

# Exchange Rate Regimes and Economic Stability of Emerging Economies: The Role of Inflation Targeting\*\*

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## Abstract

The potential growth rates of emerging economies are much larger than those of developed economies. However, many emerging economies have vulnerable economic fundamentals and have frequently experienced severe economic crises in the past. As a result, making their local currencies credible and realizing sustainable growth have been significant priorities for many emerging economies. This paper analyzes what impacts the choice of the exchange rate regime had on macroeconomic performance of emerging economies using the panel data from the second half of the 2000s. In the analysis, we focus not only on the effects of traditional exchange rate regimes such as the floating and fixed exchange rate regimes, but also on those of inflation targeting and anchored exchange rate regimes. We explore their effects on the three macroeconomic performance indicators: economic growth rate, exchange rate depreciation, and inflation rate. The analysis revealed that the fixed exchange rate and anchored exchange rate regimes mitigated the exchange rate depreciation and the inflation rate but decreased economic growth in emerging economies. On the other hand, the inflation targeting regime not only sustained economic growth as the floating exchange rate regime did, but also mitigated the exchange rate depreciation and the inflation rate as the fixed exchange rate regime did. This result shows that emerging economies adopting the inflation targeting could achieve high economic growth by maintaining flexibility in monetary policy as countries with floating exchange rates did. At the same time, they could achieve a stable inflation rate as countries with fixed exchange rates did. However, if we were to look at the short-run effects of introducing the inflation targeting, the results suggested that although the inflation targeting was effective in promoting growth, it was not effective in controlling inflation rates. Additionally, while the inflation targeting regime could stabilize short-term volatility of growth rates to some extent, no significant effects were observed in stabilizing exchange rate and inflation rate volatilities.

Keywords: Emerging economies, exchange rate regimes, inflation targeting

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## I. Introduction

Since the beginning of the 21st century, many emerging economies have achieved remarkable economic growth and have dramatically increased their presence in the global economy. Today, the growth potential of emerging economies far exceeds that of developed economies. On the other hand, many emerging economies remain fragile and have often been hit by serious economic crises. In particular, emerging economies have intrinsically been vulnerable to capital flight. This occurs because of what is called “original sin.” Emerging economies, which invest in domestic markets, are forced to borrow or issue bonds denominated in US dollars when raising funds from abroad. When foreign debt is denominated in US dollars, burdens of the US dollar-denominated debt increase as the US dollar appreciates. On the other hand, to the extent that domestic claims are denominated in the local currency, their value would not increase even if the US dollar appreciates. This currency mismatch has made emerging economies vulnerable to an appreciation of the US dollar.

To avoid the vicious cycles, it has been critical for many emerging economies to maintain “credibility” of their currencies and achieve stable economic growth. Governments have an incentive to create inflation by supplying currency excessively to boost the domestic economy and to increase seigniorage. However, if governments keep pursuing the short-term incentives, inflation and exchange rate depreciation will be conspicuous in the long term, leading to a serious economic crisis. For this reason, a major theme in many emerging economies has been how to maintain credibility of their own currencies and achieve sustainable growth.

One of the traditional tools to maintain credibility of their currencies in emerging economies has been to peg the exchange rate of their currency to a “credible” foreign currency, such as the US dollar (Rogoff, 1985). In particular, “hard pegs” of exchange rates, such as currency board regime and dollarization, have been adopted by several emerging economies as a means of increasing currency credibility and preventing economic instability by making it impossible for the home government to control the supply of its currency. However, the hard pegs of exchange rates lead to a “trilemma” where monetary policy becomes infeasible as long as international capital flows are free. Especially in a globalized international economy, US monetary policy has come to have a significant impact on emerging economies (Rey, 2016; Tillmann, 2016; Fukuda and Tanaka, 2017; Kolasa and Wesołowski, 2020). Thus, adopting a hard peg of the exchange rate, while effective in preventing inflation from soaring, might be rather negative in stabilizing excessive fluctuations in the real economy, such as GDP.

Because of these concerns, the adoption of “inflation targeting” has attracted increasing attention as an alternative approach in emerging economies. Inflation targeting aims to maintain credibility of a country’s currency by committing the government to a pre-announced inflation rate (or range of its fluctuations), while at the same time stabilizing short-term economic fluctuations by flexible monetary policy (Mishkin and Schmidt-Hebbel, 2007). Inflation targeting was initially initiated in several advanced economies, such as New

Zealand and the United Kingdom, but has been adopted by an increasing number of emerging economies in recent years. In emerging countries with fragile economic fundamentals, even if a government sets an inflation target, it might not be easy to achieve the target unless the necessary economic environment is in place (Mishkin, 2000, 2004; Fraga, Goldfajn, and Minella, 2004; Freedman and Ötoker-Robe, 2010). However, the “inflation target” has recently been viewed as a medium-term target which needs not be strictly met each period. Therefore, the adoption of inflation targeting in emerging economies may not only stabilize medium-term price fluctuations, but also stabilize short-term fluctuations in GDP and other real economic variables by monetary policy (Amato and Gerlach, 2002; Roger, 2006; Gonçalves and Salles, 2008; Ha, Kose, and Ohnsorge, 2019).

