



# Central Bank Independence, Inflation and Volatility Nexus: Does Independence Can Solve Inflation?

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## Abstract

In this study, the relationship between central bank independence and both inflation rate and inflation uncertainty is examined with the help of panel data analysis for BRICS-T countries, using data for the period 1995-2017. The findings reveal several notable results. First, the study finds a statistically significant and negative relationship between the level of central bank independence and inflation in BRICS-T countries. Consequently, this means that a higher degree of independence is associated with lower inflation rates. Additionally, the study reveals a statistically significant and positive relationship between central bank independence and inflation uncertainty. This shows that inflation uncertainty tends to increase as the level of independence increases. These results shed light on the complex dynamics between central bank independence, inflation, and inflation uncertainty, providing valuable information for policymakers, central banks, and researchers interested in monetary policy effectiveness and macroeconomic stability. It is recommended that future studies investigate the underlying mechanisms driving these relationships and evaluate potential differences across countries and time periods.

**Keywords:** BRICS-T, inflation, inflation uncertainty, central bank independence

## 1. Introduction

Central bank independence is a fundamental concept in modern monetary economics and is extremely important in shaping macroeconomic outcomes, especially with regard to inflation and inflation uncertainty. Understanding the relationship between central bank independence and these variables is crucial to designing effective monetary policies and promoting economic stability.

Inflation is a constant concern for economies around the world as it erodes purchasing power, distorts price signals, and undermines macroeconomic stability. As the primary authority responsible for monetary policy, central banks aim to ensure price stability by managing inflation within its target range. The degree of independence granted to central banks when making monetary decisions is believed to affect their effectiveness in achieving this goal.

Likewise, inflation uncertainty, which refers to the uncertainty surrounding future inflation dynamics, significantly affects the decision-making processes of economic units and market expectations. Higher levels of inflation uncertainty can hinder investment, disrupt consumption patterns and inhibit long-term planning. Central bank independence is assumed to affect inflation uncertainty through its impact on policy credibility, transparency and communication.

The concept of central bank independence has gained widespread acceptance since its academic formulation in the late 1980s, and governments around the world have increasingly adopted it as a standard procedure (Cukierman, 1994). However, the adoption of independent central banks varies across countries; while developed economies are at the forefront of establishing such institutions, many developing countries are still in the process of transitioning to central bank independence and face challenges related to institutional frameworks, political constraints, and historical legacies (Boylan, 2001).

The evolution of central bank independence reflects the various economic and political contexts in which these institutions operate. The benefits of central bank independence include less exposure to short-term political pressures that could lead to unsustainable economic growth and inflation in the long term (Fraser, 1994, p. 2).

An independent central bank increases credibility and builds trust in society. This leads to lower inflation expectations, thus reducing the cost of reducing inflation. In addition, central bank credibility enables more effective implementation of economic stabilization policies through predictable behavior (Alesina & Summers, 1993, p. 152).

The credibility, independence and transparency of the central bank can increase the confidence of both domestic and foreign investors and thus increase investment rates. Additionally, independent central banks can serve as a check against the treasury's borrowing policies and encourage governments to act prudently to avoid budget deficits (Akyazı, 2008, p. 88). Various theories have been put forward to explain the relationship between central bank independence and inflation. One prominent theory is time inconsistency theory, which suggests that independent central banks are better equipped to make credible commitments to price stability. According to this theory, when central banks are free from political pressure and have a clear mandate for price stability, they can pursue long-term monetary policies that involve short-term sacrifices but can ultimately lead to lower inflation (Cukierman, 1992).

Central bank independence can reduce inflation uncertainty by supporting price stability and stabilizing inflation expectations. When a central bank operates independently, it can focus on its primary goal of maintaining low and stable inflation without political interference. This helps build credibility and trust in the central bank's commitment to price stability, leading to more predictable inflation outcomes and reducing uncertainty for businesses and households. Although central bank independence is only one factor affecting inflation uncertainty, research has shown a generally positive relationship between central bank independence and lower inflation uncertainty (Cukierman et al., 1992).

