# *The effectiveness of inflation targeting policy in promoting economic growth ( Study experience : United Kingdom, Sweden, New Zealand )*

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**Abstract:**

*This research aimed to assess the impact of inflation targeting on economic growth in New Zealand, Sweden, and the United Kingdom. The findings indicated that inflation rates during the inflation targeting period positively contributed to economic growth. The study used the Pannell model with annual data from 1993 to 2021. Therefore, a successful inflation targeting policy enhances economic growth rates.*

***Keywords**: Inflation targeting policy; Economic growth; Monetary policy;*

**Jel Classification Codes:** E31 , E52 , C22 , O40

***Résumé:***

*Cette recherche avait pour objectif d'évaluer l'impact de la politique de ciblage de l'inflation sur la croissance économique en Nouvelle-Zélande, en Suède et au Royaume-Uni. Les résultats ont montré que la réduction des taux d'inflation pendant la période de politique de ciblage a contribué positivement à stimuler la croissance économique, soutenue par le modèle de Pannell avec des données annuelles de 1993 à 2021.*

***Mots clés**: Politique de ciblage de l'inflation ; Croissance économique ; Politique monétaire .*

**Jel Classification Codes:** E31 , E52 , C22 , O40

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## 1. INTRODUCTION

The inflation targeting policy has emerged as one of the most important monetary policy tools adopted by some central banks worldwide, in order to achieve certain economic goals, most notably price stability and controlling inflation levels at the required levels. However, there is another no less important goal is to enhance economic growth rates and thus reduce unemployment rates, despite the negative effects that inflation has suffered on the world's economies in various eras and times, however, by consensus of all economists and decision makers of the monetary authorities, inflation at certain levels does not decrease or increase the most important stimulus to maintain the sustainability of economic growth, inflation at acceptable levels determined by the monetary authorities which ultimately leads to an increase in economic growth rates .

**Problem:**

With the beginning of the nineties of the last century, several developed and developing countries officially adopted the inflation targeting policy as a modern monetary policy strategy aimed mainly at long-term price stability, and thus achieving stable growth rates, however, not all countries that adopted the inflation targeting policy were actually able to achieve the desired inflation rates, especially developing countries, due to several reasons, the most important of which The problem that revolves around the countries that have successfully implemented the inflation targeting policy :How effective is the inflation targeting policy in promoting economic growth rates?

**The importance of studying:**

The significance of this study is rooted in its comprehensive explanation of the inflation targeting policy and the necessary requirements for its implementation. It also highlights successful international examples of this policy's application, specifically in New Zealand, Sweden, and the United Kingdom. Additionally, the study aims to determine the effectiveness of the inflation targeting policy in enhancing economic growth rates using appropriate standard tools.

**Curriculum of study:**

To cover the topic, the descriptive approach was used to describe the studied phenomenon and all the concepts related to it, in addition to the analytical approach to present successful international experiences in implementing the inflation targeting policy. Finally, the standard approach was used using appropriate statistical tools such as the EViews program and historical data for the study variables in order to answer the problem proposed.

**2. inflation targeting policy*:***

The inflation targeting policy is a relatively recent concept, emerging in the early 1990s as one of the tools of contemporary monetary policy., which was permanently adopted by the central banks of many countries, as this policy aims to simplify all available monetary tools in order to achieve a predetermined inflation rate within a certain range or value during a certain period of time, most of which a year, in order to achieve several economic goals, the most important of which is controlling inflation and maintaining stable price levels.

**2.1 Definition of inflation targeting policy**:

the following definitions can be taken :

- It is a holistic policy aimed at achieving a low level of inflation while maintaining a high level of real growth ,low unemployment, financial stability and maintaining a reasonable and not excessive deficit rate (others, 2019, p. 31)

-The announcement by the Monetary Authority involves setting a specific numerical target or range for the inflation rate over one or more future periods. It also includes a commitment to lower the inflation rate in the short term and stabilize it in the long term. This constitutes a fundamental objective of monetary policy. (Yusuf, 2018, p. 240)

- The European Central Bank defines inflation targeting policy as a monetary policy approach aimed at maintaining price stability by focusing

on deviations of inflation expectations from the announced inflation target level. (Nadia, 2021, p. 953).