This paper analyzes the impact of alternative exchange rate regimes on the stabilization of emerging economies since the late 2000s. We compare the effects of inflation targeting regime with those of exchange rate anchor regime as well as those of traditional floating and fixed exchange rate regimes. Since the late 2000s, emerging economies have been hit by three major external shocks. The first was the global financial crisis triggered by the collapse of Lehman Brothers in the fall of 2008. Although the crisis originated in the United States, it spread out to emerging economies, with many recording negative growth in 2009. The second was the outflow of funds from emerging economies in response to the tapering of US monetary easing policy and the crash in the Chinese stock markets around 2015. When these shocks occurred, capital outflows resulted in economic crises in several emerging economies. The third is the COVID-19 pandemic after the spring of 2020. The pandemic caused significant negative growth in developed countries. However, the impact was more severe in emerging economies, where health care systems are more fragile than in developed countries. The analysis uses panel data that include the periods of these major negative shocks to examine how differences in exchange rate regimes affected three macroeconomic performance measures: economic growth rate, exchange rate depreciation, and inflation rate.

To explore how the inflation targeting regime is effective in emerging economies has been the subject of extensive research. While many early studies were skeptical of the effects of inflation targeting in emerging economies, there have been an increasing number of supportive results in recent years. However, the effects of inflation targeting are still controversial in emerging economies where economic fundamentals are fragile. In addition, existing studies evaluated its effects differently depending on which macroeconomic indicators are focused on (Agarwal and Ghosh, 2021). For this reason, this study reexamines the effects on various macroeconomic indicators for a large number of emerging economies using the latest data, which include the periods when several large external shocks occurred.

## **II. Exchange rate regime in emerging countries**

In the past, exchange rate regimes tended to be discussed in terms of the choice between the “floating” and “fixed” exchange rate regimes. However, few emerging economies have adopted a truly free floating exchange rate regime. Even when announcing that they have a

“floating exchange rate regime,” the majority of them adopted a “managed floating exchange rate regime” where they often intervene in the foreign exchange market. Even among countries with a “fixed exchange rate regime,” some have a strict fixed exchange rate regime such as the currency board regime in which foreign currency reserves ceiling the total amount of domestic currency issuance, while others have the crawling peg regime that allows a certain amount of fluctuation or basket-pegging that adjusts the exchange rate in accordance to changes in the value of a basket of currencies. In the extreme case, some emerging economies do not have their own legal tender but have “dollarized” their currencies to allow a major currency such as the US dollar to circulate as legal tender.

A more serious problem is that some emerging economies that have announced a flexible exchange rate regime (*de jure* flexible exchange rate regime) may in effect have adopted a fixed exchange rate regime (*de facto* fixed exchange rate regime). It is widely reported that many of the emerging economies with weak economic fundamentals tend to prefer fixed exchange rate regimes than flexible regimes (Reinhart and Rogoff, 2004). This is because in emerging economies with weak economic fundamentals, if exchange rates are freely determined through market mechanisms, there is a risk that speculative attacks and capital flights will cause large exchange rate depreciations and create major turmoil in the domestic economy. For this reason, many emerging economies that have announced a floating exchange rate regime tended to adopt an effective fixed exchange rate regime out of fear of excessive exchange rate fluctuations (see Reinhart and Calvo, 2002; von Hagen and Zhou, 2006).

Many emerging economies with fragile economic fundamentals have adopted a “fixed exchange rate regime” to enhance the “credibility” of their currencies. In particular, the “exchange rate anchor” has been thought to stabilize emerging economies by pegging the home currency to a currency with high credibility. However, a “trilemma” arises in countries that adopt a fixed exchange rate regime: as long as international capital flows exist, monetary policy becomes less flexible, making it difficult to stabilize the economy. Of course, when a country adopts the crawling peg regime that allows some degree of exchange rate volatility or the adjustable peg regime that allows changes in the parity, the degree of freedom of monetary policy remains even under a fixed exchange rate regime. However, such “fixed exchange rate regimes” carry a significant risk of collapse due to currency speculation. For this reason, in order to prevent speculation and capital flight, emerging economies have in fact been forced to adopt a “hard fixed exchange rate regime” that strongly pegs their currency to a currency with high credibility eliminating the degree of freedom in monetary policy.

To overcome the “trilemma,” an increasing number of emerging economies in recent years have sought to stabilize their economies under a floating exchange rate regime by setting an inflation target. When an inflation target is set under a floating exchange rate regime, it is more likely that the economy can be adjusted through flexible monetary policy while maintaining the “credibility” of the local currency. However, even if an inflation target is set, as long as a floating exchange rate regime is in place, there is still a risk of currency crashes due to speculation and capital flight that will result in economic turmoil. For this reason, a thorough examination is needed regarding the extent to which the adoption of the

inflation targeting regime has led to economic stability in emerging economies.

The following section examines the desirable exchange regime for achieving stable economic performance in the 97 emerging economies listed in Table 1, based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). The main feature of the IMF-AREAER classification is that it is based on the exchange regime that is considered to be effectively adopted by each country, that is, "de facto exchange rate regime," rather than the exchange regime that is publicly announced by each country, that is, "de jure exchange rate regime," (Habermeier, Kokenyne, Veyrune, and Anderson, 2009). In addition to classifying exchange regimes according to the degree of exchange rate flexibility, as shown in Table 2, the IMF also makes classifications related to whether a country has adopted "inflation targeting" and whether it has linked its currency to a specific currency (an exchange rate anchor).

Figure 1 shows how the number of countries adopting the inflation targeting and currency anchor regimes changed from 2010 to 2020 based on the IMF-AREAER for 36 advanced economies, 97 emerging economies, and 59 least developed economies, respectively. The figure shows that many advanced economies adopted the inflation targeting regime and many less developed economies adopted the exchange rate anchor regime, and the trends were common throughout the entire period. On the other hand, for emerging economies, the number of countries adopting the exchange rate anchor regime in 2010 was about three times larger than the number of countries adopting the inflation targeting regime. However, the number of emerging economies adopting the exchange rate anchor regime decreased and the number of those adopting the inflation targeting regime increased throughout the period, resulting in the number of countries adopting the exchange rate anchor regime decreasing to about 1.7 times the number of countries adopting the inflation targeting regime in 2020. This indicates that the number of emerging economies switching from the exchange rate anchor regime to the inflation targeting regime has been steadily increasing in recent years.

