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Implications of the COVID-19 Pandemic on Inflation Targeting in Emerging economies: Panel Approach Data

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ABSTRACT

This study aims to analyze the impact of the COVID-19 pandemic on inflation targeting strategies in emerging economies, using the Committee's approach to assessing monetary policy responses to an exceptional crisis with multiple shocks.We are particularly interested in analyzing the impact of inflation targeting (IT) on the volatility of the real effective exchange rate (REER) for a Panel of 11 emerging countries over the period 1990-2021.The paper takes into account self-selection concerns regarding policy adoption, and analyzes RRSP volatility effects on Gross Domestic Product GDP. Our results indicate that the degree of pass-through of the ERPT exchange rate has indeed declined for all economies considered when adopting an inflation targeting policy. We also observe a high correlation between ERPT and the determinant of inflation. However, these results do not validate the hypothesis that low inflation caused the decline in the ERPT As is the case in most of the countries under study, especially in light of the frequency of monetary policies during the period of the COVID-19 pandemic. From a political perspective, this strategy involves difficult choices between economic stability and social expectations, especially with regard to unemployment and inflation, in addition to the impact on purchasing power. Ultimately, good coordination between monetary and fiscal authorities, as well as prudent management of monetary policy, are essential to ensure the effectiveness of inflation targeting, especially during periods of economic recession.

Keywords: Inflation targeting, Economic Growth, Pass-through, COVID-19 Pandemic.

JEL Classification: F21, G30, C22, C23.

INTRODUCTION

Targeting inflation during the COVID-19 pandemic has been a complex challenge for many central banks in emerging economies. Prior to the pandemic, monetary policies focused primarily on maintaining a stable inflation rate, often around 2% to 3% per year. However, the health crisis has destabilized the global economy, disrupted supply chains, altered consumer demand, and caused significant price and purchasing power volatility.

Governments have responded with extraordinary economic measures, such as massive fiscal stimulus and quantitative easing programs. These policies have affected inflation in several ways. On the one hand, the recession caused by the lockdown has led to a decline in demand in some sectors, which has had a deflationary effect. On the other hand, monetary interventions and supply chain disruptions have led to some price increases. This has forced central banks in these emerging economies to adjust their strategies to meet these new circumstances. Instead of targeting only stable inflation, they have had to consider the short- and long-term effects of unconventional policies, such as ultra-low interest rates, and managing the economic pressures caused by the pandemic.

In short, inflation targeting during the COVID-19 pandemic required rapid monetary policy adjustment while disrupting traditional inflation drivers. Central banks had to balance the need to stimulate the economy with avoiding excessively high inflation in the long run by reducing exchange rate volatility. Indeed, a low degree of pass-through would mean that changes in the exchange rate have less effect on consumer prices and therefore on inflation in the short term. This can alter central bank forecasts for the future behavior of inflation and lead to good forecasts critical in the conduct of monetary policy. Moreover, strong exchange rate movements would affect the spread of monetary shocks between countries and the choice of countries in the exchange rate regime. It would also have an effective adaptation to the monetary policy framework. It is in this context that this paper addresses the effect of inflation targeting strategy on exchange rate volatility in the emerging countries. Our analysis is based on a sample of emerging countries that have adopted the policy inflation targeting.

Traditional theory postulates that price control of goods and services is only effective when the exchange rate is adjusted freely A Shahabadi, V Omidi (2023) . Paradoxically, in practice, some researchers suggest that exchange rate fluctuations may actually impede targeted inflation. A high degree of deferral of the exchange rate on prices of goods and services is the first factor affecting the achievement of the inflation target. Foreign shocks causing sharp exchange rate fluctuations can have a large impact on the prices of goods and services causing effective inflation to deviate from the target range. Empirically speaking, the degree of exchange rate deferral on prices appears to be generally higher for developing countries than for industrialized countries in Croce and Khan's views (2000).

The rest of the paper is organized as follows: Section 2 presents a review of the literature. Then, the document presents the model and the methodology in section 3 and defines the the empirical results and discussions in Section 4. Finally, Section 5 presents the conclusion and deals with policy implications.

LITERATURE REVIEW

This study examines on the one hand a brief review of the literature on the relationship between inflation targeting and the key macroeconomic variables for the success of this strategy in emerging countries particularly during the covid 19 period. On the other hand, we examine the multiple previous works of this strategy.

