961 at the highest. In the same way, the inflation gap, that is, the difference between the rate of inflation that currently exists and the rate that is projected to occur—shows an average of -7.859 and a standard deviation of I47.090. Its range of values is -74.154 to 123.524. The average and standard deviation of the exchange rate data are 3.016% and 2.705%, respectively. This variable's values span from a minimum of 0.794% to a maximum of 11.147%. In contrast, tax revenue exhibits low fluctuation, with a minor standard deviation of 0.002% and an average of 0.060%. Tax revenue oscillates between 0.057% and 0.064%, staying within a very small range. The average government expenditure value is found to be 24.583, with a 24.583 standard deviation. The range of values for this variable is 22.510 to 26.270. The debt-to-GDP ratio shows a standard deviation of 0.033% and an average of 0.104%. The values of this variable range from 0.070% at minimum to 0.179% at highest. The mean money supply growth score is -5.849%, with a standard deviation of 3.925%. The scores fall between 1.651% and 16.468%. Lastly, the mean value of the current account balance is 33.066, with a standard deviation of 51.397. The range of the current account balance fluctuations is -42.622 to 162.191. (See Table 2)

3.6 Diagnostic Test

Unit Root Test

The Augmented Dickey-Fuller (ADF) test, a unit root test in time series analysis, is used in the study to determine the stationarity characteristics of the provided time series. The null hypothesis posits the presence of a unit root, indicating non-stationarity, while the alternative hypothesis suggests stationarity. A p-value of less than 5% implies that the null hypothesis is rejected, implying the absence of a unit root. A critical value from a table can also be compared to the calculated Dickey-Fuller test (DFT) statistic. The null hypothesis of a unit root is rejected if the DFT statistic is less than the tabulated value.

$$DF_{\gamma} = \frac{\hat{\gamma}}{SE(\hat{\gamma})}$$

Multicollinearity and Variance Inflating Factor

Multicollinearity is characterized as the presence of a significant linear association among the response variables. It inflates standard errors and confidence intervals, leading to inaccurate estimates of individual predictor coefficients. When the independent variables in a regression model are highly correlated, it becomes difficult to disentangle their impacts on the dependent variable. Correlation analysis and VIF have been used to address the multicollinearity dilemma in the study. A high VIF indicates a high level of multicollinearity, requiring corrective methods such as variable selection or transformation. By cautiously analyzing the VIF scores, the regression findings provide accurate and accessible insights into the relationships between the variables.

$$VIF = \frac{1}{1 - R_i^2}$$

3.7 Chow Test

The study employs the Chow test to assess the presence of a structural break in a time series analysis to investigate whether there is a significant change in the relationship between the independent variables and the dependent variable at a specific point in time.

The Chow test can be formally defined as follows:

Null Hypothesis (H0): There is no structural break in the data; the relationship between the independent variables and the dependent variable is constant over time.

Alternative Hypothesis (H1): There is a structural break in the data; the relationship between the independent variables and the dependent variable changes at a specific point in time.

The test statistic follows an F-distribution, and its significance level is used to determine whether to reject the null hypothesis in favor of the alternative hypothesis.

4. Empirical Results & Analysis

4.1 Unit Root Test

The study employs the Augmented Dickey-Fuller (ADF) test, where the null hypothesis posits the presence of a unit root, indicating non-stationarity, while the alternative hypothesis suggests stationarity. A p-value below 5% signifies the rejection of the null hypothesis, implying the absence of a unit root. The analysis reveals that none of the variables receive support for the null hypothesis indicating non-stationarity, as all of them exhibit p-values below the 0.05 significance level. Consequently, it can be concluded that all the variables in the study demonstrate stationarity. The detailed results of the panel unit root test are presented in the accompanying table. (See table 3)