From the previous definitions, we find that the inflation targeting policy is measures taken by the central bank in order to achieve a specific inflation rate over a certain period of time.

## 2.2 The necessary requirements for the success of the inflation targeting policy.

To achieve the goals set for the inflation targeting policy, there must be requirements and conditions that the country must have and are mainly divided into three main sections:

### 2.2.1 Institutional requirements:

A key factor is the central bank's actual independence, as outlined in state laws that establish and regulate its operations. However, legal autonomy does not necessarily equate to genuine independence from the government or political system. Several criteria are used to assess whether monetary authorities truly enjoy independence. Among these, the process of appointing the department responsible for monetary policy and its vulnerability to political influence are crucial. Additional criteria include having a clearly defined monetary policy objective, such as achieving overall price stability, as specified by the law governing the central bank's operations. These criteria also emphasize the importance of the government's non-interference in the central bank's efforts to achieve this goal, and the extent of the bank's financial independence, particularly regarding the conditions under which it provides funding to the government. Furthermore, these criteria advocate for increased transparency in monetary policy by presenting goals and plans to citizens and markets and holding the central bank accountable if it fails to meet the target inflation rate.

### 2.2.2 Economic requirements:

One of the key economic prerequisites for implementing an inflation targeting policy is exchange rate flexibility. This is because focusing on both controlling inflation and minimizing fluctuations in the exchange rate market indicates to markets and individuals that monetary policy aims to address two goals simultaneously: controlling

inflation and maintaining exchange rate stability. This dual focus can undermine the credibility and transparency of monetary policy, a situation known as the "impossible trinity," which refers to the difficulty of simultaneously maintaining a fixed exchange rate, liberalizing the capital account, and pursuing an independent inward-oriented monetary policy. This challenge leads to a preference for abandoning exchange rate targeting in favor of liberalizing it, allowing for a free capital transaction account and an independent inward-oriented monetary policy to coexist. The inflation targeting strategy is advantageous over the exchange rate targeting strategy because it aligns better with an inward-oriented monetary policy.

### 2.2.3 Technical requirements:

Monetary policies produce important distributional effects, just like fiscal policies, but the low clarity of monetary policies makes the focus on them not as much as fiscal policies such as cutting subsidies or applying a new tax, For example, citizens immediately feel the impact of inflation targeting policies, unlike situations where there is an appreciation of the local currency or a reduction in interest rates, where the effects of such monetary policies might take time to be felt due to what are known as lag periods. The impact of these policies is not instantaneous and may require some time to manifest. Therefore, it is essential to understand the transmission mechanisms of monetary policy and identify the most influential and effective channels through which changes in monetary policy affect real economy variables, such as output, employment rates, and inflation. Changes in monetary policy are transmitted to the real economy through a set of channels that include (others M. A.-J., 2018, p. 15)

- **Interest rate channel**: It is considered the most traditional and direct channel among the transmission mechanisms of monetary policy. When the central bank adjusts its interest rate, this change is transmitted to lending rates, which in turn alters the cost of borrowing. Consequently, this affects investment and overall output.

- **Exchange rate channel**: this channel is related to the previous one, as an increase in nominal interest rates entails capital inflows and a consequent rise in the value of the local currency against other currencies, which affects foreign trade and output.

- **Forecast channel**: this channel concerns the expectations of individuals and society in general regarding future economic conditions, especially with regard to inflation, for example. This channel is largely related to the credibility of the central bank or the monetary authority that carries out monetary policy within the country.

- **Asset price channel**: if the central bank pursues a deflationary monetary policy, by raising interest rates, this will make investing in bonds more attractive than investing in corporate stocks, which will lead to a decrease in the prices of those stocks and thus a decrease in investment spending and therefore in output. This channel also works through the influence of individuals ' wealth on their consumer spending. This will lead to a decrease in consumer spending and output as the next step.