In recent literature on inflation targeting especially in emerging economies, it has been acknowledged that the high degree of openness of some emerging market economies in combination with specific characteristics of their financial systems have created additional difficulties for the implementation of inflation targeting Mishkin (2000) ; Mishkin and Savastano (2001) Ablam Estel Apeti1, Jean-Louis Combes (2023) .In the open economy, inflation targeting plays a significant role in the price stability, which is of vital importance particularly for economies in transition ; Lwazi Senzo and Irrshad Kaseeram (2023). As pointed by Svensson (2002) there are several reasons why exchange rate movements are crucial for inflation targeting in countries in transition.

First, exchange rate movements are an essential channel of monetary policy transmission. Such channel of transmission exploits the other macroeconomic variables in both direct and indirect manner and notably the inflation rate. This is due to the fact that changes in the nominal exchange rate directly affect the domestic prices of imported finished products, Consumer Price Index (CPI). Indirectly, the exchange rate channel works by affecting domestic demand. Changes in the real exchange rate influence domestic and foreign demand for domestic products and thus improve the overall demand channel.

Second, the exchange rate has a critical impact on the national economy because it transmits foreign disturbances. Emerging economies and transition economies are generally more vulnerable to large fluctuations in exchange rates. The reason is that the capital market is not very developed in national currency and there is a need to borrow in dollars or other currencies, except for a very short term loan. The result is open exchange positions of banks and corporations, and consequently an increased vulnerability of their balance sheets to large movements in exchange rates, Olamide et al (2022). Carlos Castillo (2014) has drawn attention to the fact that the importance of the exchange rate channel in monetary policy depends directly on the degree of openness of the economy to trade flows and the degree of integration of international capital markets. As a result, these variations have considerable impact on the depreciation or the appreciation of the national currency as well as on the monetary decisions.

Xiaoyun W, Liyan.H.(2021) , Bouakez and Rebei (2008), has compared the volatility of the exchange rate between a series of countries that target inflation and a group of countries with alternative monetary strategies such as exchange rate targeting and monetary targeting. He has concluded that even in a context of exchange rate flexibility, exchange rate volatility is lower for countries that follow an inflation target. This result is already confirmed by Truman (2003) who has ascertained that inflation targeting has a positive effect on exchange rate volatility for it makes it less volatile.

However, Edwards (2006; 2017) has contended that inflation targeting requires floating exchange rate fluctuations. In so doing he has suggested that exchange rate volatility is often related to the adoption of inflation

targeting since, in Svensson (2004) and Miskin's (2002) views, exchange rate volatility is a demanding condition for an inflation targeting strategy. But Edwards recommends that the study of exchange rate stability should not be conducted by comparing volatility in the context of inflation targeting and a fixed exchange rate regime. (So we have to isolate the impact of inflation targeting only by controlling the effect of the exchange rate regime.)

Fair. R.C. (2006) there is no evidence that inflation targeting, in and of itself, increases exchange rate volatility, but he asserts that it is rather the floating exchange rate regime that contributes to an increase in exchange rate volatility. The concept advocated by Parrado (2006) holds that price index targeting is a simultaneous targeting of domestic inflation, as well as the exchange rate, which is similar to targeting domestic inflation, while adopting a managed exchange rate. Alternatively, in the context of a flexible exchange rate regime, the conduct of a strategy to target domestic inflation leads to high exchange rate variability, in contrast to price index targeting.

The analysis conducted by Svensson (2004), confirm the existence of a positive relationship between the choice of inflation targeting and financial crises. But the influence of exchange rate volatility on the choice of a monetary policy based on targeting is not clear enough. He has argued that excessive volatility in the exchange rate may result from a non-performing economy, as it may reflect the monetary authorities' strategy to control inflation.

Gali and Monacelli (2005) are interested in analyzing the macroeconomic effects of the three monetary policy strategies. The first strategy targets the domestic inflation (a policy aimed at stabilizing domestic prices), the second addresses the index Consumer prices while the last one focuses on the fixed exchange rates. They have concluded that a strategy of targeting domestic inflation results from wide exchange rate volatility compared to a strategy targeting the consumer price index or a fixed exchange rate targeting.

It is of interest to highlight that emerging market economies and economies in transition are generally more vulnerable to large changes in exchange rates. This is because the capital market is not very developed in national currency and that it is necessary to borrow in dollars or other currencies, except for a very short-term loan. The result is open exchange positions of banks and companies leading to an increased vulnerability of their balance sheets to large movements in exchange rates, even if a strong appreciation may make domestic producers less competitive on both domestic and foreign markets. In the empirical literature, Gagnon and Ihrig (2004) are among the first to suggest that pass-through reductions observed in several countries can be attributed to greater commitment and credibility of central banks in maintaining low inflation rates. Although they have not explicitly linked the greater commitment and credibility of central banks to the inflation targeting strategy, it is clear that these characteristics are fundamental to the implementation of this regime. Their work has targeted an estimate of the pass-through for 20 countries. Seven of these countries have already adopted inflation targeting, in two sub-samples: one grouping countries with high inflation and the other grouping countries with a low inflation.