4.2 Multicollinearity and VIF

To ascertain the presence of multicollinearity within the dataset, a two-step approach was employed, beginning with a correlation analysis, followed by an assessment utilizing the Variance Inflation Factor (VIF). For instance, Table 4 reveals the existence of a positive association between the inflation gap and interest rates. Notably, the output gap exhibits both a negative (-0.066) correlation with interest rates and a positive (0.820) correlation with interest rates, suggesting complex relationships. Regarding government expenditure, it demonstrates correlations of -0.001, 0.080, and 0.046 with interest rates, inflation gap, and output gap, respectively. Similarly, the exchange rate displays positive correlations with interest rates and the inflation gap, while exhibiting negative correlations with the output gap and government expenditure, with coefficients of 0.152, 0.331, -0.014, and -0.012, respectively. These correlation patterns extend to the remaining variables under investigation, collectively indicating that none of the factors establish notably strong connections with one another. The findings suggest that none of them exhibit particularly strong or straightforward connections with one another, indicating that multicollinearity is not a significant concern within the dataset. (See table 4).

According to Field (2009), VIF values of more than 10 indicate multicollinearity, while some experts recommend a threshold of 2.5 or higher. Following Field's criteria, the results of Table 5 indicate that there is no multicollinearity because none of the variables' VIF values exceed 10. Eventually, the correlation analysis and VIF results demonstrate that there is no multicollinearity in the dataset. (See table 5)

4.3 Chow Test

The results below indicates that Prob > F is equal to 0.05, which is exactly equal to the significance level α. Therefore, the null hypothesis is rejected and conclude that there is a significant structural break in the data. (See table 6)

4.4 Results of Normal Taylor Rule

Based on the results presented in Table 6, a notable and significant association is observed among the Inflation Gap, Output Gap, and the constant term. In a hyperinflationary economic environment, the coefficient of the Inflation Gap (0.087) emerges as a critical factor. This positive coefficient implies a direct and substantial relationship between the policy interest rate and inflation. Specifically, for each one-unit increase in the Inflation Gap, there is a corresponding need to raise the interest rate by 0.089 units. This aligns with the imperative faced by central banks during hyperinflationary periods, where the imperative to combat rapidly escalating inflation necessitates significant interest rate hikes. The theoretical and empirical work of Svensson (1997) corroborates this principle, emphasizing the importance of central banks responding decisively to deviations in inflation from their target levels. Such responses invariably involve the proactive adjustment of interest rates in situations where inflation exceeds the predefined targets, further underscoring the positive relationship between interest rates and inflation. Conversely, the Output Gap coefficient, although statistically significant with a negative t-value, approaches practical insignificance due to its proximity to zero. In a hyperinflationary context, the primary policy focus often shifts towards stabilizing the currency and reigning in inflationary pressures, thus relegating the management of the output gap to a secondary role. The negative constant coefficient holds particular significance in this hyperinflationary context, suggesting a predisposition to maintain relatively high interest rates, even when no significant economic variables are in play. This reflects the imperative of combating hyperinflation by employing high interest rates as a baseline strategy. Moreover, the study shows that the effects of COVID-19, political turbulence and global financial crises are not considered to have a substantial impact on the analysis of hyperinflation in Turkey, either because their influence is negligible also these variables are obtained as insignificant.

The overall significance of the model, as indicated by a probability value above the conventional 0.05 threshold (0.1497). Furthermore, the model's low R-squared value (0.0361) underscores its limited capacity to elucidate variations in policy interest rates. This limitation aligns with the inherent difficulties in employing traditional monetary policy instruments to manage hyperinflation, where a multitude of external and uncontrollable factors exert substantial influence. (See table 7)