### III. Preliminary analysis

In this section, we first use the World Bank's World Development Indicators (WDI) to examine how the choice of the exchange rate regime affected three macroeconomic indicators in emerging economies (97 countries): "real GDP growth rate [annual %]," "depreciation rate of official exchange rate [LCU per US\$, period average]," and "inflation rate [consumer prices, annual %]" for each exchange regime adopted by the emerging economies (IMF-AREAER classification). This section provides a preliminary comparative analysis of how differences in the exchange rate regime (IMF-AREAER classification) affected the three macroeconomic indicators in emerging economies. In addition to the classical classification of "floating" and "fixed" exchange rate regimes, the analysis uses the classification of "inflation targeting" and "exchange rate anchor" regimes as a form of exchange regime.

Following the classification of "de facto exchange rate regime" in the IMF-AREAER, we will define either "free floating" or "floating" by the "floating exchange rate regime,"

Table 1. The list of 97 emerging economies used in the analysis

Albania	Fiji	Panama
Algeria	Gabon	Paraguay
Angola	Georgia	Peru
Antigua and Barbuda	Grenada	Philippines
Argentina	Guatemala	Poland
Armenia	Guyana	Qatar
Aruba	Hungary	Romania
Azerbaijan	India	Russia
Bahamas, The	Indonesia	Samoa
Bahrain	Iran, Islamic Republic of	Saudi Arabia
Barbados	Iraq	Serbia
Belarus	Jamaica	Seychelles
Belize	Jordan	South Africa
Bolivia	Kazakhstan	Sri Lanka
Bosnia and Herzegovina	Kosovo	St. Kitts and Nevis
Botswana	Kuwait	St. Lucia
Brazil	Lebanon	St. Vincent and the Grenadines
Brunei Darussalam	Libya	Suriname
Bulgaria	Malaysia	Syria
Cabo Verde	Maldives	Thailand
Chile	Marshall Islands	Tonga
China	Mauritius	Trinidad and Tobago
Colombia	Mexico	Tunisia
Costa Rica	Micronesia	Turkey
Croatia	Mongolia	Turkmenistan
Curaçao and Sint Maarten	Montenegro	Tuvalu
Dominica	Morocco	Ukraine
Dominican Republic	Namibia	United Arab Emirates
Ecuador	Nauru	Uruguay
Egypt	North Macedonia, Republic of	Vanuatu
El Salvador	Oman	Venezuela
Equatorial Guinea	Pakistan	
Eswatini	Palau	

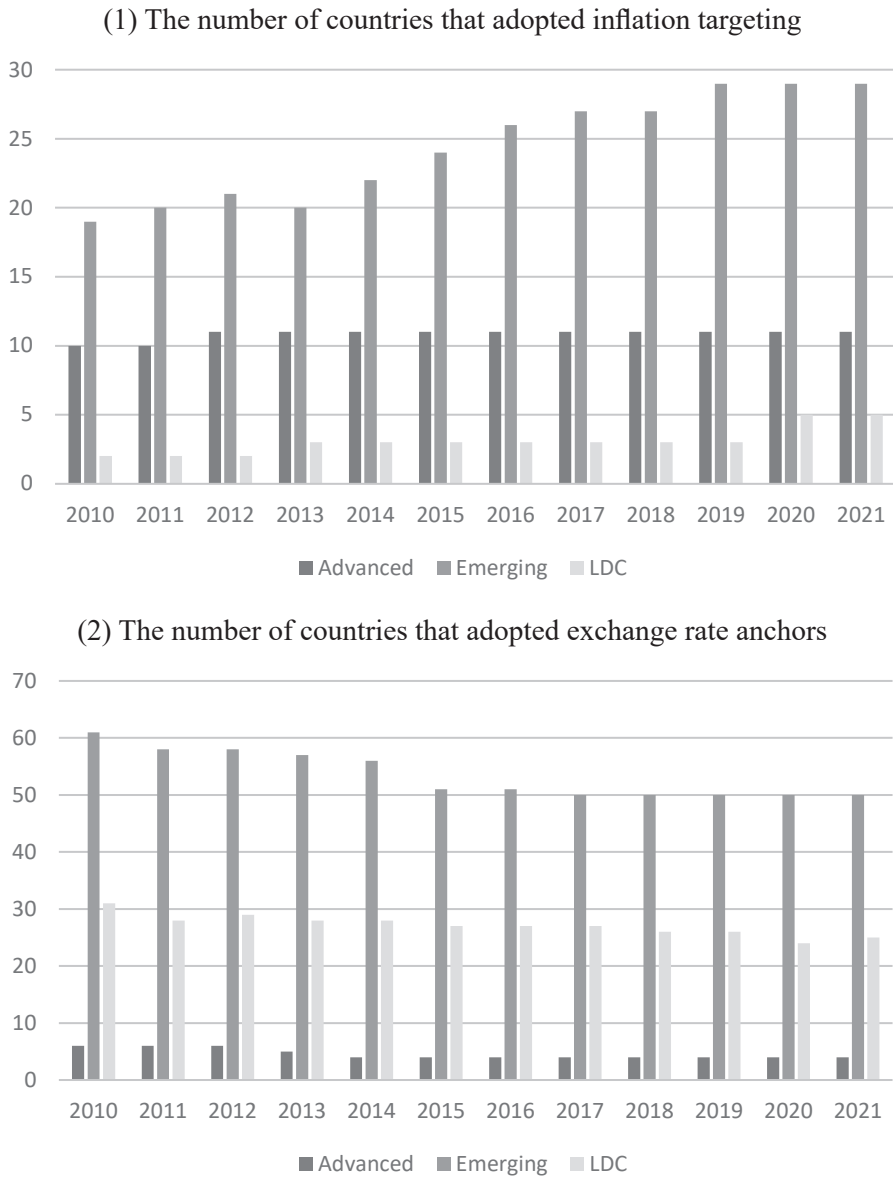
Table 2. The classification of the exchange regimes

