UNIVERSITY OF MACEDONIA

DEPARTMENT OF ECONOMICS

MASTER IN APPLIED ECONOMICS

ASSESSING THE PERFORMANCE OF THE INFLATION TARGETING POLICY

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Master Thesis submitted to the Department of Economics of the University of Macedonia in fulfillment of the requirements for the degree of Master in Applied Economics.

THESSALONIKI, OCTOBER 2019

Contents

Abstract

The purpose of this paper is to evaluate the effectiveness of the inflation targeting regime. More specifically, it is a monetary policy framework that has emerged in many countries since the early 1990s, with New Zealand being the first country which adopted this policy. An important feature of the efficiency of inflation targeting policy is lower variability. Therefore, I conduct simple hypothesis tests in order to examine if there is a change on inflation mean and variability in 47 developed and developing countries out of which 25 have adopted this policy.

Keywords: inflation targeting, variability change

1. Introduction

Inflation targeting was first adopted in the early 1990s by developed economies, but is being adopted by an increasing number of developing and emerging countries as well. The first country to adopt inflation targeting is New Zealand in 1989 and since then this regime has become a tool of monetary policy in many different countries such as the industrialized countries (Australia, Canada, United Kingdom), the emerging countries (Brazil, Chile, Korea) and those in transition (Hungary, Poland, Romania).

Inflation targeting is a framework of monetary policy where a central bank follows an obvious target for the inflation rate for the medium-term and announces this inflation target to the public. The inflation targeting policy is based on the assumption that the best that monetary policy can do in order to support the long-run growth of the economy is to maintain price stability. To this end, the Central Banks are using their basic short-term tool, interest rates. A central inflation targeting bank will increase or decrease inflation target rates above or below the target, respectively. The rationale is that rising interest rates usually encourage the economy to contain inflation while lowering interest rates usually speeds up the economy, thereby boosting inflation.

The inflation targeting regime has been the subject of research by many researchers, who have argued in their studies, that this policy has advantages and drawbacks compared to other forms of monetary policy. In particular, one advantage of inflation targeting is that it allows monetary policy to focus on domestic valuations and respond to shocks in the domestic economy, which is not feasible under a stable exchange rate system. Furthermore, transparency is an important benefit of inflation targeting. Central banks in developed countries that have successfully implemented inflation targeting tend to maintain systematic channels of communication with the public.

On the contrary, opponents of inflation targeting argue that this policy neglects output shocks by focusing exclusively on price levels. Another disadvantage is that inflation targeting can be perilous for a country in the long term. It can furnish many industries to become uncompetitive. The governments may take up too much of the responsibility or the financial obligation of keeping inflation under check. This can

lead to higher fiscal deficits, poor welfare policies or incentives packages and ultimately the economy may cease to remain as free flowing as is needed.

The paper is organized as follows. Section 2 presents the literature review. Section 3 describes the methodology and Section 4 displays the data. Section 5 reports the empirical results. Finally, Section 6 concludes.

2. Literature review

There has been appreciable debate about the effectiveness of inflation targeting policy, which first appeared in the early 1990s. Initially, the literature focuses on the first countries, which adopted the inflation targeting regime, such as New Zealand, Canada and the United Kingdom, and then targets on other countries. At this point, it should be noted that a great part of the literature examines the performance of this policy in emerging and developing economies. Moreover, it is obvious that during the first decade of inflation targeting, researchers in empirical research use simple econometric methods like VAR models. However, over the next two decades, the use of more complex techniques such as the difference in difference method and the propensity scope matching method increases.

A key prerequisite for the efficiency of inflation targeting policy is to eliminate price uncertainty. **M. Fisher and Adrian B.Orr (1994)** study whether New Zealand has succeeded in achieving price stability. Indeed, the New Zealand Central Bank has significantly reduced price uncertainty due to its independence in managing of monetary issues. In addition, the inflation targeting regime requires monetary authorities to be the primary target of a country's monetary policy. Thus, **Ben S.Bernake and Frederic S.Mishkin (1997)** argue that inflation targeting is a framework, which can improve communication between policymakers and the public, but also increase the monetary policy discipline in order to achieve success of its goals. An equally important issue is the implementation of the inflation targeting regime and its monitoring by the markets and the public. **Lars E.Svensson (1997)** observes that for the proper implementation of this policy, it is necessary to establish a clear inflation forecasting target by the Central Banks.

Many researchers have examined the experience in countries that have adopted the inflation targeting regime. In particular, **Frederic S. Mishkin and Adam S. Posen (1997)** discuss the reasons why New Zealand, Canada and the United Kingdom

chose inflation targeting as the basis of their monetary policy. They also raise a number of topics regarding the design of this policy. At this mark, it should be noted that in the late 1990s, the question arose as to whether emerging economies could adopt the inflation targeting regime. **Paul R. Masson, Miguel A. Savastano, and Sunil Sharma (1998)** explore this question, arguing that emerging countries face major problems in monetary policy. As a consequence, the conditions for the adoption of inflation targeting are not yet sufficient.

In the early 2000s, the literature continued to study the inflation targeting regime in various economies. More specifically, **Lars E.Svensson (2000)** focuses on the introduction of inflation targeting policy in open economies where the exchange rate and shocks play an important role in the conduct of monetary policy. **Frederic S. Mishkin (2000)** describes what inflation targeting is about to accept from some emerging economies such as Chile, Brazil, and the Czech Republic. He also mentions the pros and cons of this strategy. At the same time, he points out that inflation targeting is not an appropriate policy for many emerging economies, but can be a quite useful strategy in several of them.

Guy Debelle (2001) examines whether inflation targeting is a viable monetary policy strategy for an East Asian country. In particular, he argues that in several East Asian countries inflation targeting is a sustainable monetary framework that will help keep inflation in these countries low. **Asiya F. Validova (2014)** defines the concept of inflation targeting as a new monetary policy regime and describes the means of its implementation. Moreover, she focuses on the advantages, disadvantages and effectiveness of inflation targeting in both developed and developing countries. Furthermore, she studies the transition of emerging economies from implicit inflation targeting to full-pledged inflation targeting (IT), and draws useful conclusions for Russia.

The inflation targeting policy is an important and remarkable monetary policy tool in several countries. More specific, **Vittorio Corbo, Oscar Landerretche and Klaus Schmidt-Hebbel (2001)** conduct a broad empirical research on the rationale and consequences of adopting inflation targeting. They also estimate the success of inflation targeting in three directions: a) the reduction of inflation shortly before and after policy acceptance, b) the speed at which inflation was reduced, and c) the average divergence of inflation outcomes from the targets. Moreover, **Andrew Hughes Hallett and Nicola Viegi (2002)** analyze the impact of inflation targeting on

a multi-instrument world where monetary and fiscal policies are carried out by independent political authorities. From this analysis, they lead to two conclusions: a) inflation targeting is beneficial if it reduces conflicts between monetary and fiscal policy b) inflation targeting is useful when monetary policy has a strong impact on fiscal policy objectives.

Furthermore, much of the literature compares the impact of inflation targeting between developing and developed countries. **Arminio Fraga, Ilan Goldfajn and Andre Minella (2003)** assess inflation targeting in Emerging Market Economies (EMEs) compared to developed economies and develop views that can be applied in monetary policy. They also argue that inflation is higher in EME, which is due to the existence of vulnerable institutions, while they consider that the conduct of monetary policy in EMEs faces three challenges: a) Creating credibility, b) Reducing inflation and c) Addressing fiscal, financial and external dominance.

In addition, inflation targeting policy is a subject of mathematical analysis. More specifically, **Philip Arestis and Malcolm Sawyer (2003)** argue that inflation targeting is linked to New Consensus Macroeconomics (NCM). In particular, they consider inflation targeting is an important theoretical component of NCM. Then, they use three equations to describe the NCM. The first concerns aggregate demand, the second the Phillips curve, and the third a monetary-policy rule. In conclusion, they believe that inflation targeting does not offer many results because the low inflation period does not differ between IT and nonIT countries. **Kevin X.D. Huang and Zheng Liu (2004)** describe the creation and implementation of optimal monetary policy in a DSGE model, which includes much nominal rigidities and therefore many price indices, in order to examine the monetary principle, stabilization. The model presents an input-output relationship, which is supported by remarkable empirical evidence.