4.5 Results of Modified Taylor Rule

In accordance with the findings presented below, it is evident that certain variables, including the Inflation Gap, Output Gap, and an additional variable tailored for the augmented Taylor rule, specifically the Budget Deficit, exhibit statistical significance in influencing policy interest rates. The positive coefficient associated with the Inflation Gap (0.081) underscores a discernible and positive relationship between policy interest rates and inflation. This observation aligns seamlessly with the established premise that central banks, particularly in hyperinflationary settings, may deem it necessary to escalate interest rates as a response to surging inflation levels. This alignment is in accordance with the guiding principles of the Taylor Rule and is reinforced by the insights gleaned from prior research, such as the work of Svensson (1997), which underscores the imperative of resolute central bank actions in response to deviations in inflation. Conversely, the Output Gap coefficient, while statistically significant at the 0.1 level, manifests as effectively zero (0.000). Within the hyperinflationary context, where the immediate imperative is inflation control, the influence of the Output Gap in shaping interest rates is substantially muted. This resonance with the prevailing viewpoint underscores the prioritization of currency stabilization and the mitigation of inflation during crises marked by hyperinflation. The coefficient corresponding to the Budget Deficit assumes a negative sign and achieves a high level of statistical significance (p-value: 0.001). This intriguing finding suggests that during hyperinflationary episodes, central banks may respond with vigor to budget deficits by orchestrating reductions in interest rates. This observation is noteworthy and, to some extent, counterintuitive. It could potentially be explained by the imperative to stimulate economic activity or finance government expenditures amidst periods of fiscal strain. In support of these findings, Woodford (1995) expounds upon the interplay between fiscal policy, budget deficits, and monetary policy, contending that fiscal imbalances, including budget deficits, can wield influence over the monetary policy trade-offs confronting central banks. Notably, the central bank's response to fiscal incongruities, including monetized deficits, can reverberate on the determinacy of price levels, prompting actions such as the tightening of monetary policy through interest rate hikes. Furthermore, the work of Sargent and Wallace (1981) delves into the intricate relationship between fiscal policy, budget deficits, and monetary policy, illuminating the potential repercussions of fiscal deficits culminating in monetization and subsequently imparting inflationary pressures. The need for central banks to counteract such inflationary pressures may manifest through the adjustment of interest rates. Lastly, the constant term serves as a representation of the foundational interest rate when all other variables are rendered null. In the context of hyperinflation, the negative coefficient attached to this term signifies a predilection for maintaining relatively elevated interest rates even when no discernible economic factors are in active play.

This comprehensive model exhibits statistical significance (Prob > F: 0.007) at the 0.01 level, attesting to the collaborative contribution of the incorporated variables in explicating the fluctuations in policy interest rates amid hyperinflationary scenarios. The R-squared value of 0.1492 indicates that the model captures approximately 14.92% of the variance in interest rates, a notably substantial proportion within the challenging domain of hyperinflation. (See table 8)

5. Conclusion

The Turkish economy has grappled with persistent high inflation since the 1980s, setting it apart from similar developing economies. Surprisingly, this issue has remained largely unaddressed and has been accompanied by uncertain macroeconomic growth. This investigation into hyperinflation in Turkey aims to untangle the complex web of economic, fiscal, and governmental factors driving rapid price surges and currency devaluation. This study seeks a comprehensive analysis of hyperinflation in Turkey, aligning its investigative objectives to achieve a nuanced understanding of its causes, impacts, and potential pathways toward stability and recovery. The specific objectives include an examination of whether the Central Bank of Turkey follows an augmented or normal Taylor rule and an exploration of the factors contributing to hyperinflation in Turkey.

In the past, during President Erdogan's leadership, the Turkish central bank pursued an unconventional monetary policy approach, deviating from the traditional Taylor rule. This approach, known as "liraization," prioritized maintaining low interest rates despite persistently high inflation, with the aim of stimulating economic growth through accessible loans. However, this unconventional strategy ultimately led to currency depreciation and exacerbated inflationary pressures. Nevertheless, arguments have emerged in favor of adopting an "augmented" Taylor rule for the Turkish economy, which would consider additional factors beyond inflation and output gap, including exchange rate stability and vulnerability to foreign debt.