Fixed exchange rate regime	No separate legal tender
	Currency board
	Conventional peg
Intermediate exchange rate regime	Stabilized arrangement
	Crawling peg
	Crawl-like arrangement
	Pegged exchange rate within horizontal bands
	Other managed arrangement
Floating exchange rate regime	Floating
	Free floating

and either “conventional peg,” “currency board,” or “no separate legal tender” by the “fixed exchange rate regime.” Thus, the exchange rate regimes that include moderate foreign exchange intervention are classified as the “floating exchange rate regime,” while the exchange rate regimes where the parity is changed infrequently are classified as the “fixed exchange rate regime.” On the other hand, the exchange rate regimes adopting “inflation targeting” and “exchange rate anchor” are defined following the classification in the IMF-AREAER. Countries that adopt the “inflation targeting regime” are usually classified as the “floating exchange rate regime” at the same time. However, some of them are classified as either “stabilized arrangements,” “crawling peg,” or “crawl-like arrangements,” where the degree of foreign exchange intervention is more severe. Furthermore, there are several countries that are classified as the “floating exchange rate regime” but not as the “inflation targeting regime” (Ebeke and Azangue, 2015). By contrast, the majority of countries that adopt the “exchange rate anchor regime” are classified as the “fixed exchange rate regime.” But several “exchange rate anchor” countries are classified as “stabilized” or “other managed arrangements” that allow for gradual exchange rate fluctuations.

Figures 2, 3, and 4 illustrate average macroeconomic performances in emerging countries that adopt the floating exchange rate, the fixed exchange rate, the inflation targeting, or the exchange rate anchor regimes, respectively. They depict how each averaged variable evolved over the 2005-2022 period depending on the exchange rate regime. Figure 2 shows how the economic growth rates of emerging economies differed across the exchange regimes. From the figure, we see that in most years, the average economic growth rates were higher in the floating exchange rate or inflation targeting regimes than in the fixed exchange rate or exchange rate anchor regimes. On the other hand, in most years, average economic growth rates did not differ between the floating exchange rate and inflation targeting regimes, or between the fixed exchange rate and exchange rate anchor regimes.

Figure 1. The number of inflation targeting and exchange rate anchor regimes

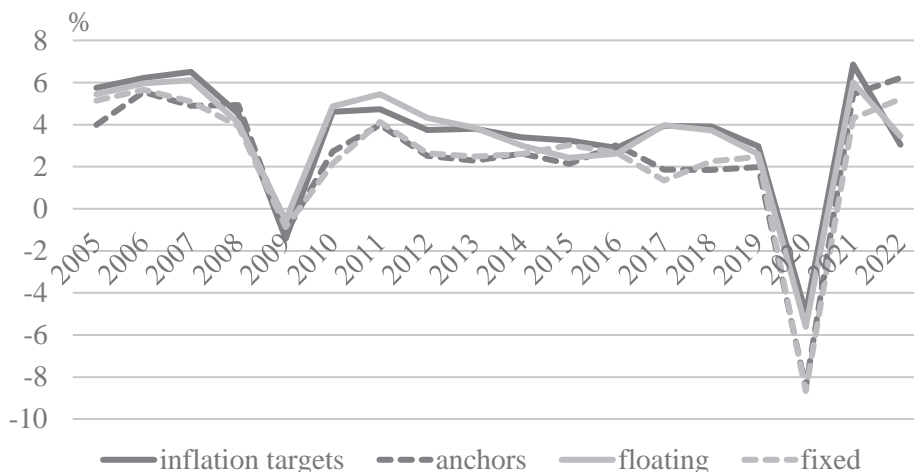


Source: Author's calculation based on IMF-AREAER.

Figure 3 shows how the exchange rate depreciation of emerging economies differed across the exchange regimes. The average depreciation rates are almost the same in most years between the floating exchange rate and inflation targeting regimes, and between the fixed exchange rate and the exchange rate anchor regimes, respectively. On the other hand, the exchange rates tended to depreciate more sharply on average in the floating exchange rate or inflation targeting regimes than in the fixed exchange rate or the exchange rate anchor regimes. Their fluctuations were also larger in the floating exchange rate or inflation target-