Another important issue for the effective implementation of inflation targeting by any country is the forecasts that should be treated with caution as they can be misleading. **Rachel Lamox (2005)** analyzes the role of forecasts in monetary policy in the United Kingdom as well as the Monetary Policy Committee's communication with the outside world. More specific, the forecast has two roles in the monetary policy process: Firstly, it helps the Committee to define monetary policy with the proper organization and updating of its debates. Secondly, it offers transparency to the Committee and contributes to communicating with the public. **Aaron Mehrotra and**

James Yetman (2018) apply an innovative, complementary test to the announced inflation targets. In particular, they consider an alternative version of the forthcoming self-developed model, in which inflation forecasts deviate from an estimated longer-run anchor point, with the forecast horizon falling. They also estimate the model, using 18 inflation targeting economies forecasts from Consensus Economics. Thus, they conclude that professional forecasts find inflation targets in most economies reliable because the estimated inflation anchor approximates the announced inflation target.

Since the mid-2000s, several researchers have been collecting empirical data for a large number of countries in their research. **Yifan Hu (2006)** explores the factors that drive a country to adopt inflation targeting policy. In particular, he uses annual data for 66 countries for the period 1980-2000 (22 are inflation targeters and 44 non inflation targeters), which are drawn from the databases of the International Monetary Fund and the World Bank. The variables used in the regressions are: fiscal position, trade openness, external debt, floating exchange rate, real GDP and inflation rate. Furthermore, the use of a dummy variable for inflation targeting as well as the assignment of two observations per country with regard to the year of inflation targeting acceptance should be highlighted. **Frederic S. Mishkin and Klaus Schmidt-Hebbel (2007)** try to answer a series of questions related to the macroeconomic performance of IT and non-IT countries. More specific, they collect empirical data from 21 IT industrial and emerging countries and compare their performance with a group of 13 non industrial IT, while they perform a VAR panel that provides them with the largest data set for all countries under study. The variables included in VAR are: international oil price, international interest rate, output gap, inflation, interest rate and nominal exchange rate.

However, the inflation targeting policy has received strong criticism for its effectiveness. **Gerald Epstein and Erinc Yeldan (2008)** argue that modern Central Banks need to build a larger political space to balance more goals. In particular, job creation and faster economic growth must be integrated into the monetary policy objectives of the Central Banks. Moreover, they describe the desirable and feasible departure from inflation targeting policy. **Carl E. Walsh (2009)** argues that in addition to the rapid spread of inflation targeting, this policy has been strongly criticized for controlling inflation but also for neglecting other macroeconomic targets, which are set by the Central Banks. Nonetheless, for developing and

emerging economies, inflation targeting has contributed to low inflation and the stability of economy. He also wonders whether inflation targeting is essential for monetary policy, indicating that there are alternatives that better promote overall economic stability.

Anna Samarina, Mirre Terpstra and Jakob De Haan (2013) examine the credibility of the results of previous studies with regard to country samples and inflation targeting dates that have been involved in drawing conclusions on inflation targeting policy. Moreover, they use two completely different estimation techniques, the difference in difference method and the propensity scope matching. They also conclude that inflation targeting has no significant contribution to reducing inflation in developed countries, but it plays an important role in curbing the phenomenon in developing and emerging economies. **Andrew Hughes Hallett and Nicola Viegi (2014)** authors examine an alternative policy that is considered a competitor of inflation targeting (IT) and is called price-level targeting (PT). The main difference between the two monetary regimes is the fact that under the PT, the Central Bank tries to stabilize the overall price level around a predetermined target price path.

During the last decade of 2010, the literature focuses on assessing the performance of inflation targeting policy in emerging economies. **Hiroyuki Taguchi and Chizuru Kato (2010)** study inflation targeting by comparing money and inflation relationship in different monetary regimes to 4 East Asian economies (Korea, Indonesia, Thailand and the Philippines) that have adopted inflation targeting after the Asian Monetary Crisis in 1997-98. The different monetary regimes are: a) inflation targeting regime with a floating exchange rate in the post-crisis period; and b) pegged exchange rate regime without inflation targeting in the pre-crisis period. **Andrew Filardo and Hans Genberg (2010)** explore various statistical measures of inflation stability to examine whether the acceptance of inflation targeting was effective in achieving the inflation target in Asia and the Pacific. In particular, they focus on the permanent and transient elements of inflation in order to observe its evolution.

Yannick Lucotte (2012) empirically studies whether the adoption of inflation targeting has encouraged governments of emerging countries to increase their domestic tax revenues. More specific, so as to address the above issue, he uses the propensity score matching methodology. In conclusion, he concludes that, on average,

the adoption of inflation targeting has contributed to increasing public revenues in emerging economies. **Dinabandhu Sethi and Debashis Acharya (2017),** examine the credibility of the inflation targeting regime in Asian economies. More specifically, they present the theoretical structure of the study, while displaying some conclusions from previous studies. Also, they analyze the episode method methodology. To sum up, they argue that inflation targeting policy is beneficial to emerging economies, especially Asian countries. **Olena Ogrokhina and Cesar M. Rodriquez (2018)** explore the impact of adopting inflation targeting as a monetary policy regime on reducing foreign currency dependence and on the influence of the monetary composition of international debt. More specifically, they use data from 74 countries, of which 15 are inflation targeters. Hence, they note that the adoption of inflation targeting has reduced the share of foreign currency in international debt by 3 to 6% compared to non-targeting countries.

Than Than Soe and Makoto Kakinaka (2018) wonder whether the inflation targeting regime can help stabilize income velocity in developing countries. In particular, they use the propensity score matching (PSM) method to study income velocity responses to the adoption of inflation targeting policy in 84 developing countries from 1990 to 2013. Moreover, they investigate the behavior of all components of income velocity (price levels, real outputs, money holdings) during the pre- and post-IT periods. Furthermore, in order to check the validity of the results, which are obtained by the PSM method, the authors apply the difference in difference approach as an alternative method. In summary, they express that an inflation targeting regime is more effective at stabilizing the income velocity of developing countries, which fulfill the conditions for accepting inflation targeting under floating exchange rate regime.

On the other hand, the literature assesses the inflation targeting regime in developed economies as well. **Dooyen Cho and Dong-Eun Rhee (2015)** assess the role of inflation targeting in stabilizing the economy during the Great Moderation period. More specific, they examine whether the economic fluctuations caused by monetary policies have been normalized in the four developed economies - Australia, Canada, Sweden and the United Kingdom - which adopted inflation targeting in the early 1990s. Moreover, they describe the relationship between inflation targeting and fluctuations in business cycles. To sum up, they conclude that monetary policy wedge has declined significantly in the four advanced economies due to the implementation

of inflation targeting in the early 1990s. **Ozan Eksi, Neslihan Kaya Eksi and Umit Ozlale (2017)** discuss the optimal monetary policy rules for the Bank of Canada for the periods before and after the adoption of inflation targeting, so as to observe the changing preferences of policymakers between the two seasons.

Concurrently, the inflation targeting relationship with the financial sector is especially important. **Imran Hussain Shah and Ahmad Hassan Ahmad (2017)** create a broad measure of inflation that includes stock price indices, using UK and US data and examine whether this measure is more superior than the CPI to achieve greater output stability, under an inflation targeting regime. More specific, they point out that a central bank implementing inflation targeting is facing a problem with selecting the appropriate weights in order to construct a price index that will be considered as an inflation measure, with the aim of limiting output volatility. **Antonia Lopez-Villavicencio and Marc Pourroy (2019)** study whether and how inflation targeting changes the way exchange rate changes affect prices. In particular, they use the Kalman filter to calculate the exchange rate pass-through (ERPT). They also conclude that inflation targeting reduces the exchange rate pass-through for any level of initial or targeted inflation, as well as that monetary authorities do not need to apply a high level of independence to restrict the ERPT.

Finally, the central bank's independence is particularly important for the effective implementation of the inflation targeting policy. **Kenneth Rogoff (2019)** argues that the challenges facing central banks are due to two events. First, their effectiveness in reducing inflation and second their inability to find ways in order to keep up with the zero lower bound on interest rates. As a result, central banks become more sensitive to populism, thereby undermining their independence. In this difficult time, central banks are necessary to look hard for new instruments so as to restore the effectiveness of ordinary interest rate policy.