The results of Gagnon and Ihrig (2004), based on a uni-equational linear model, have indicated that the pass-through has decreased in most countries. In addition, although there are countries with, on average, have a greater impact in the sub-high inflation sample, the result is reversed in the low inflation scenario. Finally, through instrumental variables, they have applied the Taylor rules for all countries considered and demonstrated that pass-through decreases are associated with a more aggressive response by central banks to inflationary pressures. Conversely, Mishkin and Schmidt-Hebbel (2007) have analyzed whether the adoption of inflation targeting has effectively reduced the sensitivity of inflation to external shocks like exchange rate shocks. The analysis has drawn on a sample of twenty-one countries that have adopted inflation targeting and thirteen others that have followed a different monetary policy regime. In their study, they have used two possible dates for the adoption of inflation targeting: the first refers to the beginning of the disinflation process in which inflation targets are periodically adjusted downwards, while the second relates to the implementation of inflation targeting in the case of an increase in the level of inflation.

The researchers have compared the differences in transmission before and after inflation targeting, as well as the differences between the countries that adopted it and those that did not. To this end, they have examined the impulse response functions obtained from a VAR panel model for the two subsamples. Their results have revealed that there is no significant difference in transmission before and after the adoption of this strategy. Gagnon and Ihrig (2004), after using the VAR framework similar to that utilized by Miller's W (2003), Miskin and Schmidt-Hebbel (2007), have contended that the proposed methodology has the advantage of being able to predict and evaluate the pass-through process after an exchange rate shock and its effect on the economy real.

Recent research on the pass-through in Peru was done by Forero and Vega (2015). The first has used a linear VAR model to estimate the pass-through for the period 1994 to 2002, while the second has analyzed the non-linearity of the transmission in a set of variables, applying a VSTAR model for the same sample. There are a few models to clarify the relationship between inflation targeting and the exchange rate.

This study can provide important recommendations to monetary policy makers in inflation-targeting emerging markets, which despite the impact of the COVID-19 outbreak and its negative effects on economic growth in most countries around the world, in emerging countries in particular, the latter continued to apply the inflation targeting strategy . We also used "second generation" econometric techniques capable of capturing the sectional

dependence in the heterogeneous plate and ensuring a high level of robustness. This overcomes the shortcomings of the widely applied rule in MCO (Pooled) -GLS econometric approaches.

The rapid monetary policy response of central banks during the COVID-19 pandemic period in various emerging economies around the world has been exceptional in many ways. This article examines several aspects of this response among inflation-targeting countries by examining the steps taken by some monetary authorities at the onset of the crisis caused by the COVID-19 pandemic to continue to implement inflation targeting policy. inflation. It is clear that the central banks examined saw the pandemic as a clear case for easing monetary policy in a context of high exchange rate volatility which has a significant impact on inflation, Minea, A., Tapsoba, R., and Villieu, P. (2021).

DATA AND METHODOLOGY

The combination of this exchange rate regime with this new monetary policy strategy inflation targeting entices us into questioning the role of the exchange rate in macroeconomic policy, as well as the effect of inflation targeting on stability of the exchange rate in emerging countries adopting an IT policy. Then, in order to analyze and determine the effect of adopting, a strategy IT on the volatility of the real effective exchange rate V (reer). However, the choice depends on the assumptions made about the parameters of the model and on their perturbations. Three estimation methods are possible: an ordinary least squares estimate, an estimate with fixed effects, and an estimate with random effects. The technique (OLS) may be biased if the inherent heterogeneity of countries is neglected; tests have shown that generally fixed or random effects models provide a better fit.

The first step to establish for a panel data sample is to verify the homogeneous or heterogeneous specification of the data series. From an economic point of view, the specification tests go to the question of whether we can assume that the theoretical model studied is perfectly identical for all countries, or whether there are specificities distinct for each country.

Then, we will test the stationary of the variables through the unit root tests on a panel, such as the test conducted by Im Pesaran and Shin (2003), Levin, Lin and Chu (2002) and Hadri (2000) . In the light of the results of the stationary test, we will study the search for the co integration relation of these variables in the long term.

For this type of model, we can distinguish two cases: the case where the parameters are deterministic constants, so we are referring to a model with fixed effects and the case where the parameters are realizations of a random variable of expectation and finite variance , we are then speaking about a random effects model. It is therefore necessary to specify the correct model for our sample. For this purpose, an analysis of the Hausman specification test is carried out.