However, some authors offer an opposing perspective on the impact of central bank independence on inflation uncertainty. Aisen and Veiga (2008) and Bade and Parkin (1977) argue that there is no significant relationship between these variables. They challenge the notion of a direct causal link between central bank independence and inflation uncertainty and suggest that other factors, such as economic conditions or the institutional framework in which the central bank operates, may also play an important role in shaping the relationship.

Additionally, Eijffinger et al. (1996) argue that the direction and impact of this relationship are determined by the indicator used to measure central bank independence. They highlight the importance of choosing the appropriate indicator, as different indicators, such as political

intervention, can capture different aspects of central bank independence and potentially lead to diverse results in empirical analysis.

In conclusion, the issue of central bank independence and its relationship with inflation uncertainty is complex and multifaceted. While time inconsistency theory supports the idea that independent central banks can achieve lower inflation through credible commitments to price stability, other research offers different perspectives. The interaction of various factors and indicators adds layers of complexity to the analysis, highlighting the need for further research to fully understand the underlying mechanisms and possible coincidental connections.

This study aims to contribute to the existing literature by examining the relationship between central bank independence and both inflation and inflation uncertainty for BRICS-T countries.

The research hypothesis is twofold. First, it is assumed that there is a long-run relationship between central bank independence and inflation, whereby greater central bank independence is associated with lower levels of inflation. Second, central bank independence is also assumed to affect inflation uncertainty, with higher levels of independence leading to an increase or decrease in inflation uncertainty depending on certain contextual factors.

To investigate these hypotheses, a comprehensive data set consisting of central bank independence measures, inflation rates and inflation uncertainty indicators will be used. A variety of econometric models, including time series analysis and panel data techniques, will be used to account for the dynamic nature of the variables and control for potential confounding factors.

The findings of this study have implications for policymakers and central banks worldwide, as they can inform decisions on the design and implementation of monetary policy frameworks. Understanding the relationship between central bank independence, inflation, and inflation uncertainty can help create effective policies that support price stability, increase economic growth, and reduce uncertainty in the macroeconomic environment.

In summary, this study attempts to deepen our understanding of the relationships between central bank independence, inflation and inflation uncertainty. This study aims to contribute to the academic literature by examining these dynamics through rigorous empirical analysis and provide valuable information for policymakers seeking to design sound monetary policy frameworks.

## **2. The Relationship Between Central Bank Independence and Inflation**

Academic views on the benefits of central bank independence have a long history, and scholars have typically emphasized the importance of independent monetary authorities to achieve low inflation outcomes. The theoretical basis for this claim is clear: Policymakers often face a time inconsistency problem when evaluating inflation-unemployment trade-offs that lead to higher than desired inflation rates in equilibrium (Kydlund and Prescott, 1977; Lim, 2021, pp. 311-312).

To counteract this inflation bias and ensure due recognition, governments must exercise control of monetary policy either by adhering to a set of rules governing monetary expansion (Barro and Gordon, 1983) or by controlling the money supply, for example, through an inflation-linked performance contract (Walsh, 1995). They may leave it to the central banker, an independent central banking committee (Faust, 1996) or supranational monetary regulation (Giavzi and Pagano, 1988). This type of delegation can also help alleviate the electoral pressures faced by a central bank (Eggertsson and Le Borgne, 2010) (Lim, 2021, pp. 311-312).

However, delegating monetary policy to independent institutions is only half the battle. Because this kind of independence should also be used in monitoring inflation outcomes. Although Central Banks have multiple purposes, their limited policy tools cannot prioritize price stability because of the Tinbergen rule. This conflict tends to become more acute in developing countries where the problem of dynamic inconsistency is never fully resolved (Mas, 1995). Moreover, even if an independent central bank aims at low inflation as its sole goal, inflation itself is affected by a number of factors that may lie outside the direct jurisdiction of the monetary authority. Therefore, there is little guarantee that even a single-minded, inflation-targeted central bank will routinely succeed in maintaining low inflation (Lim, 2021, pp. 311-312).

The ability of an independent central bank to commit to a low inflation outcome likewise depends on the existence of checks and balances in a country's political system (Keefer and Stasavage, 2002). Stronger democratic institutions are generally more successful in reining in inflation (Keefer and Stasavage, 2003; Lim, 2021, pp. 311-312).