The outcomes of the estimations conducted using both the normal and augmented Taylor models suggest that, given the multifaceted nature of hyperinflationary challenges, the augmented Taylor model emerges as a more suitable choice for central banks in this context, accepting first hypothesis. The augmented model exhibits greater statistical significance, indicating its potential to provide a more robust framework for guiding monetary policy decisions during episodes of hyperinflation.

A particularly intriguing revelation stemming from the results derived from the augmented Taylor model pertains to the central bank's response to budget deficits during periods of hyperinflation. In contrast to conventional expectations, the model suggests that central banks may adopt a decisive approach by reducing interest rates in the face of budget deficits. This observation stands out as a noteworthy departure from the anticipated norm and warrants deeper exploration. It is conceivable that this unorthodox response is driven by the central bank's overarching objectives, such as stimulating economic activity or facilitating the financing of government expenditures in times of fiscal strain. Furthermore, a comprehensive analysis of an array of variables, encompassing government expenditure, exchange rates, current account balances, trade balances, debt-to-GDP ratios, tax revenue, and money supply, reveals coefficients that lack statistical significance when assessed against customary thresholds. This outcome suggests that within the context of hyperinflation, these variables exert limited influence over the determination of policy interest rates, thus leading to the rejection of second hypothesis. Notably, the interest rates derived from the augmented Taylor rule differ significantly from those obtained through the normal Taylor rule. In the normal Taylor model, the negative constant coefficient assumes particular significance within the hyperinflationary context. This coefficient implies a predisposition to maintain relatively high interest rates, even when no discernible economic variables are actively in play. This reflects the central bank's imperative to combat hyperinflation by employing elevated interest rates as a foundational strategy. Conversely, in the augmented Taylor model, the constant term is estimated to be negatively insignificant, thereby supporting third hypothesis. This implies that the model acknowledges the limited relevance of a constant baseline interest rate in the hyperinflationary scenario, where unconventional measures and the consideration of various additional factors become essential for effective policy formulation. Lastly, GFC (2008), Political turbulence and COVID 19 is found to be insignificant, rejecting forth hypothesis.

It is crucial to recognize the inherently intricate and challenging nature of hyperinflation as an economic phenomenon. No single model, including the augmented Taylor model, can serve as a comprehensive solution in isolation. Central banks contending with hyperinflationary crises typically deploy a combination of unconventional measures alongside adjustments in monetary policy. Therefore, while the augmented Taylor model can be a valuable tool, central banks must consider a broader spectrum of policy instruments and strategies to effectively manage the complexities inherent in hyperinflationary environments.

6. References

Adanur-Aklan, N., & Nargeleçekenler, M. (2008). The Taylor Rule: An Assessment of Turkish Experience. Ankara University, *Faculty of Political Science Journal*, 63(2), 22-41.

Akyüz, Y. (1973). Money and Inflation in Turkey: 1950–1968, Ankara: Ankara. *University, Publications of The Faculty of Political Sciences, No. 361*.

Barone, A. (2022). *What is the quantity theory of money: Definition and formula*. Investopedia.

Bernanke, S., B., & Mishkin, F., S. (1997). Inflation Targeting: A New Framework for Monetary Policy. *Journal of Economic Perspectives*, 11(2), 97-116.

Berument, H., & Taşçi, H. (2004). Monetary policy rules in practice: Evidence from Turkey. *International Journal of Finance & Economics*, 9(1), 33–38. https://doi.org/10.1002/ijfe.219

Brandao-Marques, L., Casiraghi, M., Gelos, G., Harrison, O., & Kamber, G. (2023). Is high debt constraining monetary policy? evidence from inflation expectations. *IMF Working Papers*, 2023(143), 1. https://doi.org/10.5089/9798400243059.001

Bulut, Ü. (2017). Monetary Policy and Asset Prices in the Period Following the Global Crisis: The Case of Turkey. *Eskişehir Osmangazi Üniversitesi İİBF Dergisi*, 12(1), 13-30.

Clarida, R., Gali, J., & Gertler, M. (2000). Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory. *The Quarterly Journal of Economics*, 115(1), 147–180.