The effect of transitioning to inflation targeting on exchange rate volatility has attracted the attention of several economists, such as Parrado (2006) ,Gali and Monacelli (2005) .

Rose (2006) has developed a model that studies the volatility of the real effective exchange rate, and it is as follows:

$$V(REER)_{it} = \beta IT_{it} + \alpha + \sum_{t} \lambda_t T_t + \sum_{j} \gamma_j X_{jit} + \zeta_{it}$$

The complete formulation of our model is as follows:

$$V(REER)_{it} = c_i + \beta_i IT_{it} + \alpha_i GDPr_{it} + \mu_i CC_{it} + \delta_i OP_{it} + \phi_i POP_{it} + \lambda_i i_{it} + \eta_i M + \vartheta_i CPI + \zeta_{it}$$

The real effective exchange rate volatility at period t of the rated country i noted V(REER)it Blank variable that takes value 1 if the country has targeted inflation and 0 if not noted ITit. The constant gross domestic product of country i at period t noted GDPrit. The current account of country i in period t noted CCit .The degree of trade openness of country i to period t noted OPit. The labor force of country i in period t noted POPit. The interest rate of country i in period t noted iit. The third policy-related variable is domestic narrow money or M1. In general, broad money (M2) is more highly correlated with output and prices than M1. However, factors other than monetary policy contribute to fluctuations in M2, which complicates its interpretation as a policy variable. The error term noted ζ_t .

Effective real exchange rate (ERER) data are monthly data obtained from IMF statistics, and are used to calculate the annual volatility of CERT, while data for other variables are annual and derived from world development Indicators (WDI).

MODEL ESTIMATION AND RESULTS

Descriptive Statistics

In Table 1 we report the statistics of the whole variables.

Table 1. Summary statistics for variable.

Variable	Mean	Std. Dev.	Minimum	Maximum
V(reer)it	.0329796	.1285493	-.5271156	.3333157
GDPrit	3.038307	2.566392	-1.546137	9.313559
CCit	1.11e+08	8.15e+08	-4.61e+08	1.08e+10
OPit	3.798937	0.7365436	2.018858	5.353457
ITit	0.4140625	0.49320	0	1
IPCit	57.60552	35.00389	-1.346719	132.4647
iit	58.31806	199.9345	-24.60022	1254.874
POPit	14.08316	6.117429	.101579	20.00558

In the second step, we examine the problem of multicollinearity between explanatory variables which can lead to biased results. To detect multicollinearity, we calculate the correlation matrix. The multiple correlation coefficients associated with the regressions of each explanatory variable on all the other variables make it possible to identify multicollinearity comprising more than two variables. According to Kennedy (2007), there is a serious problem of multicollinearity if the correlation coefficient is above 80% for each pair of variables. Table 2 presents correlation matrix for the selected variables (p-values 0.05). There is a problem of multicollinearity if the correlation coefficient is above 80% for each pair of variables (Kennedy, 2007), which is not the case here as indicated in the Table 2.

Table 2. Variables correlation matrix.

Variable	V(REER)it	POPit	C Cit	OPit	ITit	iit	GDPrit	Mit	CPIit
V(REER)it	1.0000								
POPit	0.2438	1.0000							
C Cit	-0.0705	-0.0521	1.0000						
OPit	-0.0910	-0.3622	0.1002	1.0000					
ITit	-0.0973	0.1137	0.0711	-0.0647	1.0000				
Iit	-0.0337	-0.1030	0.0690	0.68038	-0.0157	1.0000			
GDPrit	-0.0856	0.0570	0.1118	-0.1330	0.0945	-0.0966	1.0000		
Mit	-0.1056	0.0391	-0.0346	-0.2153	-0.2132	-0.0707	0.0927	1.0000	
CPIit	-0.0531	0.0397	0.0927	0.0553	0.7231	-0.0408	0.1741	-0.416	1.000

Referring to the results presented in this table, we can infer that the various correlation matrices illustrate the links between the variables. Indeed, we have noticed that all the coefficients of correlation between the variables are less than 0.7, so we can deduce that there is no correlation problem.

The volatility of the exchange rate V(reer) is negatively correlated with the current account, the opening rate, inflation targeting, interest rate, gross domestic product, money supply and price index Consumption. This negative correlation between the variables of the model means that the variables are inversely covariant in such a way that the more the values of the one increase, the more those of the others decrease, and so it is a functional relationship of the decreasing linear type.