In sum, central bank independence is neither necessary nor sufficient to guarantee lower inflation outcomes, and in the presence of a short-term inflation-unemployment trade-off, independence may even give the monetary authority the power to create higher inflation. This situation will be examined with econometric studies in the following sections of the study (Lim, 2021, pp. 311-312).

### **3. Data and Method**

In the study, 1995-2017 data from BRICS-T countries were used to examine the effect of central bank independence on inflation. Auxiliary variables used in the study are gross domestic product, real broad effective exchange rate, pump price of oil, exports of goods and services. These data were investigated with panel data analysis. Data were obtained from World Bank and Fred databases. Variables are calculated in current US dollars.

BRICS-T countries, consisting of Brazil, Russia, India, China, South Africa and Turkey, exhibit several similarities that contribute to their common status as emerging economies. First, these countries have experienced remarkable economic growth and development, supported by factors such as large populations, abundant natural resources, and strong domestic markets (Bhandari & Mendonca, 2019; Magalhães, 2020). In addition, they have undergone significant changes in their geopolitical position, leading to increased global influence and active participation in international forums (Soares & Freitas, 2017). Additionally, BRICS-T countries face common challenges such as income inequality, the need for infrastructure development and institutional reform (Oliveira, 2018).

Due to the significant similarities observed between BRICS-T countries, the research used these countries as the focus of the study.

The econometric model to be estimated in the study to examine the effects of the central bank independence level on inflation is shown below:

$$\text{Model-1: } LNINF_t = \alpha_t + \beta_1 LNGDP_t + \beta_2 LNER_t + \beta_3 OIL_t + \beta_4 LNEXP_t + \beta_5 CBI + u_t \quad (1)$$

$$\text{Model-2: } LNINFUNC_t = \alpha_t + \beta_1 LNGDP_t + \beta_2 LNER_t + \beta_3 OIL_t + \beta_4 LNEXP_t + \beta_5 CBI + u_t \quad (2)$$

Abbreviations in the equations define the following concepts:

INF	Inflation
INFUNC	Inflation Uncertainty
GDP	Gross Domestic Product

ER Exchange Rate  
 OIL Oil Prices  
 EXP Export  
 CBI Central Bank Independence

In the given model, the parameter indicated by ( $\alpha$ ) represents the constant term, and the parameters indicated by ( $\beta$ ) represent the slope coefficients. The error terms are represented by (u) and (t) represents the time variable within the model.

*Table 1: Descriptive Statistics*

		Variables					
Stats.		INF	GDP	ER	OIL	EXP	CBI
Model 1	Min.	-1.401	25.584	4.128	0.27	24.241	0.348
	Max.	5.285	30.141	5.191	2.54	28.532	0.843
	St. Err.	1.060	1.037	0.266	0.490	1.082	0.154
	Mean	1.951	27.441	4.707	0.922	25.875	0.527
Model 2	Min.	0.187	25.584	4.132	0.28	24.242	0.348
	Max.	4.570	30.141	5.191	2.54	28.532	0.843
	St. Err.	0.951	1.033	0.258	0.486	1.046	0.162
	Mean	1.144	27.600	4.710	1.015	26.087	0.536

Ensuring stationarity of the series is a very important step in panel data analysis as it affects the choice of estimation method. By examining the stationarity of the series, researchers can choose the appropriate technique and avoid biases caused by non-stationary data. In addition, cross-section dependence is an important factor affecting the estimation results in panel data analysis. To obtain accurate and reliable findings, it is important to consider and account for cross-sectional dependence. When panel unit root tests are examined, they are categorized as first and second generation according to the presence or absence of cross-sectional dependence. Pesaran (2004) CD test was used to detect the presence of cross-sectional section. Table 2 shows the results of the applied cross-sectional dependency test.

*Table 2: CD Test Results*

		Variables				
Stats./Prob.		INF	GDP	ER	OIL	EXP
Model 1	Stats.	4.55	17.28	3.21	17.21	18.25
	Prob.	0.000***	0.000***	0.001***	0.000***	0.000***
Model 2	Stats.	4.96	15.90	4.63	15.36	16.58
	Prob.	0.000***	0.000***	0.001***	0.000***	0.000***

Note: \*\*\* indicates significance at 10% significance level.