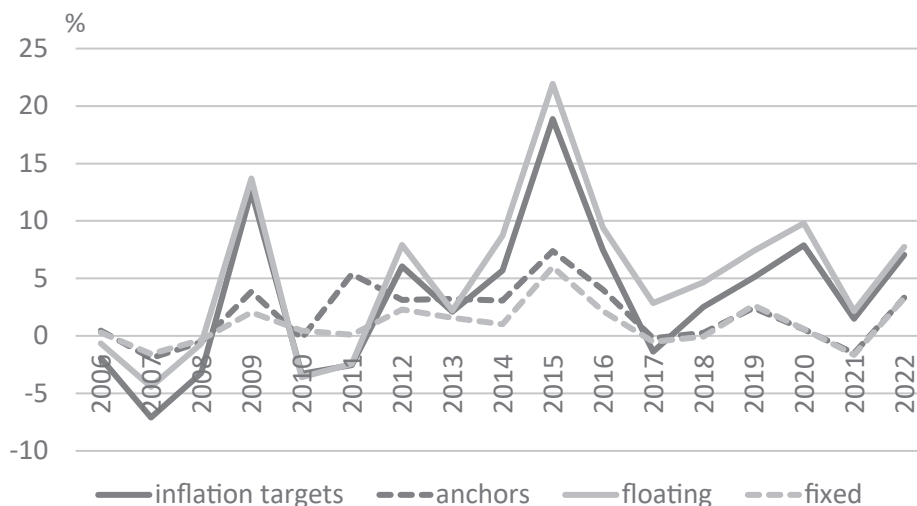


Figure 2. Average economic growth rates in 97 emerging countries



Source: Author's calculation based on IMF-AREAER and WDI.

Figure 3. Average rates of exchange rate depreciation in 97 emerging countries

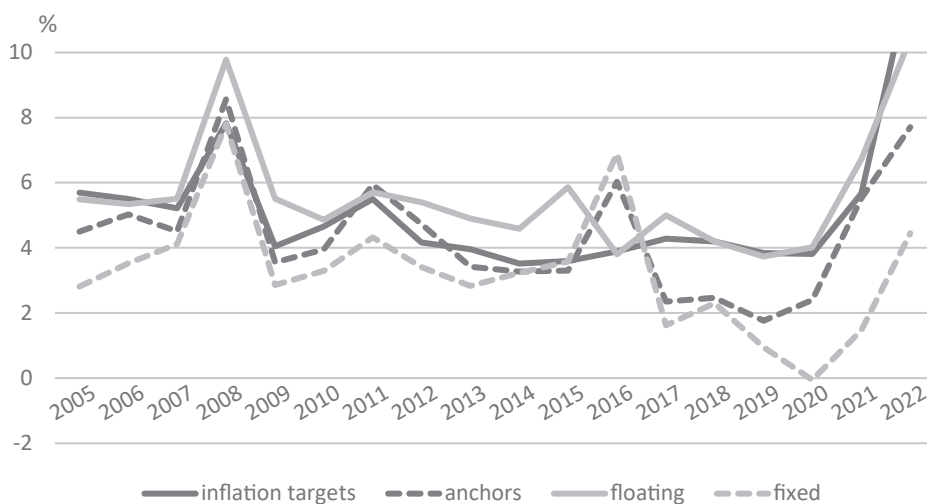


Source: Author's calculation based on IMF-AREAER and WDI.

ing regimes. In particular, the exchange rates in the floating exchange rate or inflation targeting regimes depreciated significantly on average in 2009 when the global financial crisis occurred, in 2015 when the United States tapered its quantitative easing policy and China's stock market crash occurred, and in 2020 when the COVID-19 pandemic occurred. These results suggest that countries adopting the floating exchange rate or inflation targeting regimes, which have more flexibility in monetary policy, may have been able to achieve higher growth rates by allowing their exchange rate adjustments than countries adopting the fixed exchange rate or exchange rate anchor regimes, which have less flexibility in monetary policy.

Figure 4 shows how inflation rates in emerging economies differ across the exchange regimes. From the figure, we observe that the average tended to be the highest in the floating exchange rate regime and the lowest in the fixed exchange rate regime. On the other hand, when comparing the inflation targeting and exchange anchor regimes on average, the inflation targeting regime significantly outperformed the exchange anchor regime after 2017, when prices were stagnant globally, but there was no significant difference between the regimes in other years. More notably, the average in the inflation targeting regime was not only well below the average in the floating exchange rate regime in most years but also the most stable among the exchange regimes except in 2001 and 2022. In particular, in 2016, prices soared in both the fixed exchange rate and exchange rate anchor regimes but did not in the inflation targeting regime. The results indicate that countries adopting the inflation targeting regime, like countries adopting the floating exchange rate regime, have achieved higher economic growth by allowing more flexibility in monetary policy and exchange rate fluctuations, and at the same time, by committing to inflation targets, they may have achieved more stable inflation rates than countries adopting the floating exchange rate regime.

Figure 4. Average inflation rates in 97 emerging countries



Source: Author's calculation based on IMF-AREAER and WDI.

#### IV. Panel data analysis

In the previous section, we provided a preliminary comparative analysis of how the different exchange rate regimes in emerging economies changed the three macroeconomic performances by drawing a graph of the average values. However, we cannot rule out the possibility that such a simplified analysis is a spurious correlation, since it does not control for the effects of other factors that may affect each macroeconomic variable. In this section, we

examine whether the results of the previous section still hold when controlling for other factors by conducting a panel regression analysis.