This result confirms the positive impact of these variables and, substantially, the inflation targeting strategy on the reduction of exchange rate volatility. Nevertheless, there is a positive dependence between exchange rate volatility and the level of the population, so an increase in the population positively influences exchange rate volatility.

Empirical Analysis

The estimate of the static relationship describing the volatility of the real exchange rate V(REER) due to IT policy- for our sample of countries adopting this new monetary policy strategy based on the reduction of national price indices- requires first a verification of the homogeneous or heterogeneous specification of the data generating process. From an econometric point of view, this is tantamount to testing the equality of the coefficients of our theoretical model and studying the individual dimension. Economically speaking, the specification tests go to the question of whether one assumes that the volatility of the real exchange rate is exactly the same for all the countries in the sample or, on the contrary, there are specificities related to each country.

The conclusions of this test are as follows; the real exchange rate volatility is the same for the 14 countries that adopt or do not adopt an inflation targeting policy. Therefore our theoretical model is typical for this sample and can be formalized as follows:

$$\mathrm{vol(REER)_{it}} = c + \beta_i \mathrm{IT_{it}} + \alpha_i \mathrm{GDPr_{it}} + \mu_i \mathrm{CC_{it}} + \delta_i \mathrm{OP_{it}} + \phi_i \mathrm{POP_{it}} + \lambda_i i_{it} + \eta_i M + \vartheta_i \mathrm{IPC} + \zeta_{it}$$

If, on the other hand, we are rejecting the null hypothesis, we have to go on to a second step, which consists in determining whether the heterogeneity comes from the coefficients.

Xi (β_i ; α_i ; μ_i ; δ_i ; ϕ_i ; λ_i).

Panel Unit Root Test

Unit root tests have become an essential step in analyzing the stationarity of time series, but the application of these tests on panel data is recent. The most frequently used tests are those of Levin Lin and Chu (LLC) and IM, Pesaran and Shin (IPS) and Fisher-tests ADF (ADF). In our research, we will embark on a scrutiny of the properties of stationarity and cointegration.

Table 3. Stationarity Table test results.

Variables	LLC		IPS		ADF	
	Level	First difference	Level	First difference	Level	First difference
V(REER)it	0.24291 (0.5960)	-8.55303 (0.0000) ***	-0.95501 (0.1698)	-8.36196 (0.0000) ***	1.44195 (0.9253)	-2.44421 (0.0073) ***
GDPrit	3.45763 (0.9997)	-5.26413 (0.0000) ***	5.28869 (1.0000)	-7.99333 (0.0000) ***	5.00877 (1.0000)	-7.39108 (0.0000) ***
C Cit	2487.07 (1.0000)	84.7172 (0.0000) ***	-6.73588 (0.0000) ***	-17.5459 (0.0000) ***	0.23450 (0.5927)	-12.9253 (0.0000) ***
OPit	1.42024 (0.9222)	-10.5104 (0.0000) ***	1.96054 (0.9750)	-10.3726 (0.0000)	1.87798 (0.9698)	-9.44975 (0.0000) ***
ITit	2.03381 (0.9790)	-2.36925 (0.0089) ***	-1.35034 (0.0885)	-4.44236 (0.0000) ***	2.01369 (0.9780)	-6.15198 (0.0000) ***
CPIit	3.16129 (0.9992)	-3.05556 (0.0011) ***	2.4941 (0.9936)	-4.1814 (0.000) ***	7.06462 (1.0000)	-4.51508 (0.0000) ***
iit	-1.53802 (0.0620)	-8.85343 (0.0000) ***	-3.79646 (0.0001)	-14.1797 (0.0000) ***	69.1118 (0.0002)	213.930 (0.0000) ***
POPit	0.22363 (0.5885)	12.7451 (0.0000) ***	1.07687 (0.8592)	-5.26110 (0.0000) ***	12.4952 (0.9992)	114.793 (0.0000) ***

Note: Stationarity of the variables at the level of meanings 1%, 5%, et 10% (***), (**), (*).Source: own calculations

From the results of the table 3 above, we cannot reject the null hypothesis of unit root, in several cases. The results of the unit root tests obtained reveal that the variables are non-stationary in level. The application of these three tests to the variables in first differences predicts that all the variables are stationary in the first difference of the series or the series are cointegrated of the same order I (1) and it is then possible to test whether these are linked by a long-term relationship.

Cointegration Analysis

The verification of the existence of such a long-term relationship requires the verification of the existence of a cointegration relation while using the Pedroni co-integration tests.

To test the cointegration relationship between the independent variable (CPI), interest rate (IT), real effective exchange rate volatility V (REER), money supply (MM) and gross domestic product (GDP) (analyzing the relation between our variables) we will use the test Pedroni (1999) with a null hypothesis of absence of cointegration between several variables; an alternative hypothesis that depends on the degree of heterogeneity retained.