Based on the findings presented in Table 2, the probability values obtained for each variable are all below the significance level of 0.05, leading to rejection of the null hypothesis (H0). As a result, the existence of cross-sectional dependence was observed. The fact that the economic shock that may occur in these countries will affect other countries emphasizes the interconnectedness of their economies. After investigating the cross-section dependence, the stationarity of the series can be discussed. CIPS unit root test results are shown in Table 3.

Table 3: CIPS Unit Root Test Results

		Variables				
		INF	GDP	ER	OIL	EXP
Model 1	Intercept Model	-2.512	-2.253	-2.398	-2.081	-2.172
	Intercept & Trend Model	-2.635	-2.594	-2.232	-2.163	-2.694
Model 2	Intercept Model	-2.645	-2.524	-2.747	-1.938	-1.902
	Intercept & Trend Model	-2.293	-2.736	-2.539	-2.031	-2.514

**Critical Values:** Intercept Model: %10 -2.21, %5 -2.33, %1 -2.57; Intercept & Trend Model: %10 -2.73, %5 -2.86, %1 -3.1

The results in Table 3 present a mixed picture. For Model 1 and Model 2, the inflation series is stationary at level for the intercept model, but it is not stationary for the intercept and trend model. Considering the structure of inflation, it is accepted that the results of intercept and trend models are valid since it is expected to contain a trend effect. On the other hand, it is seen that the variables GDP, ER, OIL and EXP are not stationary for the intercept and trend model at the 5% significance level. For the intercept model, it is seen that the variables of ER for Model 1 and GDP and ER for Model 2 are stationary at the 5% significance level. However, considering the trend effects, it is decided that the series are not stationary. It was observed that the variables were stationary for the first differences.

In the study, the Pedroni cointegration test, which is widely preferred in the literature, is used to investigate the existence of long-term relationships between the series. Table 4 shows the Pedroni test results.

Table 4: Pedroni Cointegration Test Results

		t-stat.	Prob.
Model 1	Modified Phillips-Perron t	1.494	0.068*
	Phillips-Perron t	-3.291	0.001***
	Augmented Dickey-Fuller t	-3.440	0.000***
Model 2	Modified Phillips-Perron t	2.012	0.022***
	Phillips-Perron t	-2.620	0.004***
	Augmented Dickey-Fuller t	0.593	0.277

Note: \*, \*\*\* indicate significance at 10% and 1% significance level, respectively.

According to the Pedroni test results, it is seen that there is a long-term relationship between the series for Model 1 and Model 2. After the cointegration test, PMG and DFE models are used to investigate the direction and size of the long-term relationships. PMG and DFE test results for Model-1 are seen in Table 5.

Table 5: PMG and DFE Test Results for Model 1

Variables	PMG		DFE	
	Coeff.	Prob.	Coeff.	Prob.
GDP	-7.060	0.000***	-1.460	0.084*
ER	3.730	0.000***	.1477	0.895
OIL	-.550	0.000***	-.3007	0.526
EXP	6.806	0.000***	1.662	0.013***
CBI	-9.857	0.000***	-8.017	0.000***

Note: \*, \*\*\* indicate significance at 10% and 1% significance level, respectively.

According to the results in Table 5, it is seen that all variables have a significant effect on the inflation variable. While GDP, OIL and CBI variables have a negative effect on inflation, ER and EXP have an increasing effect on inflation.

According to the DFE test results, GDP and CBI have a negative effect on inflation, while the EXP variable has a positive effect on inflation. Long-term results of PMG and DFE tests for Model-2 are seen in Table 6.

*Table 6: PMG and DFE Test Results for Model 2*

Variables	PMG		DFE	
	Coeff.	Prob.	Coeff.	Prob.
GDP	-5.420	0.000***	.3955	0.853
ER	6.601	0.000***	-.8434	0.761
OIL	-1.200	0.000***	-.3083	0.746
EXP	4.066	0.000***	-.5191	0.759
CBI	63.469	0.000***	.9860	0.941

Note: \*\*\* indicates significance at 10% significance level.