### 2.3 Some successful international experiences with inflation targeting policy:

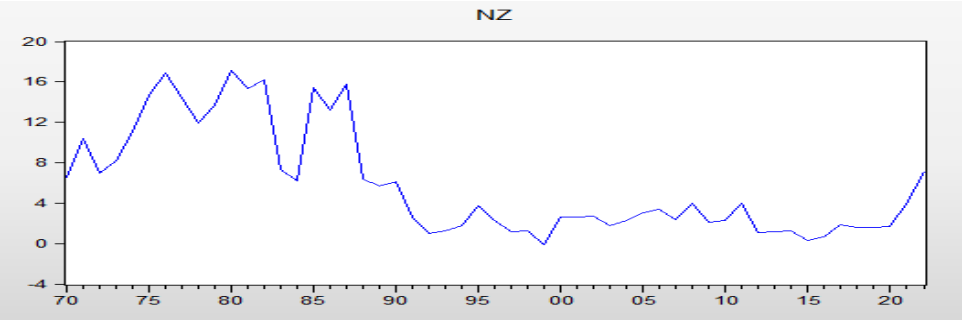
Starting in the early 1990s, many countries adopted inflation targeting policies. However, only a few have successfully implemented this approach and achieved the desired inflation rates consistently over several years. Among the most notable of these countries are:

#### 2.3.1 New Zealand:

New Zealand was the first country to officially implement the inflation targeting policy in February 1991, after the implementation of many major economic reforms (floating the local currency, privatization, public sector reform, liberalization of foreign trade, reform of the welfare system ...Etc.) due to the significant inflation rates that the New Zealand economy has experienced over two decades (during the seventies and Eighties of the last century ). (Karima, 2016/2017, p. 111) after which a significant decrease in inflation levels is known as a result of the reforms

taken and the implementation of the inflation targeting policy , and the following figure shows that :

**Figure 01 evolution of inflation rates in New Zealand during 1970-2022**




Source: prepared by the researcher based on World Bank data

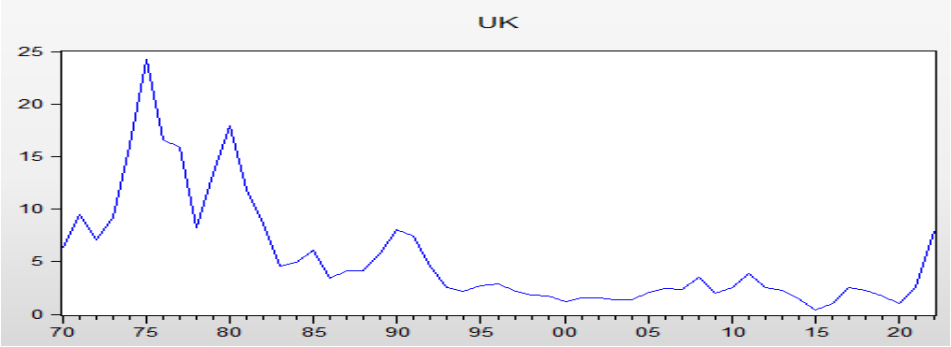
The figure shows that before New Zealand adopted its inflation targeting policy (1970-1991), inflation fluctuated between 7.9% and 16.2%, which were very high levels. However, from 1988 onwards, inflation began to decrease significantly, thanks to structural economic reforms introduced in 1987. As a result, inflation remained stable within the target range from 1991 until 2020, never exceeding 4%. This stability was largely due to the implementation of the inflation targeting policy. Nevertheless, inflation rates surged in 2022 due to the global inflation wave triggered by the effects of COVID-19, which caused unprecedented increases in inflation rates worldwide.

### 2.3.2 United Kingdom

The UK was among the first countries to implement an inflation targeting policy, where at first the Treasury chose a target inflation rate that the Bank of England works to achieve using monetary policy instruments (interest rate), but since 1997 it has switched to a point target where the actual value of the inflation rate was allowed to rise or fall with a tolerance level of 1% on both sides of the target point, which increased the transparency and credibility of monetary policy. On April 23, 1998, Legislative amendments were introduced that affirmed the Bank of England's independence in carrying out its functions under the new monetary policy framework. While the Bank operates independently, it

remains accountable to Parliament and the public for achieving its goals. The Treasury Department retains exclusive authority to set the target inflation rate and is required to send a written notification to the Monetary Policy Committee at least once a year, specifying the inflation rate the Bank must achieve.(Karima, 2016/2017, p. 124) the following figure shows the evolution of inflation rates in the UK during 1970-2022.