3. Methodology

To investigate the effectiveness of inflation targeting policy, I will examine whether there is a change in mean and variance (variability) of annualized inflation by estimating simple hypothesis tests for all countries for which I use data. More specifically, I introduce the null hypothesis and its alternative hypothesis to discuss

concurrent trials that more accurately compare two independent populations with their respective physiological distributions N (μ_1, σ_1^2) and N (μ_2, σ_2^2):

$$H_0 : \{\mu_{1=}\mu_2\} \cap \{\sigma_1^2 = \sigma_2^2\}$$

and

$$H_1 : \{\mu_1 \neq \mu_2\} \bigcup \{\sigma_1^2 \neq \sigma_2^2\}$$

Hence, the null hypothesis states that there is no change in the mean and the variance, while the alternative hypothesis states the opposite.

4. Data

To analyze the performance of the inflation targeting regime, I have collected data on the Consumer Price Index from 47 countries. In particular, I calculated the annualized inflation, which is the logarithmic difference in the Consumer Price Index. The charts of annualized inflation are presented in Appendix (Figure 1).The sources of data are the International Financial Statistics database of the International Monetary Fund and the Federal Reserve Economic Data. More specific, for the majority of countries, the sample I study ranges from 1970:01 to 2019:04 (monthly frequency) and includes 592 observations. Exceptions due to lack of data include the following countries: Chile, Colombia, Israel (1971:01 to 2019:04), Costa Rica (1977:01 to 2019:03), Slovenia, Brazil, Hungary (1981:01 to 2019:04), Poland (1990: 01 to 2019:04), Latvia, Lithuania, Slovakia (1992:01 to 2019:04), Russia (1993:01 to 2019:04), China (1994:01 to 2019:04), Cyprus, Malta, Romania (1997:01 to 2019: 04), Estonia (1999:01 to 2019:04) and the Czech Republic (2001:01 to 2019:04). There are no monthly observations available for Australia, New Zealand. Hence, I use quarterly data for 1970: Q1 to 2019: Q1 (Australia and New Zealand). The summary statistics for all inflation series appear in Appendix (Table A1).

Furthermore, in order to check if there is a change in the mean and variance, I have divided the 47 countries into 2 groups. The first group is consisted of the inflation targeting countries and the second group is made up of those that have not adopted the inflation targeting policy. Concerning the first group I have created two subsets: the first is from the commencement of data to the time of adoption of inflation targeting, and the second starts from the time of the entry of inflation

targeting as a monetary policy tool to the end of data in April 2019. Moreover, I have followed a similar procedure for the second group of countries except that the first subset is completed when the annualized inflation of each country shows a sharp change in its behavior.

5. Empirical findings

In this section, I present in two tables the results from simple hypothesis tests of the annualized inflation mean and volatility for the two groups of countries. The first table refers to the countries that are inflation targeters and the second to the rest countries.

Table 1: Test for a shift in inflation variance of inflation targeting countries

Country	Sample	Mean	Variance
Australia	1970Q1-1993Q1	0,083 (0.000)	0,038 (0.000)
Australia	**1993Q2-**2019Q1	0,024 (0.000)	0,012 (0.000)
Brazil	1981M1-1999M5	7,139 (0.000)	12,082 (0.000)
Brazil	**1999M6-**2019M4	0,064 (0.000)	0,026 (0.000)
Canada	1970M1-1991M1	0,067 (0.000)	0,032 (0.000)
Canada	**1991M2-**2019M4	0,017 (0.000)	0,013 (0.000)
Chile	1971M1-1998M8	0,735 (0.000)	0,031 (0.000)
Chile	**1999M9-**2019M4	0,031 (0.000)	0,020 (0.000)
Colombia	1971M1-1999M9	0,224 (0.000)	0,059 (0.000)
Colombia	**1999M10-**2019M4	0,051 (0.000)	0,021 (0.000)
Czech Republic	2001M1-2019M4	0,037 (0.000)	0,029 (0.000)
Hungary	1981M1-2000M12	0,156 (0.000)	0,088 (0.000)
Hungary	**2001M1-**2019M4	0,040 (0.000)	0,026 (0.000)
Iceland	1970M2-	0,235	0,222

	2001M2		
Iceland	**2001M3-** 2019M4	0,047 (0.000)	0,035 (0.000)
India	1970M1- 2016M7	0,080 (0.000)	0,054 (0.000)
India	**2016M8-** 2019M4	0,041 (0.000)	0,018 (0.000)
Indonesia	1970M1- 2005M6	0,129 (0.000)	0,123 (0.000)
Indonesia	**2005M7-** 2019M4	0,062 (0.000)	0,035 (0.000)
Israel	1971M1- 1997M5	0,658 (0.000)	0,942 (0.000)
Israel	**1997M6-** 2019M4	0,021 (0.000)	0,024 (0.000)
Japan	1970M1- 2012M12	0,028 (0.000)	0,046 (0.000)
Japan	**2013M1-** 2019M4	0,008 (0.000)	0,011 (0.000)
Korea	1970M1- 2000M12	0,095 (0.000)	0,077 (0.000)
Korea	**2001M1-** 2019M4	0,025 (0.000)	0,012 (0.000)
Mexico	1970M1- 2000M12	0,342 (0.000)	0,350 (0.000)
Mexico	**2001M1-** 2019M4	0,043 (0.000)	0,010 (0.000)
New Zealand	1970Q1- 1989Q3	0,117 (0.000)	0,044 (0.000)
New Zealand	**1989Q4-** 2019Q1	0,021 (0.000)	0,014 (0.000)
Norway	1970M1- 2001M2	0,062 (0.000)	0,035 (0.000)
Norway	**2001M3-** 2019M4	0,020 (0.000)	0,011 (0.000)
Poland	1990M1- 1997M12	1,307 (0.000)	2,774 (0.000)
Poland	**1998M1-** 2019M4	0,032 (0.000)	0,031 (0.000)
Romania	1997M1- 2005M7	0,465 (0.000)	0,448 (0.000)
Romania	**2005M8-** 2019M4	0,038 (0.000)	0,030 (0.000)
Russia	1993M1- 2013M12	0,862 (0.000)	1,994 (0.000)
Russia	**2014M1-** 2019M4	0,072 (0.000)	0,045 (0.000)
South Africa	1970M1- 2000M1	0,114 (0.000)	0,038 (0.000)

South Africa	**2000M2-** 2019M4	0,053 (0.000)	0,027 (0.000)
Sweden	1970M1- 1992M12	0,081 (0.000)	0,028 (0.000)
Sweden	**1993M1-** 2019M4	0,013 (0.000)	0,013 (0.000)
Switzerland	1970M1- 2000M12	0,034 (0.000)	0,026 (0.000)
Switzerland	**2001M1-** 2019M4	0,004 (0.000)	0,008 (0.000)
Turkey	1970M1- 2005M12	0,481 (0.000)	0,281 (0.000)
Turkey	**2006M1-** 2019M4	0,093 (0.000)	0,034 (0.000)
UK	1970M1- 1992M9	0,095 (0.000)	0,055 (0.000)
UK	**1992M10-** 2019M4	0,021 (0.000)	0,008 (0.000)
US	1970M1- 2011M12	0,044 (0.000)	0,029 (0.000)
US	**2012M1-** 2019M4	0,015 (0.000)	0,007 (0.000)

Notes: a) in the sample column, the first subset is the start of the sample while the second is the period in which each country adopts inflation targeting regime as a monetary policy tool. In particular, the outlined date is the date of adoption of inflation targeting. b) in the case of the Czech Republic, I created only a subset due to the lack of available CPI data of the country. At this point, it is worth noting that the Czech Republic adopted an inflation targeting policy in December 1997. In brackets is the probability value for the significance of mean and variance differences.

On the basis of the results I derive from Table 1, I observe that there is a decrease in both the mean and the variance between the two subsets for all countries. At the same time, it is easily understood that this decrease is statistically significant because the probability is 0.000. Therefore, for inflation targeting countries, I will reject the null hypothesis and I will accept the alternative assumption that there is a change in the mean and volatility of annualized inflation.