Specifically, we use the panel data from 2006 to 2021 for emerging economies. Defining  $\Delta y_{j,t}/y_{j,t} \equiv$  growth rate of per capita real GDP (annual %),  $\Delta EX_{j,t}/EX_{j,t} \equiv$  depreciation rate of the official exchange rate [LCU per US\$, period average], and  $\Delta P_{j,t}/P_{j,t} \equiv$  inflation rate [consumer prices, annual %]), respectively, we estimated the following equations regressing each of them on the exchange rate regime dummy  $regime_{j,t}^i$ , the time dummy  $time_{T,t}$ , and control variables  $X_{j,t}^k$ 's.

$$\Delta y_{j,t}/y_{j,t} = constant + \sum_{i=1}^m a_i regime_{j,t}^i + \sum_{T=2006}^{2021} b_{y,t} time_{T,t} + \sum_{k=1}^{n1} c_k X_{j,t}^k, \quad (1)$$

$$\Delta EX_{j,t}/EX_{j,t} = constant + \sum_{i=1}^m d_i regime_{j,t}^i + \sum_{T=2006}^{2021} b_{ex,t} time_{T,t} + \sum_{h=1}^{n2} e_h X_{j,t}^h, \quad (2)$$

$$\Delta P_{j,t}/P_{j,t} = constant + \sum_{i=1}^m f_i regime_{j,t}^i + \sum_{T=2006}^{2021} b_{p,t} time_{T,t} + \sum_{l=1}^{n3} g_l X_{j,t}^l, \quad (3)$$

where  $regime_{j,t}^i$  is a dummy variable that takes 1 if country  $j$ 's exchange regime is  $i$  (= the floating exchange rate regime, the inflation targeting regime, the fixed exchange rate regime, or the exchange rate anchor regime) in period  $t$ , and 0 otherwise.  $time_{T,t}$  is a dummy variable that takes 1 if  $t=T$  and 0 otherwise.

In equation (1), the control variables  $X_{j,t}^k$ 's are GDP per capita [PPP base, constant 2017 international \$] in the previous period, the savings rate in the previous period [adjusted gross savings, % of GNI], population growth rate [annual %], working age population ratio [population ages 15-64, % of total population], trade volume ratio [sum of exports and imports of goods and services, % of GDP], foreign direct investment [net inflows, % of GDP], external debt ratio [% of GNI], and the depreciation rate of the exchange rate in the previous period. In equation (2), the control variables  $X_{j,t}^k$ 's are the growth rate of money supply in the previous period [broad money growth, annual %], inflation rate in the previous period, GDP per capita [PPP base, constant 2017 international \$], real GDP growth in the previous period (annual %), working age population ratio [population ages 15-64, % of total population], and external debt ratio [% of GNI]. In equation (3), control variables  $X_{j,t}^k$ 's include the growth rate of money supply in the previous period [broad money growth, annual %], the depreciation rate of the exchange rate in the previous period, the growth rate of real GDP in the previous period (annual %), the working-age population ratio [population ages 15-64, % of total population], and external debt ratio [% of GNI].

All of these control variables were downloaded from WDI. However, the data are unbalanced panel due to missing data in several emerging economies. In the analysis, we included time dummies  $time_{T,t}$  as explanatory variables to control for the impact of the global common shocks that occurred in each year of the estimation.

## V. Estimation results

Table 3 summarizes the estimation results of the impacts on the growth rate of GDP per

Table 3. The estimation results of the impacts on the growth rate of per capita GDP

	coeff.	t value	coeff.	t value	coeff.	t value	coeff.	t value
constant term	2.452	9.29 ***	2.685	1.20	1.840	8.49 ***	1.577	0.69
inflation targeting dummy	0.392	1.10	0.279	0.90	1.155	2.78 ***	1.012	2.71 ***
anchor dummy	-1.747	-5.71 ***	-1.402	-4.24 ***				
floating rate dummy					-0.185	-0.45	-0.502	-1.40
fixed rate dummy					-1.226	-4.34 ***	-0.721	-2.09 **
per capita GDP			0.000	-1.68 *			0.000	-2.02 **
savings rate			0.096	7.64 ***			0.099	7.84 ***
population growth rate			-0.862	-7.00 ***			-0.910	-7.28 ***
working age pop. ratio			-0.024	-0.69			-0.006	-0.18
trade volume ratio			0.000	-0.08			-0.006	-1.19
foreign direct investment			0.100	3.47 ***			0.096	3.25 ***
external debt ratio			0.005	1.27			0.006	1.56
depreciation rate			-0.042	-3.60 ***			-0.034	-2.86 ***
Adjusted R <sup>2</sup>	0.306		0.510		0.299		0.501	
The number of samples	1,504		782		1,498		782	

Note: \*\*\* = 1% significance level, \*\* = 5% significance level, and \* = 10% significance level.

capita (per capita GDP). The table shows the estimation results with and without the control variables. First, when the control variables are included, a significant negative impact is observed for GDP per capita in the previous period and population growth, while a significant positive impact is observed for the savings rate in the previous period. This result is consistent with standard neoclassical economic growth models such as the Solow model. In terms of external factors, the ratio of foreign direct investment to GDP had a significant positive impact, while the depreciation rate of the exchange rate in the previous period had a significant negative impact. While the growth rate tends to be higher in emerging economies that are more open to external transactions, the exchange rate depreciation, which is usually accompanied by capital flight, is rather negative for economic growth.

The more important result is that the fixed exchange rate regime dummy and the exchange rate anchor dummy have a significant negative impact regardless of the control variables. Since the constant term is positive, this result suggests that the fixed exchange rate and exchange rate anchor regimes that make monetary policy less flexibility tended to suppress economic growth. On the other hand, no such significant negative effect is observed for the floating exchange rate regime dummy or inflation targeting dummy. In particular, significant positive effects were observed in some cases for the inflation targeting dummy. This indicates that the growth rate may have increased in countries adopting the inflation targeting regime.