**Figure 02: evolution of inflation rates in the UK during 1970-2022**



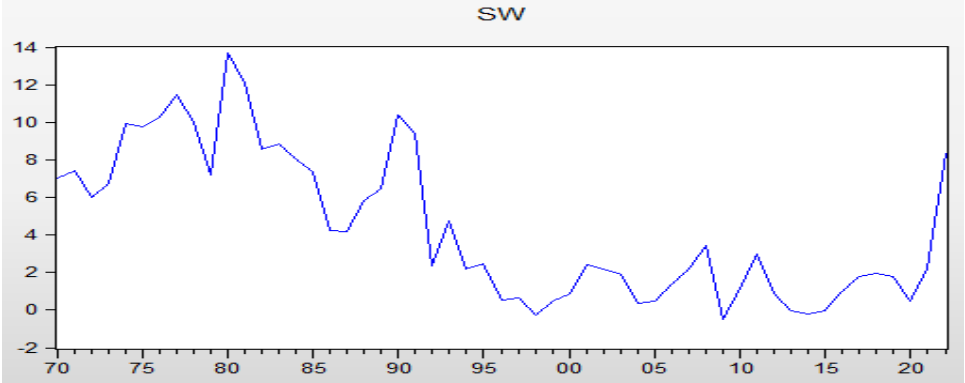

Source: prepared by the researcher based on World Bank data

From the figure, we see that the United Kingdom experienced relatively high inflation levels at the beginning of the 1970s, reaching 24.20% in 1975. However, starting in 1983, inflation levels began to decline significantly due to structural economic reforms implemented in the UK economy. These reforms primarily focused on privatization and reducing the public sector's encroachment on the private sector. Despite this, inflation rates remained high until 2022, exceeding target levels due to the effects of the global COVID-19 pandemic.

### 2.3.3 Sweden

Sweden was among the first countries to adopt an inflation targeting policy in the early 1990s, following its abandonment of the fixed exchange rate policy in November 1992. In early 1993, the Board of Directors of the Bank of Sweden officially implemented an inflation targeting strategy to manage the inflation resulting from the depreciation of its local currency due to floating exchange rates and changes in government tax policies at that time. (Zainab, 2021/2022, p. 110), the following table shows the development of inflation rates in Sweden during 1970-2022.

**Figure 03: evolution of inflation rates in the Sweden during 1970-2022**




Source: prepared by the researcher based on World Bank data

From the figure, we find that Sweden was suffering from high inflation levels at the beginning of the Seventies, reaching a peak of 14% in 1981, and 10% in 1990, but it witnessed a significant decline starting from 1992 until 2021, where the inflation rate was 1.5% on average, which is within the target range set by the monetary authorities at the time, but during 2022 inflation was a relatively high level of 8.25%, which is the result of the consequences of the global pandemic covid-19

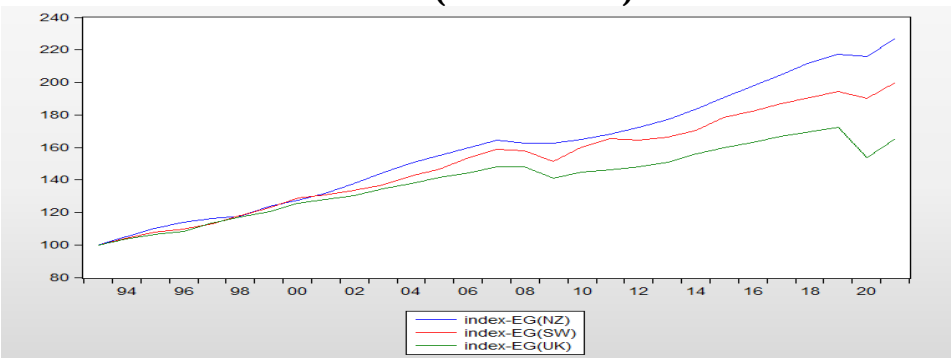
## 3.The standard study

In this section of the study, we will evaluate the effectiveness of the inflation targeting policy in enhancing economic growth rates in the countries being examined: New Zealand, the United Kingdom, and Sweden. These countries have been selected because of their successful implementation of inflation targeting policies.