Table 2: Test for a shift in inflation variance of rest countries

Country	Sample	Mean	Variance
Austria	1970M1- 1992M6	0,048 (0.000)	0,022 (0.000)
Austria	*1992M7-* 2019M	0,019 (0.000)	0,009 (0.000)
Belgium	1970M1- 1991M5	0,058 (0.000)	0,032 (0.000)

Belgium	**1991M6-** 2019M4	0,019	0,010
China	1994M1- 1994M10	0,237 (0.000)	0,024 (0.000)
China	**1994M11-** 2019M4	0,029 (0.000)	0,043 (0.000)
Costa Rica	1977M1- 1991M5	0,224 (0.000)	0,219 (0.000)
Costa Rica	**1991M6-** 2019M3	0,099 (0.000)	0,064 (0.000)
Cyprus	1997M1- 1999M7	0,023 (0.000)	0,012 (0.000)
Cyprus	**1999M8-** 2019M4	0,018 (0.000)	0,019 (0.000)
Denmark	1970M1- 1993M5	0,072 (0.000)	0,037 (0.000)
Denmark	**1993M6-** 2019M4	0,017 (0.000)	0,008 (0.000)
Estonia	1999M1- 2001M5	0,040 (0.000)	0,012 (0.000)
Estonia	**2001M6-** 2019M4	0,032 (0.000)	0,028 (0.000)
Finland	1970M1- 1995M10	0,074 (0.000)	0,045 (0.000)
Finland	**1995M11-** 2019M4	0,014 (0.000)	0,011 (0.000)
France	1970M1- 1998M10	0,062 (0.000)	0,041 (0.000)
France	**1998M11-** 2019M4	0,013 (0.000)	0,008 (0.000)
Germany	1970M1- 1992M7	0,038 (0.000)	0,020 (0.000)
Germany	**1992M8-** 2019M4	0,016 (0.000)	0,009 (0.000)
Greece	1970M1- 1991M4	0,162 (0.000)	0,072 (0.000)
Greece	**1991M5-** 2019M4	0,043 (0.000)	0,048 (0.000)
Ireland	1970M1- 1996M3	0,081 (0.000)	0,063 (0.000)
Ireland	**1996M4-** 2019M4	0,018 (0.000)	0,023 (0.000)
Italy	1970M1- 1993M10	0,107 (0.000)	0,057 (0.000)
Italy	**1993M11-** 2019M4	0,021 (0.000)	0,013 (0.000)
Latvia	1992M1- 1993M7	6,665 (0.000)	4,284 (0.000)
Latvia	**1993M8-**	0,072	0,103

	2019M4	(0.000)	(0.000)
Lithuania	1992M1-1993M6	8,602 (0.000)	2,660 (0.000)
Lithuania	*1993M7-*2019M4	0,150 (0.000)	0,549 (0.000)
Luxembourg	1970M1-1993M12	0,052 (0.000)	0,030 (0.000)
Luxembourg	*1994M1-*2019M4	0,018 (0.000)	0,009 (0.000)
Malta	1997M1-2004M11	0,115 (0.000)	0,060 (0.000)
Malta	*2004M12-*2019M4	0,037 (0.000)	0,032 (0.000)
Netherlands	1970M1-1992M6	0,047 (0.000)	0,031 (0.000)
Netherlands	*1992M7-*2019M4	0,019 (0.000)	0,008 (0.000)
Portugal	1970M1-1992M7	0,169 (0.000)	0,074 (0.000)
Portugal	*1992M8-*2019M4	0,025 (0.000)	0,019 (0.000)
Slovakia	1992M1-1995M5	0,148 (0.000)	0,064 (0.000)
Slovakia	*1995M6-*2019M4	0,042 (0.000)	0,035 (0.000)
Slovenia	1981M1-1996M10	2,232 (0.000)	5,232 (0.000)
Slovenia	*1996M11-*2019M4	0,037 (0.000)	0,030 (0.000)
Spain	1970M1-1996M8	0,105 (0.000)	0,056 (0.000)
Spain	*1996M9-*2019M4	0,021 (0.000)	0,014 (0.000)

Note: in the sample column, the first subset is the start of the sample while the second is the period in which annualized inflation of each country shows a sharp shift. In brackets is the probability value for the significance of mean and variance differences.

According to the results of Table 2, I notice that there is a decrease in both the mean and the variance between the two subsets for all countries. However, there are some exceptions as there have been some increases in the variance of the three countries. More specific, for China where the variance increased from 0.024 to 0.043, for Cyprus from 0.012 to 0.019 and for Estonia from 0.012 to 0.028. Nonetheless, this decrease of rest countries is statistically significant because the probability is 0.000. As a consequence, for countries in second group I will reject the null hypothesis and I will accept the alternative assumption that there is a change in the mean and volatility of annualized inflation.

Hence, all the countries except China, Cyprus and Estonia appear to experience a statistically significant decrease in the variability of annualized inflation. As conclusions from the empirical study, it is easily understood that countries that adopted inflation targeting policy as a tool of their monetary policy managed to reduce and maintain inflation at a low and steady rate. Furthermore, I observe that countries that have not adopted inflation targeting have managed to keep inflation low.

6. Conclusions

Inflation targeting is an overriding framework for monetary policy. In the last three decades, many countries have adopted this regime in an effort to reduce inflation to a low and stable rate. This is a policy that, as much of the literature states, has both advantages and disadvantages.

This paper applies a test for change in mean and variability of annualized inflation. I use data from 47 countries, 25 of which are inflation targeters. In particular, I have observed that in all countries there is a statistically significant decrease in both the average and the variance between the two periods considered for each country. Exceptions are China, Cyprus and Estonia, where there is an increase in variance. As a consequence, I note that inflation targeting policy is effective for countries that have implemented it in their monetary policy. Similar conclusions regarding their inflation performance also emerge for other countries, which may not use inflation targeting policy but apply equally successful frameworks in their monetary policies.

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Appendix

Table A1: Full sample summary statistics

Euro area countries

Country	Sample	Mean	Max	Min	St. Dev.	Skewness	Kurtosis
Austria	1970m01-2019m04	0,032	0,102	-0,002	0,021	1,095	3,62
Belgium	1970m01-2019m04	0,036	0,163	-0,016	0,03	1,567	5,836
Cyprus	1997m01-2019m04	0,018	0,063	-0,024	0,018	-0,173	2,558
Estonia	1999m01-2019m04	0,033	0,114	-0,021	0,026	0,589	4,106
Finland	1970m01-2019m04	0,045	0,192	-0,015	0,045	1,287	3,989
France	1970m01-2019m04	0,042	0,151	-0,007	0,04	1,144	3,072
Germany	1970m01-2019m04	0,026	0,079	-0,009	0,019	0,77	2,748
Greece	1970m01-2019m04	0,094	0,338	-0,028	0,083	0,617	2,319
Ireland	1970m01-2019m04	0,049	0,241	-0,065	0,056	1,416	4,623
Italy	1970m01-2019m04	0,063	0,252	-0,005	0,059	1,219	3,41
Latvia	1992m01-2019m04	0,454	14,45	-0,041	1,839	5,48	34,38
Lithuania	1992m01-2019m04	0,614	14,12	-0,019	2,09	4,217	21,38
Luxembourg	1970m01-2019m04	0,035	0,118	-0,014	0,027	1,068	3,493
Malta	1997m01-2019m04	0,064	0,208	0,000	0,058	0,812	2,843
Netherlands	1970m01-2019m04	0,032	0,111	-0,012	0,025	1,145	3,558
Portugal	1970m01-2019m04	0,091	0,512	-0,016	0,088	1,137	3,925
Slovakia	1992m01-2019m04	0,056	0,27	-0,009	0,054	1,662	6,293
Slovenia	1981m01-2019m04	0,944	34,65	-0,008	3,541	6,66	51,82
Spain	1970m01-2019m04	0,066	0,284	-0,013	0,059	1,168	3,78