Coppola (2022). *How to manage hyperinflation*. Oracle NetSuite.

Doğan, B. Eroğlu, Ö. and Değer, O. (2016). Enflasyon ve Faiz Oranı Arasındaki Nedensellik İlişkisi: Türkiye Örneği. *Çankırı Karatekin Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 6(1), 405-425.

Fenira, M. (2014). Democracy: A Determinant Factor in Reducing Inflation. *International Journal of Economics and Financial Issues*, 4(2), 363-375.

Fry, M. (1980). Money, Interest, Inflation and Growth in Turkey, *Journal of Monetary Economics,* 6 (4), 535–45.

Kalayci, .Y. (2002). Parasal Hedefleme, Enflasyon Hedeflemesi ve Enflasyonist Bekleyişler: Türkiye Ekseninde Bir Değerlendirme. *Süleyman Demirel Üniversitesi İktisadi Ve İdari Bilimler Fakültesi Dergisi*, 7(2) 6(3), 124–134. https://doi.org/10.17261/pressacademia.2019.1111

Kaygisiz, A. D., & İşcan, H. (2019). Türkiye'de Döviz Kuru, Enflasyon ve Faiz Oranı İlişkisi: 2009-2017 Uygulaması. *Iğdır Üniversitesi Sosyal Bilimler Dergisi*, 17, 581-604.

Kesriyeli, M., & Yalcin, C. (1998). Taylor Kurali ve Uygulamasi Uzerine Bir Not. *CBRT Discussing Paper, no. 9802.*

Lebe, F., & Bayat, T. (2011). Taylor Rule: A Vector Autoregressive Model Analysis for Turkey, *Ege Academic Review*, 11, 95-112.

Oktayer, A. (2010). Türkiye'de Bütçe Açığı, Para Arzı ve Enflasyon İlişkisi. *Maliye Dergisi*, 158, 431-447.

Ongan, T.H. (2004). Enflasyon Hedeflemesi ve Taylor Kurali: Turkiye Ornegi. *Maliye Konferanslari*, 45, 1-12.

Orphanides, Athanasios. (2000). *Activist stabilization policy and inflation : the Taylor rule in the 1970s*. Divisions of Research & Statistics and Monetary Affairs, Federal Reserve Board.

Özcan, M. (2016). Asymmetric Taylor Monetary Rule: The Case of Turkey. 10, 68-92. https://doi.org/10.17740/eas.soc.2016.V10-05.

Özel, S. (2000). Türkiye'de Enflasyon, Devalüasyon ve Faiz. Alkım Yayıncılık, *İstanbul*.

Papi, L., & Lim, C. H. (1997). An econometric analysis of the determinants of inflation in Turkey. *IMF Working Paper No 97/170*. https://doi.org/10.2139/ssrn.883293

Saatcioglu, C., & Korap, L. (2006). Determinants of Turkish Inflation. Discussion Paper, No. 2006/7, *Turkish Economic Association, Ankara*

Sahin, B. E., & Dereli, D. D. (2019). An evaluation on inflation in Turkey after 1980 and the analysis of relationship between inflation, interest rate and exchange rate. *Pressacademia,*

Sargent, T. J. (1982). *The Ends of Four Big Inflations*. https://doi.org/10.21034/wp.158

Sargent, T., J., & Wallace, N. (1981). *Some Unpleasant Monetarist Arithmetic*. Quarterly Review, Federal Reserve Bank of Minneapolis,5(Fall*).*

Stoupos, N., Nikas, C., & Kiohos, A. (2023). Turkey: From a thriving economic past towards a rugged future? - an empirical analysis on the Turkish Financial Markets. *Emerging Markets Review*, 54, 100992. https://doi.org/10.1016/j.ememar.2022.100992

Svensson, L., E. (1997). Inflation forecast targeting: Implementing and monitoring inflation targets. *European Economic Review*, 41(6), 1111-1146. https://doi.org/10.1016/S0014-2921(96)00055-4.