We have employed two categories of tests to give robust results on the relationship between the variables as both categories depend on the homogeneity Kao (1999) and the heterogeneity Pedroni (1999) of the cointegration vectors.

The application of the three cointegration tests on our data provides us the following results presented in the table below.

Table 4. Cointegration Panel Tests.

Alternative hypothesis : common AR coefs.(Within-dimension)				
	Statistic	Prob	Weighted Statestic	Prob
Panel v-statestic	8.523213	0.0000	7.988051	0.0000
Panel rho-statestic	-0.171719	0.4318	0.472393	0.6817
Panel PP- statestic	-0.313878	0.3768	0.239768	0.5947
Panel ADF- statestic	0.884630	0.8118	0.485705	0.6864
Alternative hypothesis : common AR coefs.(between-dimension)				
	Statistic	Prob		

Group rho-Statestic	1.425032	0.9229
Group PP-Statestic	0.196867	0.5780
Group ADF-Statestic	1.174836	0.8800

On the basis of the results of Pedroni (1999) cointegration tests displayed in the table 4 above, we can notice that at the level of our sample, six of the seven panel statistics are greater than the critical value of the normal distribution for a threshold of 5 % which gives rise to the categorical rejection of the alternative hypothesis. Thus, all these tests confirm the acceptance of the null hypothesis of absence of cointegration. More precisely, the results of these tests corroborate the absence of the existence of a cointegration relation between the variables.

In addition, the results of the stationarity and cointegration tests allow us to better specify the panel data model that is used to determine how these individual effects should be modeled, fixed effect model or random effects model.The specification tests have confirmed that our basic model can be formalized as a panel with individual effects. We will consider the Haussman test to decide between a model with a fixed effect or a random effect

The Hausman test (1978) is a test for the specification of individual effects. It is employed to discriminate fixed and random effects. The main results of the Hausman test describing the impact of inflation targeting on exchange rate variability under the null H0 assumption of random effect and the alternative hypothesis H1 indicates the presence of fixed individual effects.

Table 5. Test de spécification d'Hausman

P-Value	Value of the test (Chi-Square. Statistic)
(0.0275)	X2 (4) = 12.59

Note: (*) Designates the significance level at the 5% threshold. Source: own calculations

According to table 5 the Hausman test results give the statistic = 12.59, the P-value is below the confidence level 5%, . AS the null hypothesis is rejected, we will favor the adoption of non- Fixed individual effects to our reference model and use the In estimator to obtain more consistent estimators.

The Fisher statistic value is 5.91. It informs us about the overall significance of the model and this high value with zero probability only means that the model is globally significant.

Table 6.Model estimation of exchange rate volatility.

Variable to explain: real effective exchange rate volatility V (REER)			
Period: 1990-2021; T = 30; N = 20; Total panel observations: 600 obs			
Variable Explicatives	MCO (Pooled)	Model to fixed effects	Random Effects Model (GLS)
POPit	3.04e-10 (0.000)***	9.80e-10 (0.027)**	3.72e-10 (0.004)***
C Cit	-5.44e-12 (0.487)	-2.08e-13 (0.976)	-6.66e-13 (0.926)
OPit	-.000313 (0.273)	-.00069 (0.277)	-.0002289 (0.538)
ITit	-.0434132 (0.025)**	-.0434101 (0.038)**	-.0486291 (0.015)**
Iit	.000037 (0.529)	-.0003171 (0.016)**	-.0000134 (0.864)
GDPrit	-6.48e-06 (0.034)**	-.0000556 (0.000)***	-.0000147 (0.007)***
MMit	-9.06e-1 (0.002)***	-1.27e-16 (0.238)	-5.83e-17 (0.235)
CPIit	.00561 (0.848)	.0013497 (0.000)***	.0008783 (0.004)***
C	.0595769 (0.004)***	.033315 (0.433)	.0128718 (0.651)
R2	0.1120	0.1267	0.1453
(F-stat) Prob	5.91 (0.0001)***	6.53 (0.0000)***	

Note: the statistics are in parentheses. *** Significant at the 1% threshold, ** Significant at the 5% threshold, and * Significant at the 10% threshold. Source: own calculations

According to the results shown in Table 6 ,the estimator by within procedure yields expected and significant results:

The variable Dummy (IT) has a positive and significant influence on exchange rate volatility V (reer). A 1% increase in the (IT) rate, leading to a more or less than -0434132% decrease in exchange rate volatility in countries that have adopted an inflation targeting policy.