Inflation-targeting countries

Country	Sample	Mean	Max	Min	St. Dev.	Skewness	Kurtosis
Australia	1970Q01-2019Q01	0,052	0,176	-0,004	0,04	0,975	3,138
Brazil	1981m01-2019m04	3,463	68,21	0,016	9,082	4,159	22,7
Canada	1970m01-2019m04	0,038	0,132	-0.021	0,034	1,091	3,208
Chile	1971m01-2019m04	0,449	7,462	-0,033	1,124	3,893	18,91
Colombia	1971m01-2019m04	0,153	0,406	0,017	0,097	0,134	1,665
Czech Republic	2001m01-2019m04	0,037	0,107	0,000	0,029	0,628	2,414
Hungary	1981m01-2019m04	0,101	0,385	-0,014	0,088	1,177	3,538
Iceland	1970m01-2019m04	0,158	1,021	0,000	0,195	1,702	5,501
Indonesia	1970m01-2019m04	0,11	0,824	-0,011	0,11	3,517	18,35
Israel	1971m01-2019m04	0,369	4,803	-0,027	0,765	3,58	17,01
Korea	1970m01-2019m04	0,069	0,325	0,001	0,07	1,687	5,134
Mexico	1970m01-2019m04	0,231	1,797	0,021	0,313	2,492	9,355
New Zealand	1970Q01-2019Q01	0,06	0,189	-0,005	0,055	0,892	2,359
Norway	1970m01-2019m04	0,047	0,152	-0,018	0,035	0,851	2,717
Poland	1990m01-2019m04	0,379	12	-0,012	1,551	6,032	39,48
Romania	1997m01-2019m04	0,202	1,777	-0,029	0,347	3,062	12,7
Russia	1993m01-2019m04	0,702	10,65	0,021	1,808	3,701	16,4
South Africa	1970m01-2019m04	0,09	0,209	-0,019	0,045	0,106	2,273
Sweden	1970m01-2019m04	0,045	0,155	-0,018	0,04	0,606	2,248
Switzerland	1970m01-2019m04	0,023	0,119	-0,014	0,026	1,143	3,742
Turkey	1970m01-2019m04	0,376	1,258	0,039	0,296	0,725	2,53
UK	1970m01-2019m04	0,055	0,268	0,001	0,053	1,776	5,86

Other countries

Country	Sample	Mean	Max	Min	St. Dev.	Skewness	Kurtosis
China	1994m01-2019m04	0,036	0,277	-0,022	0,056	2,54	9,441
Costa Rica	1977m01-2019m03	0,142	1,088	-0,012	0,15	3,551	18,31
Denmark	1970m01-2019m04	0,043	0,168	-0,001	0,038	1,23	3,524
India	1970m01-2019m04	0,078	0,346	-0,112	0,053	0,828	7,912
Japan	1970m01-2019m04	0,026	0,247	-0,025	0,044	2,608	11,37
US	1970m01-2019m04	0,04	0,145	-0,019	0,029	1,447	4,95

Figure 1: Annualized Inflation

CHECH REPUBLIC

CHILE

CHINA

COLOMBIA

COSTA RICA

CYPRUS

DENMARK

ESTONIA

FINLAND

FRANCE

GERMANY

GREECE

HUNGARY

ICELAND

INDIA

INDONESIA

IRELAND

ISRAEL

ITALY

JAPAN

KOREA

LATVIA

LITHUANIA

LUXEMBOURG

MALTA

MEXICO

NETHERLANDS

NORWAY

POLAND

PORTUGAL

ROMANIA

RUSSIA

SLOVAKIA

SLOVENIA

SOUTH AFRICA
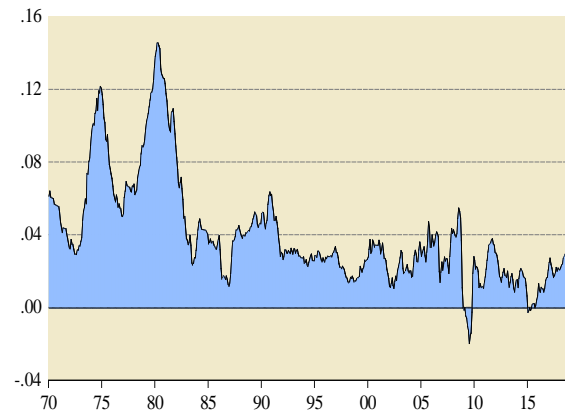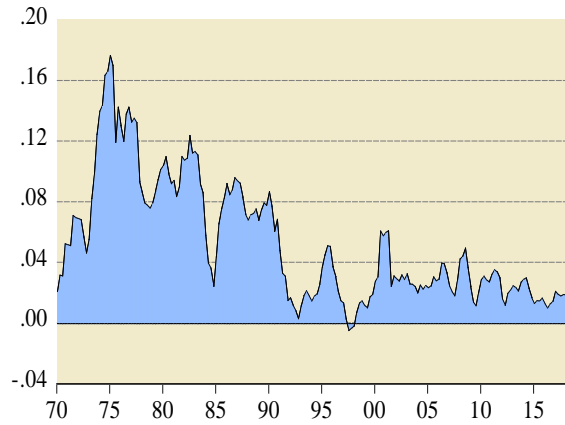