Taylor, J. B. (1993). Discretion versus policy rules in practice. *Carnegie-Rochester Conference Series on Public Policy*, 39, 195–214. https://doi.org/10.1016/0167-2231(93)90009-l

Ülgen, G. (2005). Türkiye'de Piyasa Ekonomisine Geçiş ve Sürdürülebilirliği. Derin Yayınları. *İstanbul.*

Us, V. (2004). Monetary Transmission Mechanism in Turkey Under the Monetary Conditions index: An Alternative Policy Rule, *Applied Economics*, 36(9), 967-976.

Us, V. (2007). Alternative Monetary Policy Rules in the Turkish Economy under an Inflation Targeting Framework, *Emerging Markets Finance and Trade*, 43 (2), 82- 101.

Uslu, L., & Özçam, A. (2014). A Modified Taylor Rule for the Central Bank of Turkey: 2003-2012. *KSÜ İİBF Dergisi*, 4(1), 2-18.

Uslu, N., C., & Karahan, P. (2018). A Dynamic Analysis on the Validity of the Phillips Curve for Turkey.

Woodford, M. (1995). Price-level determinacy without control of a monetary aggregate. *Carnegie-Rochester Conference Series on Public Policy*, 43, 1-46. https://doi.org/10.1016/0167-2231(95)90033-0

Yaprakli, S. (2011). The Validity of Open Economy Monetary Policy Rule in Turkey: A Bounds Test Approach. *Industrial Relations and Human Resources Journal*, 13 (1), 127-142.

Yazgan, M., E., & Yilmazkuday, H. (2007). Monetary policy rules in practice: Evidence from Turkey and Israel. *Applied Financial Economics*, 17(1), 1–8. https://doi.org/10.1080/09603100600606206

Yeldan, E. (2003). Küreselleşme Sürecinde Türkiye Ekonomisi. İletişim Yayınları. *İstanbul*.

7. Appendix

Table1: Independent Variables

Variables	**Description**
Exchange Rates	The value of one currency with another influences international trade and influences import prices and inflation.
Debt to GDP Ratio	The ratio of a country's total debt to its GDP, which serves as an indicator of its ability to manage and repay debts.
Tax Revenue	The entire income collected by a government through taxation, which influences its fiscal policies and spending capacity.
Government Expenditures	The entire amount of money spent by the government on goods, services, and programs that have an impact on economic activity and fiscal health.
Inflation Gap	The difference between a country's current inflation and expected inflation.
Trade Balance	The difference between a country's total exports and total imports over a certain period.
Current Account Balance	The whole balance of a country's international transactions, including trade, services, and transfers, is known as the current account balance.
Money Supply Growth	It refers to the rate at which a country's total money supply increases over time. It's a key economic indicator used to assess potential inflationary pressures, economic activity, and the effectiveness of monetary policy.

Budget Deficit	It occurs when a government spends more money than it takes in through taxes and other sources of revenue. It's essentially the difference between income and expenses for the government.
Output Gap	The gap between an economy's actual and potential output, indicating whether it is running at or over full capacity.

Table2: Descriptive Statistics

Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Interest Rate	92	24.573	17.279	8.750	60.000
Inflation Gap	92	-7.859	47.090	-74.154	123.524
Output Gap	92	10.402	57,351.170	-102,642.000	119,961.000
Government Expenditure	92	24.583	24.583	22.510	26.270
Exchange Rate	92	3.016	2.705	0.794	11.147
Current Account Balance	92	33.066	51.397	-42.622	162.191
Trade Balance	92	0.541	4.476	-8.543	9.406
Debt to GDP	92	0.104	0.033	0.070	0.179
Tax Revenue	92	0.060	0.002	0.057	0.064
Money Supply Growth	92	5.849	3.925	1.651	16.468
Budget Deficit	92	-0.009	0.007	-0.026	-0.002