Table 4 summarizes the estimation results for the effects of exchange rate regimes on the rate of exchange rate depreciation. As in Table 3, it shows the estimation results with and

Table 4. The estimation results of the impacts on the exchange rate depreciation

	coeff.	t value	coeff.	t value	coeff.	t value	coeff.	t value
constant term	7.208	9.31 ***	8.667	1.92 *	5.972	9.55 ***	9.923	2.21 ***
inflation targeting dummy	-3.906	-3.73 ***	-0.979	-1.24	-5.199	-4.31 ***	-2.703	-2.93 ***
anchor dummy	-5.016	-5.59 ***	-1.387	-1.82 *				
floating rate dummy					2.861	2.42 **	2.990	3.35 ***
fixed rate dummy					-5.043	-6.15 ***	-0.891	-1.13
money supply growth rate			0.082	2.85 **			0.088	3.06 ***
inflation rate			0.588	9.40 ***			0.566	8.88 ***
per capita GDP			0.000	3.61 ***			0.000	3.75 ***
GDP growth rate			-0.287	-3.80 ***			-0.279	-3.71 ***
working age pop. ratio			-0.158	-2.17 **			-0.189	-2.59 ***
external debt ratio			-0.005	-0.67			-0.007	-0.99
Adjusted R <sup>2</sup>	0.079		0.323		0.094		0.330	
The number of samples	1,500		910		1,494		908	

Note: \*\*\* = 1% significance level, \*\* = 5% significance level, and \* = 10% significance level.

without the control variables. First, when the control variables are included, we observe that the inflation rate in the previous period, the growth rate of money supply in the previous period, and GDP per capita in the previous period tend to significantly depreciate the exchange rate, while the GDP growth rate in the previous period and the working-age population ratio tend to significantly appreciate the exchange rate. This suggests that exchange rates tend to depreciate in high-inflation countries and tend to appreciate in high-growth countries. However, the constant term was significantly positive regardless of control variables, indicating that the exchange rates tended to depreciate on average in emerging economies.

On the other hand, the fixed exchange rate regime dummy and the exchange rate anchor dummy took a negative sign. In particular, these dummies were significant when the control variables were not included. The result indicates that the fixed exchange rate and the exchange rate anchor regimes tended to mitigate the exchange rate depreciation through endogenous adjustment of domestic macroeconomic variables. In contrast, the floating exchange rate regime dummy took a significant positive sign. This suggests that in the floating exchange rate regime without an inflation target, the exchange rate tended to depreciate to a greater extent due to the greater degree of freedom in monetary policy. A more interesting result is that the inflation targeting dummy took a significant negative sign in many cases. This suggests that, unlike countries with flexible exchange rates but without an inflation target, countries with an inflation target were able to prevent the exchange rate depreciation by maintaining “credibility” of their currencies. This suggests that the inflation targeting regime may have prevented the exchange rate depreciation without reducing the growth rate as the fixed exchange rate and exchange rate anchor regimes did.

Table 5 summarizes our estimation results of the impacts on the inflation rate. As in Ta-

Table 5. The estimation results of the impacts on the inflation rate

	coeff.	t value	coeff.	t value	coeff.	t value	coeff.	t value
constant term	7.583	11.84 ***	10.220	5.01 ***	7.765	14.91 ***	11.335	5.65 ***
inflation targeting dummy	-2.934	-3.44 ***	-1.773	-4.66 ***	-3.092	-3.14 ***	-2.183	-4.94 ***
anchor dummy	-2.737	-3.67 ***	-2.147	-5.87 ***				
floating rate dummy					-0.054	-0.06	0.834	1.90 *
fixed rate dummy					-4.027	-5.89 ***	-2.828	-7.60 ***
money supply growth rate			0.163	12.19 ***			0.158	11.98 ***
depreciation rate			0.130	12.83 ***			0.121	12.13 ***
GDP growth rate			-0.106	-2.83 ***			-0.109	-2.98 **
working age pop. ratio			-0.088	-2.84 ***			-0.109	-3.56 ***
external debt ratio			0.001	0.16			0.002	0.54
Adjusted R <sup>2</sup>	0.026		0.406		0.042		0.429	
The number of samples	1,389		910		1,387		908	

Note: \*\*\* = 1% significance level, \*\* = 5% significance level, and \* = 10% significance level.

bles 3 and 4, the estimation results are presented with and without the control variables. First, when the control variables are included, the growth rate of money supply in the previous period and the depreciation rate of the exchange rate in the previous period significantly increased the inflation rate, while the growth rate of GDP in the previous period and the working-age population ratio significantly decreased the inflation rate. The former results are consistent with standard macroeconomic mechanisms such as the quantity theory of money and the theory of exchange rate pass-through. However, regardless of the control variables, the constant term was significantly positive, indicating that inflation tended to be high on average in emerging economies.

On the other hand, the effects of the exchange regime dummies show that different exchange regimes may have led to significantly different inflation rates in emerging economies. That is, not only the fixed exchange rate and exchange rate anchor dummies but also the inflation targeting dummy significantly reduced the inflation rate, with or without the control variables. By contrast, the floating exchange rate regime dummy was either insignificant or, if significant, was positive. This result suggests that while the inflation targeting regime as well as the fixed exchange rate and exchange rate anchor regimes were effective in reducing the inflation rate, the floating exchange rate regime had no such effect. The results indicate that countries adopting inflation targeting have achieved higher economic growth by allowing more flexibility in monetary policy and have achieved more stable inflation rates by committing to an inflation target.