### 3.1 Description of the study variables:

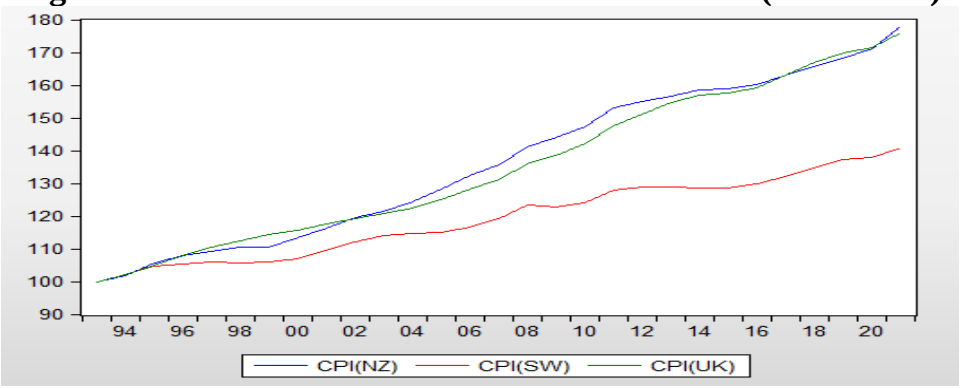
The effectiveness of the inflation targeting policy was measured using the Consumer Price Index (CPI), with 1993 as the base year. Economic growth was assessed through the GDP growth index, also using 1993 as the base year. These time periods were selected to correspond with the introduction of the inflation targeting policy in the countries under study. The following figure depicts the evolution of these indicators throughout the study:

**Figure 05: evolution of the economic growth index of the countries studied ( 1993 = 100 )**




Source: prepared by the researchers based on World Bank data

**Figure 04: evolution of the Consumer Price Index (1993 = 100)**




Source: prepared by the researchers based on World Bank data

### 3.2 Description of the Model used:

Given that the data incorporates both time series and cross-sectional components, the appropriate model for this study is a panel model. The model is specified as follows:

$$\boldsymbol{INGDB_{it} = a_{0i} + a_{1i}CPI_{it} + \varepsilon_{it}}$$

Where:

$INGDB_{it}$: economic growth index

$CPI_{it}$: Consumer Price Index

$a_{0i}$: fixed limit

$\boldsymbol{\varepsilon_{it}}$: random error limit

$i = 1.2.3$: represents the syllabic aspect (countries studied: United Kingdom, New Zealand, Sweden)

$t = 1.2 \ldots 29$: represents annual data (1993-2021)

The total data volume used in this study is 29×3=87.

### 3.3 Data Panel stability study:

The stability analysis is the initial step in determining the most appropriate final model for the study. The comprehensive unit root test, which includes several individual tests for stability, has been employed. The results are presented in the following table:

**Table 01: summary of the unit Root Test at the original level**

| Test / variable | Levin.Lin and Chu | | Im.P.and Sh | | ADF | | PP | |
|---|---|---|---|---|---|---|---|---|
| | **Statstic** | **Prob** | **Statstic** | **Prob** | **Statstic** | **Prob** | **Statstic** | **Prob** |
| INGDB | **0.56** | **0.71** | **2.29** | **0.98** | **1.61** | **0.95** | **2.23** | **0.89** |
| CPI | **1.86** | **0.96** | **4.24** | **1.00** | **0.08** | **1.00** | **0.05** | **1.00** |