SPAIN

SWEDEN

SWITZERLAND

TURKEY

UNITED KINGDOM
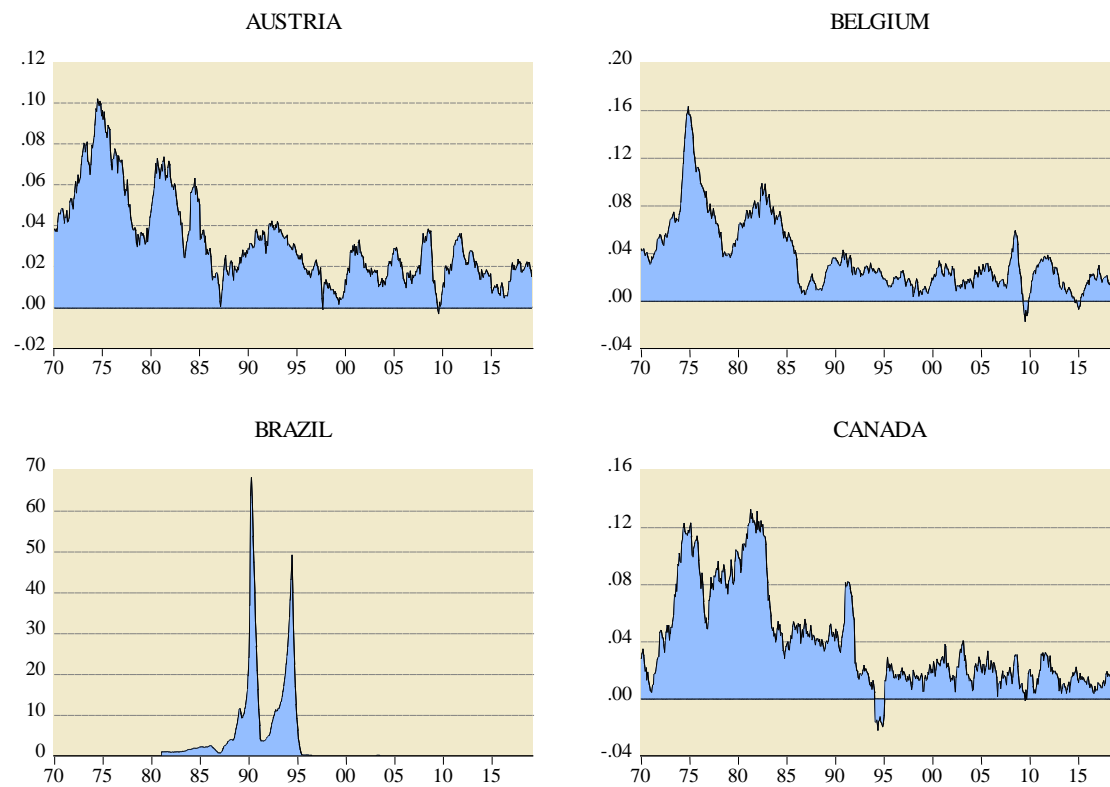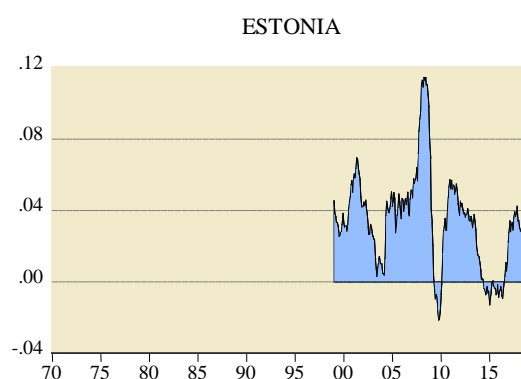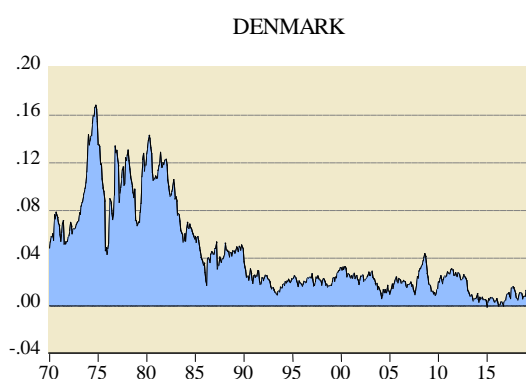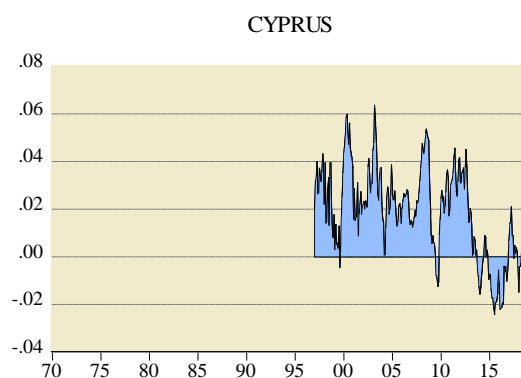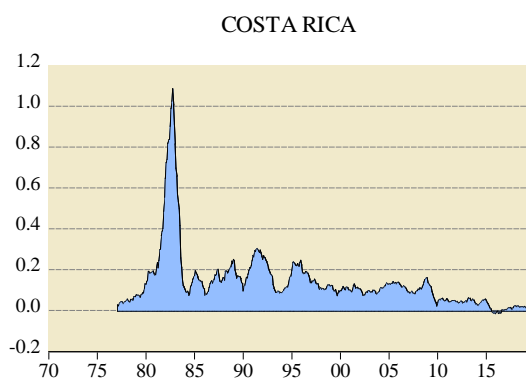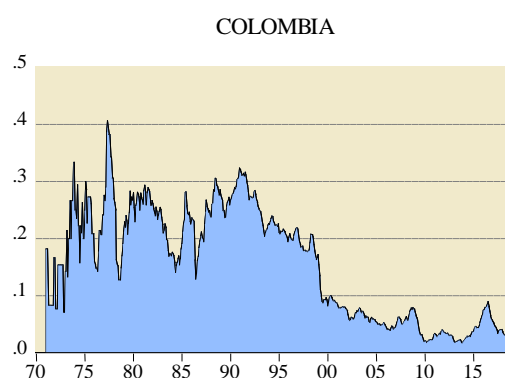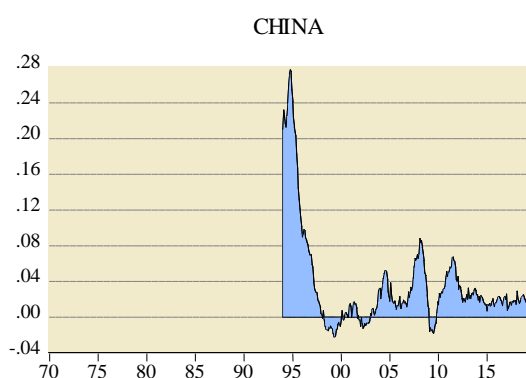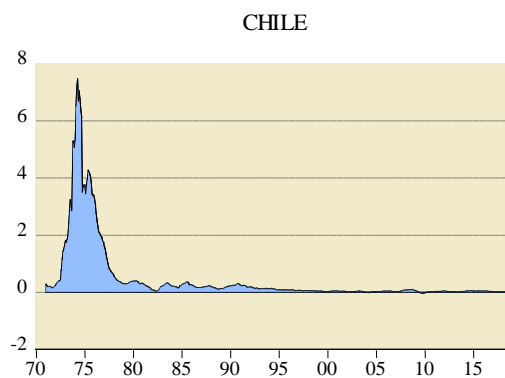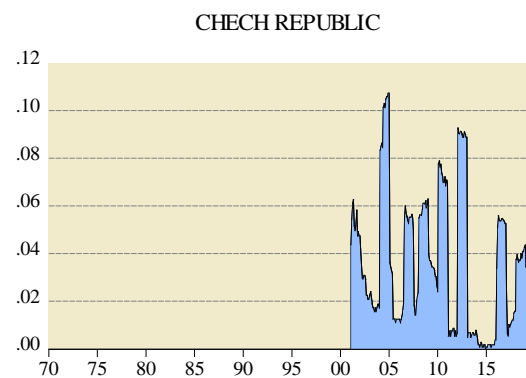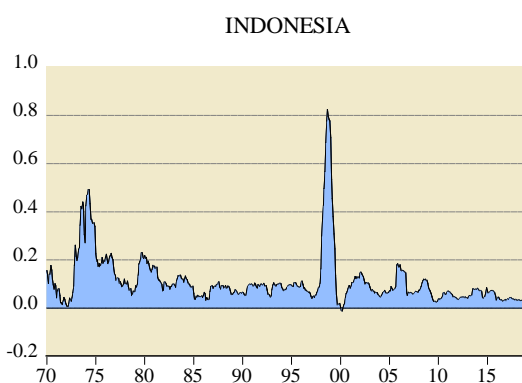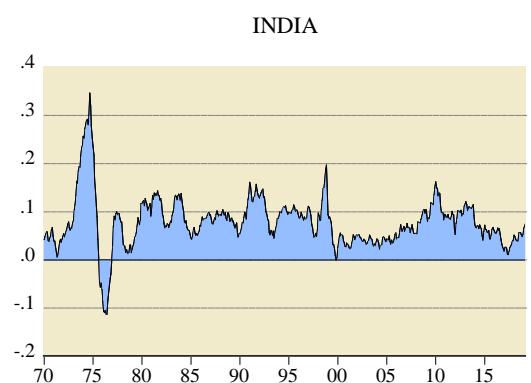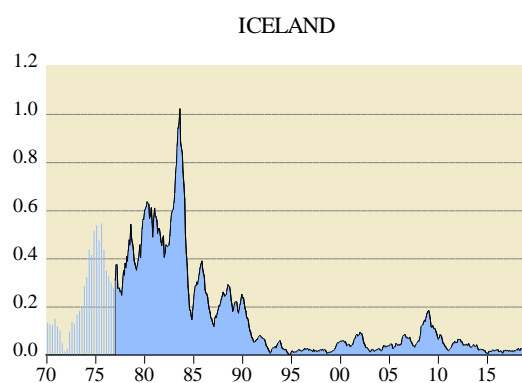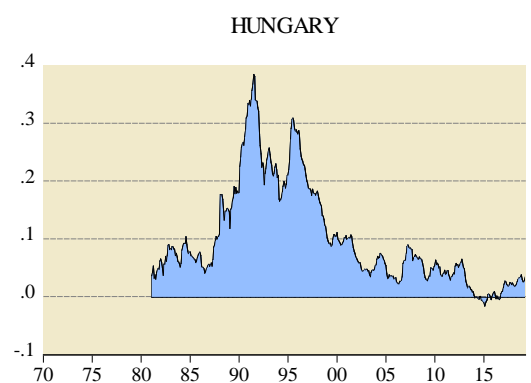