Table3: ADF Unit Root Results

Variables	**Z- Statistics**	**p-value**
Interest Rate	-9.581	0.000*
Inflation Gap	-8.437	0.000*
Output Gap	-10.199	0.000*
Government Expenditure	-8.810	0.000*
Exchange Rate	-9.373	0.000*
Current Account Balance	-5.783	0.000*
Trade Balance	-9.969	0.000*
Debt to GDP	-9.428	0.000*
Tax Revenue	-2.786	0.060**
Money Supply	-4.371	0.000*
Budget Deficit	-9.409	0.000*

Note: * & ** indicate the level of significance at 5%&10% confidence interval, respectively.

Table4: Correlation Matrix

	Interest Rate	Inflation Gap	Output Gap	Government Expenditure	Exchange Rate	Current Account Balance	Trade Balance	Debt to GDP	Tax Revenue	Money Supply	Budget Deficit
Real Interest Rate	1										
Inflation Gap	0.085	1									
Output Gap	-0.066	0.820	1								
Government Expenditure	-0.001	0.080	0.046	1							
Exchange Rate	0.152	0.331	-0.014	-0.012	1						
Current Account Balance	0.120	0.118	0.057	-0.145	-0.013	1					
Trade Balance	0.000	0.030	0.040	-0.084	0.015	0.309	1				
Debt to GDP	0.191	0.143	0.031	-0.120	0.047	0.027	0.021	1			
Tax Revenue	0.098	-0.233	-0.162	0.086	-0.073	-0.483	0.043	0.064	1		
Money Supply	-0.065	0.056	-0.085	0.205	0.174	0.208	-0.147	-0.102	-0.269	1	
Budget Deficit	-0.381	-0.174	-0.091	0.018	-0.061	-0.133	-0.006	-0.688	-0.004	0.035	1

Table 5: Results of VIF

Variable	**VIF**	**1/VIF**
Inflation Gap	5.570	0.180
Output Gap	4.810	0.208
Budget Deficit	2.280	0.439
Debt to GDP	2.110	0.474
Current Account Balance	1.740	0.573
Exchange Rate	1.630	0.612
Tax Revenue	1.580	0.634
Real Interest Rate	1.330	0.749
Money Supply	1.310	0.764
Trade Balance	1.240	0.805
Government Expenditure	1.150	0.869
Mean VIF	**2.250**	

Table 6: Results of Chow Test

F-statistic	2.98
Prob> F	0.05

Table 7: Results of Normal Taylor Rule

	Coefficient	**T**	**P>|t|**
Inflation Gap	0.089	2.28	0.025*
Output Gap	0.000	-2.17	0.024*
Global Financial crises	0.90	1.5	0.139
Political Turbulence	-0.22	-0.3	0.765
COVID 19	-0.62	-0.73	0.466
constant	-1.04	-2.42	0.018*
Prob > F	0.1497		
R-squared	0.0896		
Adj R-squared	0.0361		

Note: * indicate the level of significance at 5% confidence interval.

Table 8: Results of Augmented (Modified) Taylor Rule

	Coefficient	**t**	**P>|t|**
Inflation Gap	0.081	1.76	0.082**
Output Gap	0.000	-1.93	0.057**
Government Expenditure	-5.076	-0.92	0.36
Exchange Rate	0.112	0.13	0.896
Current Account Balance	0.008	1.34	0.185
Trade Balance	-0.033	-0.56	0.58
Debt to GDP	-68.773	-1.59	0.115
Tax Revenue	223.849	1.53	0.13
Money Supply	-0.109	-1.53	0.129
Budget Deficit	-442.509	-3.41	0.001*
Global Financial Crises	0.400	0.67	0.503
Political Turbulence	-0.634	-0.84	0.402
COVID 19	0.308	0.35	0.726
Constant	-13.614	-1.54	0.128
Prob > F	0.0163		
R-squared	0.2722		
Adj R-squared	0.149		

Note: * & ** indicate the level of significance at 5% & 10% confidence interval, respectively.