Source: prepared by the researcher based on Appendix No. 01

The previous table summarizes the results of the unit root tests, which include four main tests: Levin-Lin-Chu, Im-Pesaran-Shin W-stat, ADF, and PP. All tests indicated the presence of a unit root for both variables, as the p-values exceed 0.05. This leads us to accept the null hypothesis of a unit root, suggesting that the panel data for the study variables are unstable. Therefore, we need to analyze the first differences to determine the degree of integration of the data:

**Table 02: summary of the unit Root Test at the first difference**

| Test / variable | Levin.Lin and Chu | | Im.P.and Sh | | ADF | | PP | |
|---|---|---|---|---|---|---|---|---|
| | **Statstic** | **Prob** | **Statstic** | **Prob** | **Statstic** | **Prob** | **Statstic** | **Prob** |
| INGDB | **-7.23** | **0.00** | **-7.08** | **0.00** | **49.69** | **0.00** | **58.66** | **0.00** |
| CPI | **-4.10** | **0.00** | **-3.54** | **0.00** | **23.03** | **0.00** | **22.40** | **0.00** |

Source: prepared by the researcher based on Appendix No. 01

The previous table shows that the variables are not stationary at the level of the unit root but become stationary at the first difference. Since the p-values of the tests are below 0.05, we reject the null hypothesis of a unit root. Consequently, the panel data for the study variables are stable at the first difference and are therefore first-order integrated.

### 3.4 Simultaneous integration testing of Panel data:

To test for the existence of a long-term equilibrium relationship between the study variables, we use the Pedroni and Kao tests. The results are presented in the following table:

**Table 03 :Pedroni and Kao test for the existence of a simultaneous integration relationship**

| | ADF | | Panel rho | | Panel PP | | Panel ADF | | Group rho | | Group PP | | Group ADF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | statistic | prob | statistic | prob | statistic | prob | statistic | prob | statistic | prob | statistic | prob | statistic | prob |
| Pedroni | - | - | -.019 | 0.42 | -0.54 | 0.29 | -0.49 | 0.30 | 0.45 | 0.67 | -0.14 | 0.44 | -0.8 | 0.46 |
| Kao | 0.30 | 0.37 | - | - | - | - | - | - | - | - | - | - | - | - |

Source: prepared by the researcher based on Appendix No. 02

The previous table displays the results of the simultaneous integration test. For the Pedroni test, nine out of eleven tests failed to reject the null hypothesis of no cointegration, as indicated by p-values greater than 0.05. Similarly, the Kao test also suggested the absence of cointegration, with a p-value exceeding 0.05. Based on the results of both tests, we conclude that there is no simultaneous integration relationship between the study variables.

**5-estimate the user model and interpret the results:**

The random-effects panel model was used, and the estimation results are as follows:

**Table 04 : Panel model estimate**

| Dependent Variable : INGDP | | | |
|---|---|---|---|
| Variable | **Coefficient** | **t- statistic** | **prob** |
| CPI | **1.2120** | **20.0660** | **0.00** |
| C | **-21.31** | **-1.8260** | **0.07** |
| Effiects Specification | | **428S.D** | **Rho** |
| Cross – section random | | **13.72** | **0.55** |
| Idiosyncratic random | | **12.40** | **0.44** |

Source: prepared by the researcher based on Appendix No. 02

The following table shows the result of the Hausman test for the trade-off between the static effect model and the random effect:

**Table 05 : Hausman test**

| Test Summary | Chi-Sq.statistic | Chi-Sq. d.f. | Prob |
|---|---|---|---|
| Cross-section random | **1.53** | **1** | **0.20** |
| Variable | **Fixed** | **Random** | **Prob** |
| CPI | **1.317** | **1.312** | **0.20** |

Source: prepared by the researcher based on Appendix No. 03

The previous table indicates that the optimal model is the fixed effects model, which is specified as follows:

**Table 06 :Estimation of the Random Effect Model**

| Dependent Variable : INGDP | | | |
|---|---|---|---|
| Variable | **Coefficient** | **t- statistic** | **prob** |
| CPI | **1.3173** | **20.1067** | **0.00** |
| C | **-21.08** | **-2.553** | **0.01** |

Source: prepared by the researcher based on Appendix No. 03

The table demonstrates that the model is well-explained, as indicated by an adjusted $R^2$ value of 0.8358. This suggests that the independent variable (Consumer Price Index) explains 83.58% of the variation in the dependent variable (economic growth index), highlighting the explanatory power of the independent variable. Furthermore, the model is statistically significant overall, with a Fisher test p-value of 0.00, which is less than 0.05. This allows us to reject the null hypothesis and accept the alternative hypothesis, confirming the statistical significance of the model..