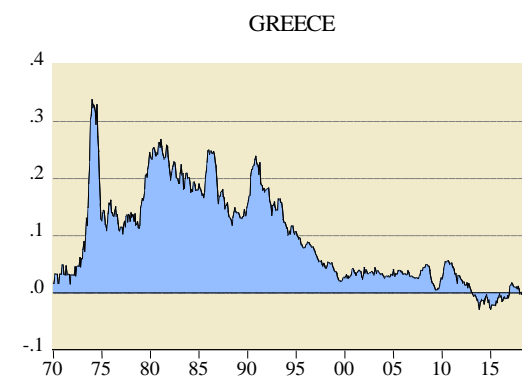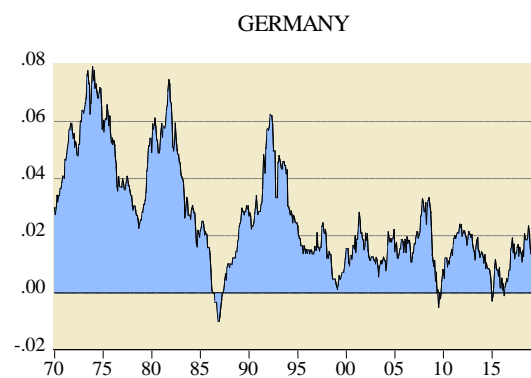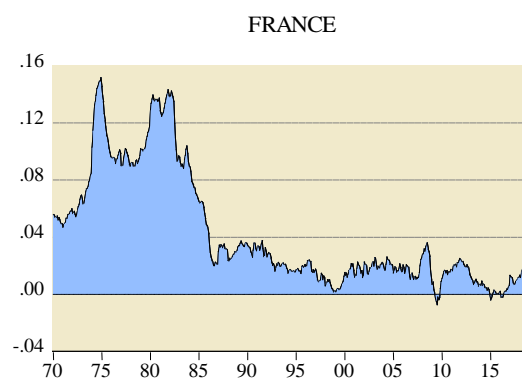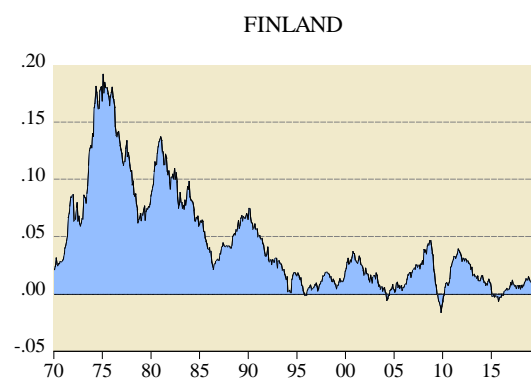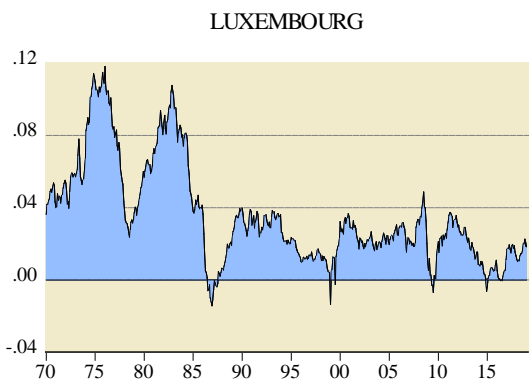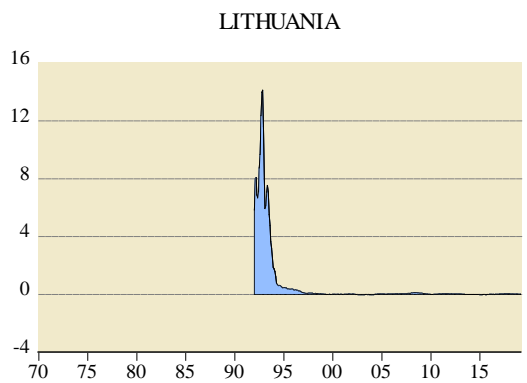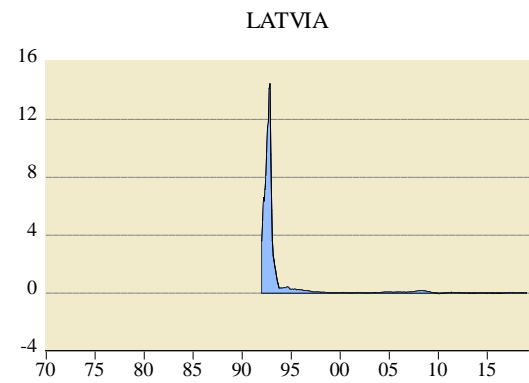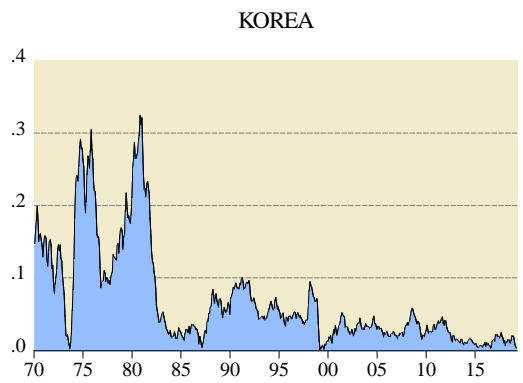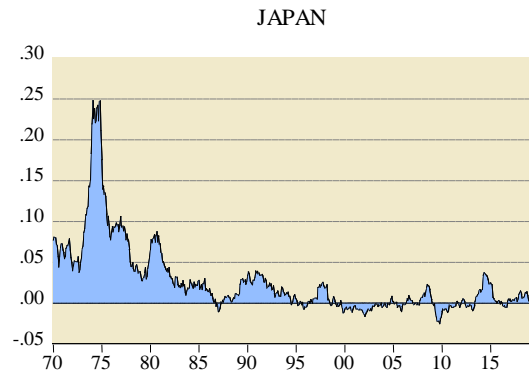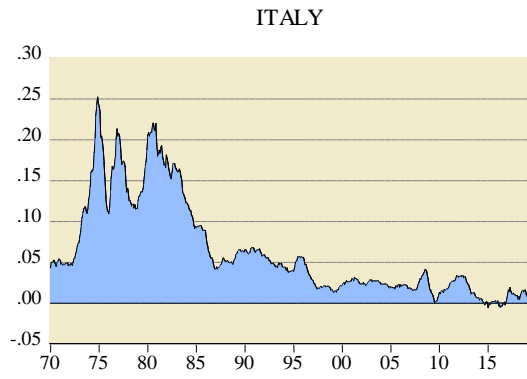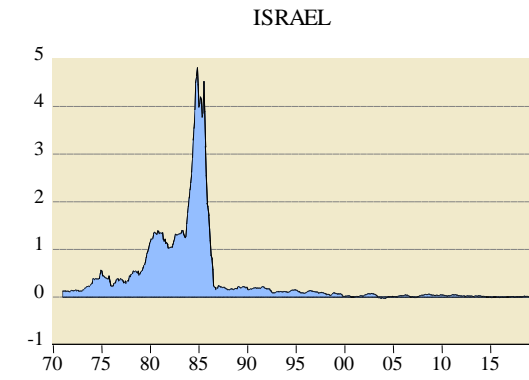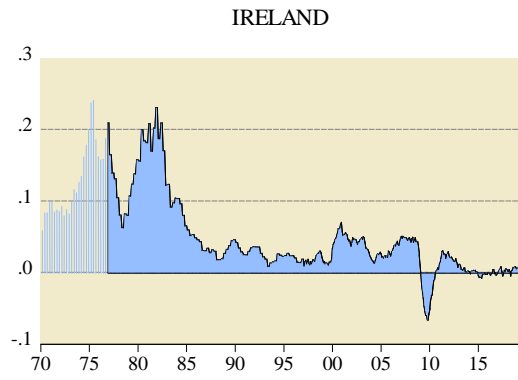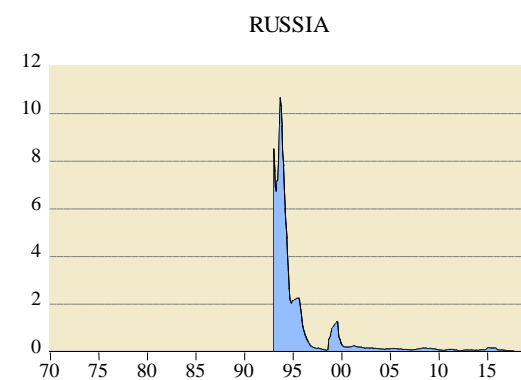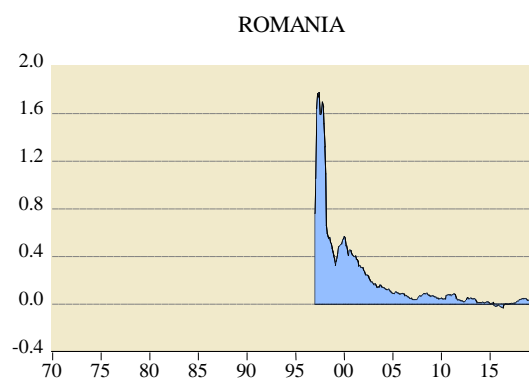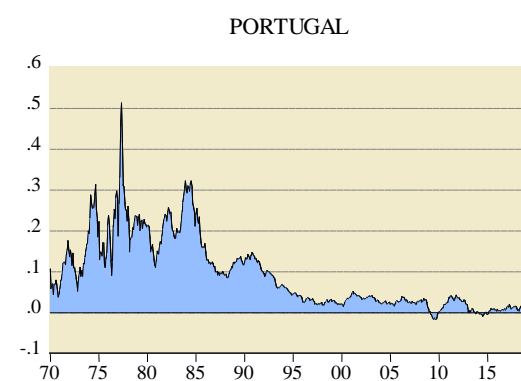