The level of the population (POP) significantly and positively influences the real exchange rate volatility V(reer)it. A 1% increase in the POP leads to a 9.8% increase in exchange rate volatility. This relationship is explained by the increase in aggregate demand for countries with high populations whose large markets would attract more trade flows.

Several empirical studies have shown that the increase in population size has a signal of an increase in the size of the market which, consequently, entails a certain volatility of the exchange rate. This result is consistent with the findings of several studies such as Svensson (2000) and Rose (2006). The population, then, does also exert a significant effect on the constant real exchange rate as the sign semi-elasticity volatility population is positive and significant.

Our results has revealed that the current account (CCit) has a negative and insignificant effect on the exchange rate volatility V(reer) since its elasticity is low in the order of 2.08%. The 1% increase in the variable (CCit), causes a decrease of 2.08% of V(reer). This is due to the macroeconomic instability in some countries in our sample. Hence, external current accounts have no effect on exchange rate variability.

Additionally, the opening rate has no effect on the variability of this exchange rate because the semi-elasticity of this real exchange rate relative to the rate of opening is of (expected) negative sign but not significant.

On the other hand, real gross domestic product (GDP) stabilizes the real exchange rate because the semi-elasticity of the variability of this real exchange rate in relation to the GDP is negative and significant. A 1% increase in GDP results in a -5556% decline in exchange rate volatility.

Our results has indicated that the money supply (MM) has a negative and insignificant effect on real exchange rate volatility V(reer). The 1% increase in the variable (MM), brings about a decrease of 1.27%, and it is because of the macroeconomic instability in some of the countries in the sample.

The level of the Consumer Price Index (CPI) significantly and positively influences the real exchange rate volatility V(reer) in the countries of the sample. The 1% increase in the CPI variable results in an increase of 0.0013497% V(reer). Indeed, according to Varoudakiset al. (1998) high inflation may introduce distortions in the choice of productive investment, by disadvantaging long-term investment, which adversely affects the entry of capital and reduces the demand for local currency.

The estimation by the Within method of the real exchange rate volatility for all countries; whether or not adopting a policy of targeting the inflation rate; gives no clear idea of the advantage and the disadvantage of this approach Monetary policy on the volatility of the real exchange rate although the dummy variable (IT) is a negative and significant sign.

Our previous study has offered us almost satisfactory results in assessing the performance of inflation targeting on real exchange rate volatility. This inadequacy can be explained by the heterogeneity of monetary and economic policies between the countries of the sample whether or not they adopt the inflation targeting policy.

For this reason, we have oriented our study towards a comparison of the results between two pre- and post-covid 19 periods in the same group of inflation targeting countries, taking 2018 as a symmetrical year (1990/2021) between two periods.

The first period from 1990 to 2018 (Pre-covid -19 inflation targeting period).

The second period from 2019 to 2021 (Post-covid-19 inflation targeting period).

Our sample consists of countries that adopt the inflation targeting policy:

Australia, Chile, Brazil, Turkey, Ghana, India, Indonesia, Mexico, Colombia, Philippines and South Africa.

We keep the same model used for the previous estimate:

$$V(REER)_{it} = c_i + \beta_i IT_{it} + \alpha_i GDPr_{it} + \mu_i CC_{it} + \delta_i OP_{it} + \phi_i POP_{it} + \lambda_i i_{it} + \eta_i MM + \vartheta_i IPC + \zeta_{it}$$

The estimation of the various tests; fixed effect, random effect and the Hausman test gives us the following results:

Table 7. Estimation of the volatility of the real effective exchange rate V (REER).

Variable to explain: volatility of the real effective exchange rate V (REER).						
Period : 1990-2018				Period : 2019-2021		
Panel : (1)				Panel : (2)		
ExplanatVariable	Coefficient	Std. Error	p-v	Coefficient	Std. Error	p-v
POPit	2.38E-06	1.81E-06	(0.1904)	1.72E-06	1.28E-06	(0.1815)
CCit	1.18E-08	2.60E-08	(0.6512)	1.86E-10	1.21E-08	(0.9877)
OPit	-0.063159	1.615573	(0.9689)	2.295183	1.378924	(0.0983)*
iit	2.296778	1.155646	(0.0496)***	0.162883	0.199697	(0.4161)
GDPit	-0.080152	0.052316	(0.1286)	-0.100249	0.021325	(0.0000)***
Mit	-2.79E-07	3.10E-07	(0.3703)	-5.81E-08	3.61E-08	(0.1002)*
IPCit	-2.012696	1.473232	(0.1049)*	0.281701	0.628675	(0.6548)

C	-141.9054	163.9643	(0.3888)	-162.2534	100.9849	(0.1005)*
R2	0.186717			R2	0.234663	
F-statistic	1.377509			F-statistic	2.434879	
Prob	0.163361			Prob	0.00024	

Note: t-Statistics are in parentheses. *** Significant at the threshold of 1% at most, ** Significant at the threshold of 5% at most, and * significant at the threshold of 10% at the most. Source: own calculations

According to the results shown in table 7 ,the estimator by within procedure yields expected and significant results:

Based on the results reported in the table above, the inflation targeting strategy has a significant effect on the volatility of the real exchange rate over the post-inflation inflation period compared to the pre- Inflation targeting.