For the t-test of the inflation coefficient (Consumer Price Index), the p-value is 0.00, which is less than 0.05. This leads us to reject the null hypothesis and accept the alternative hypothesis, indicating that the independent variable is statistically significant. Additionally, the positive coefficient value of 1.31 suggests that targeted inflation in the countries under study has positively contributed to improving economic growth rates.

## 4. CONCLUSION

Inflation targeting is a relatively recent approach to monetary policy, primarily aimed at controlling inflation and maintaining price stability. This creates a favorable economic environment for investment, stimulates

production, and fosters spending while protecting the economy from deflation and recession, ultimately generating employment and driving economic growth. Many countries have adopted this policy; however, only a few have successfully achieved the desired outcomes due to the specific conditions required for effective implementation. Notable examples of such success include New Zealand, Sweden, and the United Kingdom. This study was conducted to evaluate whether inflation targeting has a positive impact on economic growth in these countries. The study's results indicate that inflation targeting has a positive and statistically significant effect on economic growth rates throughout the period during which the policy was applied..

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# 6. Appendices

## 6.1 Appendix No. 01

**Table 01: summary of the unit Root Test at the original level**

**the unit Root test for the INGDB variable**

Panel Unit Root Test on INGDB

Panel unit root test: Summary
Series: INGDB
Date: 01/03/24 Time: 09:24
Sample: 1993 2021
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | 0.56925 | 0.7154 | 3 | 84 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | 2.29383 | 0.9891 | 3 | 84 |
| ADF - Fisher Chi-square | 1.61634 | 0.9514 | 3 | 84 |
| PP - Fisher Chi-square | 2.23015 | 0.8974 | 3 | 84 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

**the unit Root test for the CPI variable**

Panel Unit Root Test on CPI

Panel unit root test: Summary
Series: CPI
Date: 01/03/24 Time: 09:18
Sample: 1993 2021
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | 1.86694 | 0.9690 | 3 | 83 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | 4.24323 | 1.0000 | 3 | 83 |
| ADF - Fisher Chi-square | 0.08182 | 1.0000 | 3 | 83 |
| PP - Fisher Chi-square | 0.05164 | 1.0000 | 3 | 84 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Source: prepared by the researcher based on the outputs of EViews13

**Table 02: summary of the unit Root Test at the first difference**

**ADF test for the INGDB variable**

Panel Unit Root Test on D(INGDB)

Panel unit root test: Summary
Series: D(INGDB)
Date: 01/03/24 Time: 09:40
Sample: 1993 2021
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | -7.22950 | 0.0000 | 3 | 81 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | -7.07597 | 0.0000 | 3 | 81 |
| ADF - Fisher Chi-square | 49.6889 | 0.0000 | 3 | 81 |
| PP - Fisher Chi-square | 58.6686 | 0.0000 | 3 | 81 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

**ADF test for the CPI variable**

Panel Unit Root Test on D(CPI)

Panel unit root test: Summary
Series: D(CPI)
Date: 01/03/24 Time: 09:40
Sample: 1993 2021
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | -4.09755 | 0.0000 | 3 | 81 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | -3.53632 | 0.0002 | 3 | 81 |
| ADF - Fisher Chi-square | 23.0276 | 0.0008 | 3 | 81 |
| PP - Fisher Chi-square | 22.3989 | 0.0010 | 3 | 81 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

## 6.2 Appendix No. 02

### Table 03 :Pedroni and Kao test for the existence of a simultaneous integration relationship

**Kao test**

Kao Residual Cointegration Test
Series: CPI INGDB
Date: 01/03/24 Time: 09:55
Sample: 1993 2021
Included observations: 87
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 7
Newey-West automatic bandwidth selection and Bartlett kernel

| | t-Statistic | Prob. |
|---|---|---|
| ADF | 0.306601 | 0.3796 |
| Residual variance | 4.794692 | |
| HAC variance | 11.32477 | |