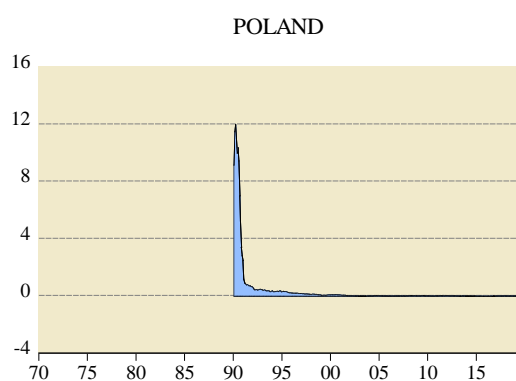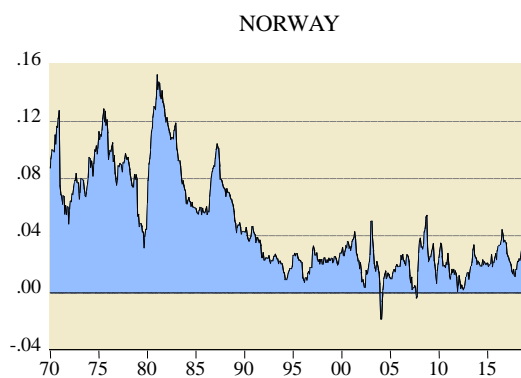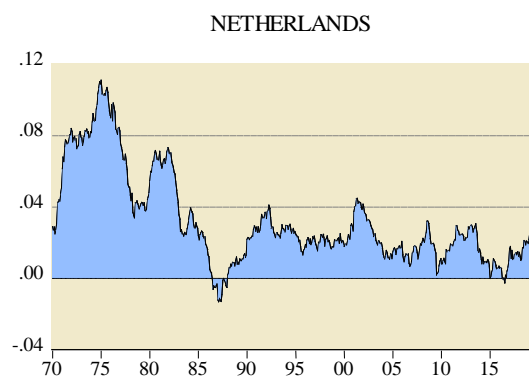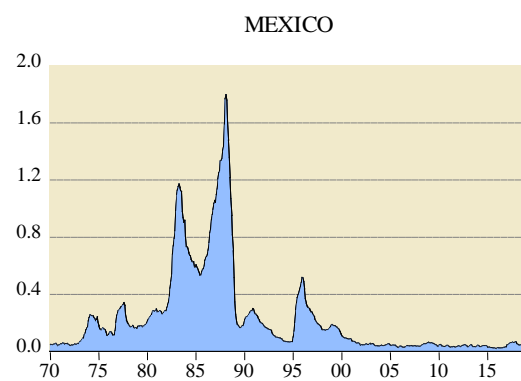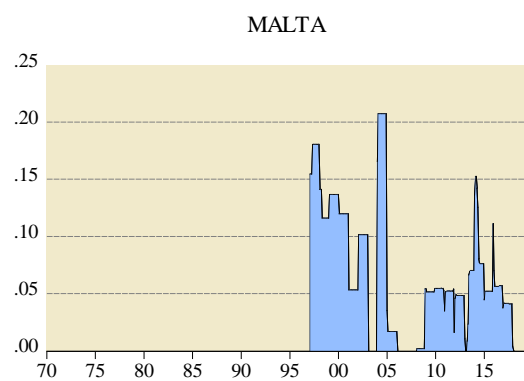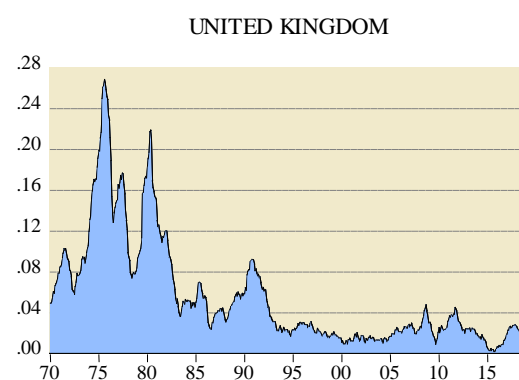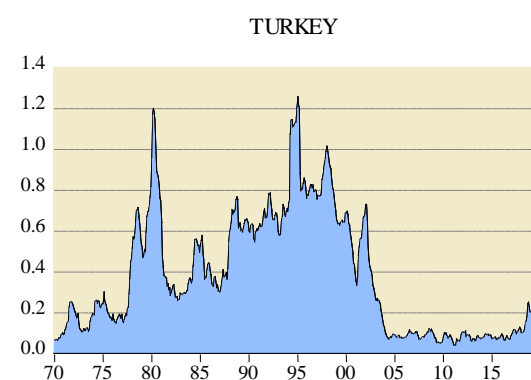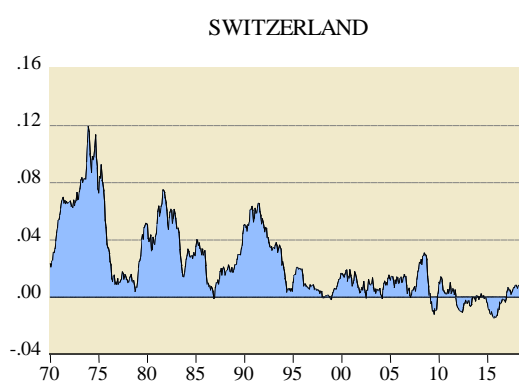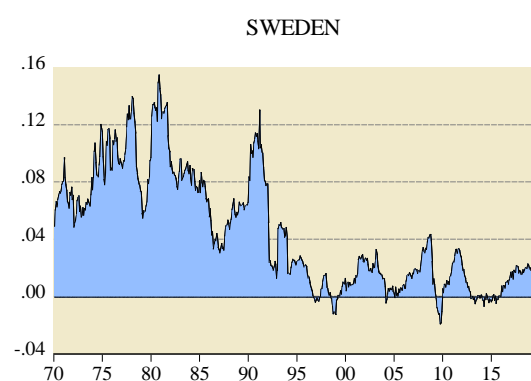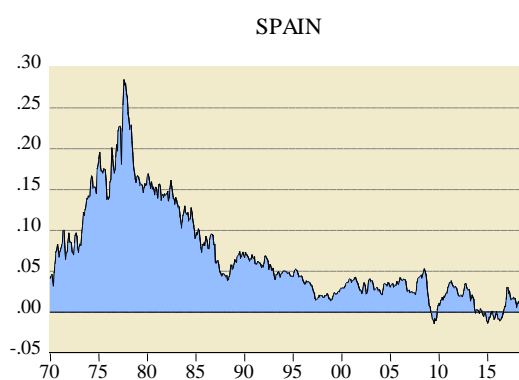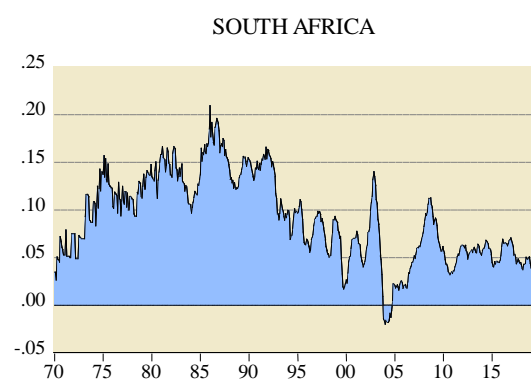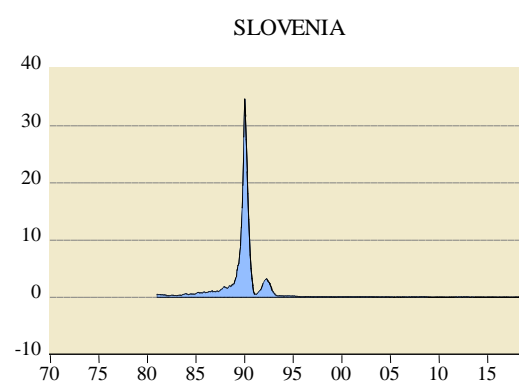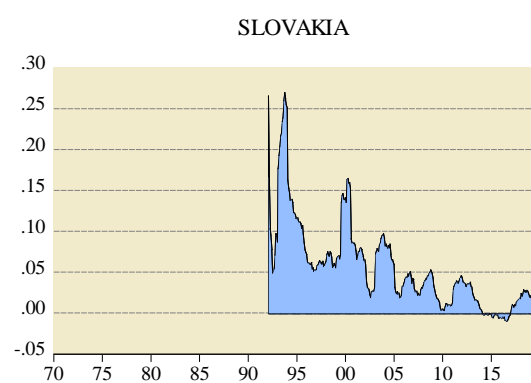
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