According to the results in Table 6, each variable has a significant effect on inflation uncertainty in the long term as a result of the PMG test. While GDP and OIL variables have a negative effect on inflation uncertainty, the effects of ER, EXP and CBI variables on inflation uncertainty are positive. According to the DFE test results, the variables do not have a significant effect on inflation uncertainty.

#### 4. Conclusion

The process of central banks gaining legal independence since the 1970s and being designated as the main determinant of monetary policy, focusing primarily on ensuring price stability, have emerged as important institutional factors in achieving the goals of central banking. The autonomy granted to central banks through legal independence has proven effective in increasing their effectiveness and increasing public confidence.

The basic logic behind the autonomy granted to central banks is to protect them from political pressures that could lead to inflationary and expansionary policies. While the inverse relationship between central bank independence and inflation has been extensively documented in developed economies, evidence for developing countries is limited and incomplete.

Understanding the importance of an independent central bank has led to an increasing interest in research in this field. Scholars have been examining the measurement of central bank independence and its impact on macroeconomic variables since the 1960s. Although research results on the relationship between central bank independence and macroeconomic factors are diverse, there is a widespread consensus in the literature that central bank independence is inversely proportional to inflation. These findings contributed to the emphasis on central bank independence and efforts to increase the degree of independence.

This study investigates the relationship between central bank independence and both inflation and inflation uncertainty in BRICS-T countries. Empirical analysis reveals a long-run relationship between central bank independence and inflation, indicating that a higher degree of independence is linked to lower levels of inflation in the long run. This suggests that giving central banks greater autonomy enables them to prioritize price stability and take effective measures to control inflation.

Additionally, the research highlights a long-term relationship between central bank independence and inflation uncertainty. The findings show that central bank independence affects inflation uncertainty in the long run and this effect causes an increase in inflation uncertainty. This indicates that greater central bank independence will lead to increased uncertainty in inflation.

These findings have important implications for policymakers and central banks, highlighting the importance of establishing and maintaining central bank independence as a crucial aspect of effective monetary policy frameworks. Strengthening central bank independence could lead to long-term price stability and lower levels of inflation. However, prudent management of potential short-term impacts, such as increased inflation uncertainty, is vital to facilitate a smooth transition to a more stable inflation environment.

To gain a comprehensive understanding of the mechanisms and channels through which central bank independence affects inflation and inflation uncertainty, further research should be conducted to investigate additional contextual factors and potential interactions with other macroeconomic variables. Such deeper insights will enable policymakers and central banks to make well-informed decisions and implement appropriate policy measures that support macroeconomic stability and promote economic growth.

In conclusion, this study advances our knowledge about central bank independence, inflation, and inflation uncertainty. Research findings confirm the expected long-term relationship between central bank independence and inflation, showing that increased independence is associated with falling inflation rates. Similarly, central bank independence has a long-term impact on inflation uncertainty, with greater independence leading to higher uncertainty. These results are consistent with the existing literature on the subject.

Among the studies examining the effect of central bank independence on inflation uncertainty, Eijffinger et al. (1996) emphasized that the choice of indicators used to measure central bank independence is crucial in determining the direction and magnitude of the relationship. This makes it necessary to carefully evaluate the specific indicators used when assessing the relationship between central bank independence and inflation uncertainty.

Svensson's (1997) research reveals the effects of the time inconsistency problem, revealing both 'inflation bias' and 'stability bias', and states that this may contribute to an increase in inflation instability. In an environment where there is a time inconsistency problem, policy makers tend to prioritize production stability at the expense of inflation stability. But in forward-looking models, central banks, basing their actions on determination, respond to cost-increasing shocks by demonstrating their commitment to maintaining low inflation both today and in the future and balancing the expectations of economic agents. On the other hand, there are precautionary central bankers who can easily take back their promises, are far from reliable, and lead to an increase in inflation expectations and a decrease in the ability to balance inflation. As a result, Central Bank Independence may inadvertently have a negative impact on inflation imbalance by addressing the time inconsistency problem. Svensson's (1997) findings support the results of this study. Increased independence as a result of the time inconsistency problem for an independent central bank may lead to increased inflation volatility.

These findings highlight the importance of central bank independence as a crucial factor in achieving and maintaining price stability and provide insight for policymakers and central banks in their search for sound monetary policies.

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