First, there is a decrease in the variation of all the coefficients of our model between the two periods.Indeed, we have discerned that the rate of openness (op) becomes a positive and significant sign and that a one percentage point increase in the rate of openness results in all other things being equal, an increase of 2.29 % of the real exchange rate volatility and that its variation is down, compared to the pre-inflation targeting period.

Similarly, the current account (DC) is positive and not significant, but it unveils a smaller variation, going from 2.6% to 1.21%, compared to the pre-inflation targeting period.

Concerning the interest rate (iit), it takes a positive and significant sign during the period of inflation targeting, so any increase leads to a positive change in the volatility of the real exchange rate. This result confirms the theory that any increase in interest rates prompts a change in the exchange rate via the capital account channel. After the adoption of inflation targeting, the interest rate becomes non-significant. This explains why the adoption of the inflation targeting strategy harmonizes the effect of a change in the interest rate and the volatility of the exchange rate.

For the gross domestic product (GDP), it takes a negative and insignificant sign during the pre-inflation targeting period. While it is negative and significant after the adoption of the inflation targeting strategy, an increase in GDP leads to a decrease in the volatility of the real exchange rate V(reer).

The most significant result of this estimate, however, is that the Consumer Price Index (CPI);being the main indicator of inflation in emerging countries; takes a negative and significant sign during the pre- Inflation therefore any positive change in the CPI incites a decline in exchange rate volatility. Whereas after the adoption of the inflation targeting strategy, this relationship between the CPI and the real exchange rate volatility becomes insignificant.

CONCLUSION AND POLICY IMPLICATIONS

Finally, it is important to point out that a broad consensus, backed by empirical studies, supporting the fact that inflation targeting is the most effective and attractive framework for achieving low exchange rate volatility and result in low and stable inflation and anchor inflation expectations in both emerging and developing countries. On the other hand, it is noted that inflation targeting has generally resulted in an improvement in the dimensions of monetary policy and its effectiveness mainly during the period of COVID -19.

For our part, we find that the results are very sensitive to the number of episodes of disinflation studied and to the number of crises that went through the inflation targeting study period and even, sometimes, to the composition of the group of countries. inflation targets as well as the control group not practicing inflation targeting. The accumulation of these factors would have greatly altered the conclusions of most of these studies. However, it is interesting to note that the health crisis (Covid-19) has radically changed the perception of monetary policy in emerging countries.

In our research, we shed light on the effectiveness of the monetary inflation targeting policy on reducing exchange rate volatility. Based on previous studies by Rose (2006), Edwards (2006) and Pétursson (2004) who have already addressed the issue of the impact of an inflation targeting policy on the volatility of the real exchange rate, we have sketched out a reference model for countries that adopt or do not adopt inflation targeting.

We used gross domestic product in real terms, population, openness and external current accounts to identify the impact of monetary policy on real exchange rate variability. This exchange rate is estimated by the standard deviations of the natural logarithm of the real exchange rate. Fisher specification tests corroborated that our model can be panel shaped with individual effects. The estimation of the first stage for all the emerging countries in our sample, whether or not they adopt the inflation targeting strategy, gives us positive results on the effect of inflation targeting on the volatility of the real exchange rate.

We can therefore argue that the adoption of the inflation targeting strategy during the COVID-19 period has succeeded in making the inflationary environment more moderate and stable with a more stable level of exchange rate volatility, which, in itself, plays a crucial role in price stability and economic stability.

One may wonder whether after this crisis, traditional monetary policies can still be considered as the appropriate framework to achieve macroeconomic stability. Moreover, this crisis led central banks to neglect other important objectives, such as employment and economic growth, and forced the monetary authorities to deal with the effects of a deep recession by conducting so-called debt monetary policies in order to ensure the survival of certain companies and preserve a certain level of employment. So, in terms of research perspectives, we assume that our work could be a starting point to study the ability of inflation targeting to adapt to changes and disruptions in financial markets.

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