**Pedroni test**

Pedroni Residual Cointegration Test
Series: CPI INGDB
Date: 01/03/24 Time: 09:53
Sample: 1993 2021
Included observations: 87
Cross-sections included: 3
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
Automatic lag length selection based on SIC with a max lag of 6
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

| | Statistic | Prob. | Weighted Statistic | Prob. |
|---|---|---|---|---|
| Panel v-Statistic | 15.96074 | 0.0000 | 7.351303 | 0.0000 |
| Panel rho-Statistic | -0.195934 | 0.4223 | -0.317830 | 0.3753 |
| Panel PP-Statistic | -0.542717 | 0.2937 | -0.581410 | 0.2805 |
| Panel ADF-Statistic | -0.496029 | 0.3099 | -0.511569 | 0.3045 |

Alternative hypothesis: individual AR coefs. (between-dimension)

| | Statistic | Prob. |
|---|---|---|
| Group rho-Statistic | 0.458477 | 0.6767 |
| Group PP-Statistic | -0.144340 | 0.4426 |
| Group ADF-Statistic | -0.080564 | 0.4679 |

Source: prepared by the researcher based on the outputs of EViews13

### Table 04: Panel model estimate

Dependent Variable: INGDB
Method: Panel EGLS (Cross-section random effects)
Date: 01/12/24 Time: 11:02
Sample: 1993 2021
Periods included: 29
Cross-sections included: 3
Total panel (balanced) observations: 87
Swamy and Arora estimator of component variances

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| CPI | 1.312037 | 0.065386 | 20.06607 | 0.0000 |
| C | -21.39127 | 11.71444 | -1.826060 | 0.0714 |

Effects Specification

| | S.D. | Rho |
|---|---|---|
| Cross-section random | 13.72041 | 0.5504 |
| Idiosyncratic random | 12.40165 | 0.4496 |

Weighted Statistics

| | | | |
|---|---|---|---|
| R-squared | 0.824622 | Mean dependent var | 24.78219 |
| Adjusted R-squared | 0.822558 | S.D. dependent var | 29.55053 |
| S.E. of regression | 12.44781 | Sum squared resid | 13170.57 |
| F-statistic | 399.6668 | Durbin-Watson stat | 0.117829 |
| Prob(F-statistic) | 0.000000 | | |

Source: prepared by the researcher based on the outputs of EViews13

## 6.3 Appendix No. 03

## Table 05: Hausman test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
|---|---|---|---|
| Cross-section random | 1.633908 | 1 | 0.2012 |

Cross-section random effects test comparisons:

| Variable | Fixed | Random | Var(Diff.) | Prob. |
|---|---|---|---|---|
| CPI | 1.317319 | 1.312037 | 0.000017 | 0.2012 |

Source: prepared by the researcher based on the outputs of EViews13

## Table 06: Estimation of the Random Effect Model

Dependent Variable: INGDB
Method: Panel Least Squares
Date: 01/12/24 Time: 11:11
Sample: 1993 2021
Periods included: 29
Cross-sections included: 3
Total panel (balanced) observations: 87

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| CPI | 1.317319 | 0.065516 | 20.10674 | 0.0000 |
| C | -22.08002 | 8.646879 | -2.553525 | 0.0125 |

Effects Specification

Cross-section fixed (dummy variables)

| | | | |
|---|---|---|---|
| R-squared | 0.841537 | Mean dependent var | 149.7129 |
| Adjusted R-squared | 0.835809 | S.D. dependent var | 30.60588 |
| S.E. of regression | 12.40165 | Akaike info criterion | 7.918422 |
| Sum squared resid | 12765.47 | Schwarz criterion | 8.031797 |
| Log likelihood | -340.4514 | Hannan-Quinn criter. | 7.964075 |
| F-statistic | 146.9268 | Durbin-Watson stat | 0.121658 |
| Prob(F-statistic) | 0.000000 | | |