## VI. Fixed effects estimations

In the previous section, we estimated equations (1)-(3) and showed that countries adopt-

ing the inflation targeting regime have achieved high economic growth as those adopting the floating exchange rate regime have and have achieved stable inflation rates as those adopting the fixed exchange rate regime have. In this section, we explore whether the results are robust even when including the country fixed effects. The fixed effects models are common in panel data analysis. However, the inclusion of country fixed effects in the estimation creates the problem that the effects of countries that did not change the exchange regime throughout the period will not be reflected in the estimation results of the exchange regime dummy. In our estimations, this is a serious problem because the exchange rate regime never changed over time in many emerging countries. Therefore, it is important to note that the estimates that include country fixed effects will reflect only the effects of the very exceptional countries whose exchange regime changed during the period.

Tables 6, 7, and 8 summarize the estimation results when we use the growth rate of GDP per capita, the exchange rate depreciation, and the inflation rate as a dependent variable, respectively. To save space, the tables only show the estimation results with the control variables. The estimated equations and estimation methods are exactly the same as before, except for the inclusion of country fixed effects. Therefore, the impact of the control variables is almost the same as in the estimation results without the inclusion of country fixed effects, except for statistical significances. In contrast, several exchange regime dummies differed significantly when country fixed effects were included.

Table 6 reports the effects on GDP per capita growth. In the table, the inflation targeting dummy was significantly positive, while the exchange rate anchor dummy and fixed ex-

Table 6. The fixed-effect estimations of the impacts on the growth rate of per capita GDP

	coeff.	t value	coeff.	t value
constant term	10.646	1.38	11.115	1.48
inflation targeting dummy	1.224	2.00 ***	1.561	2.42 **
anchor dummy	0.533	0.82		
floating rate dummy			-0.751	-1.80 *
fixed rate dummy			1.069	0.84
per capita GDP	-0.001	-5.20 ***	-0.001	-5.28 ***
savings rate	0.136	5.12 ***	0.136	5.14 ***
population growth rate	-0.607	-2.36 **	-0.621	-2.43 **
working age pop. ratio	-0.152	-1.43	-0.160	-1.54
trade volume ratio	0.067	5.78 ***	0.067	5.88 ***
foreign direct investment	0.092	2.78 ***	0.090	2.72 ***
external debt ratio	-0.006	-0.84	-0.004	-0.57
depreciation rate	-0.040	-3.23 ***	-0.039	-3.14 ***
Adjusted R <sup>2</sup>	0.585		0.586	
The number of samples	782		782	

Note: \*\*\* = 1% significance level, \*\* = 5% significance level, and \* = 10% significance level.

Table 7. The fixed-effect estimations of the impacts on the exchange rate depreciation

	coeff.	t value	coeff.	t value
constant term	-27.140	-1.56	-26.756	-1.55
inflation targeting dummy	-1.406	-0.84	-3.033	-1.73 *
anchor dummy	-3.564	-2.20 **		
floating rate dummy			3.889	3.40 ***
fixed rate dummy			0.926	0.37
money supply growth rate	0.033	1.09	0.039	1.28
inflation rate	0.281	3.66 ***	0.289	3.78 ***
per capita GDP	0.001	3.90 ***	0.001	3.67 ***
GDP growth rate	-0.353	-4.26 ***	-0.343	-4.15 ***
working age pop. ratio	0.295	1.19	0.264	1.09
external debt ratio	-0.013	-1.17	-0.014	-1.34
Adjusted R <sup>2</sup>	0.344		0.348	
The number of samples	910		908	

Note: \*\*\* = 1% significance level, \*\* = 5% significance level, and \* = 10% significance level.

Table 8. The fixed-effect estimations of the impacts on the inflation rate

	coeff.	t value	coeff.	t value
constant term	5.105	0.77	4.720	0.70
inflation targeting dummy	-1.054	-1.42	-1.412	-1.81 ***
anchor dummy	-0.928	-1.32		
floating rate dummy			0.874	1.72 *
fixed rate dummy			0.241	0.22
money supply growth rate	0.076	5.70 ***	0.077	5.80 ***
depreciation rate	0.095	9.51 ***	0.094	9.39 ***
GDP growth rate	-0.055	-1.57	-0.056	-1.58
working age pop. ratio	-0.002	-0.02	-0.006	-0.06
external debt ratio	-0.001	-0.27	-0.002	-0.39
Adjusted R <sup>2</sup>	0.554		0.554	
The number of samples	910		908	

Note: \*\*\* = 1% significance level, \*\* = 5% significance level, and \* = 10% significance level.

change rate regime dummy became insignificant when country fixed effects were included. A marginally significant negative sign was also detected for the floating exchange rate regime dummy. This result suggests that the change in the exchange regime of the emerging economies did not result in a significant change in growth rates, while the emerging economies that adopted a new inflation targeting saw an increase in growth rates.

Table 7 reports the estimation results of the effects on the exchange rate depreciation.



Even when country fixed effects were included, the exchange rate anchor dummy remained significantly negative, and the floating exchange rate regime dummy remained significantly positive. However, no statistically significant sign was detected for the fixed exchange rate regime dummy, and its statistical significance was also largely reduced for the inflation targeting dummy. These results suggest that the new adoption of inflation targeting by emerging economies had only a limited effect on the exchange rate depreciation.

Table 8 reports the estimation results of the effects on the inflation rate. When country fixed effects were included, the effect of the fixed rate dummy changes its sign and becomes statistically insignificant. Furthermore, the effects of the other exchange regime dummy were all much less statistically significant, although the sign condition was the same as when no fixed effects were included. This suggests that the inflation-suppressing effects of the inflation targeting, exchange rate anchor, and fixed exchange rate regimes are less significant immediately after the regimes are newly adopted.

## VII. The effects on volatilities

In the previous sections, we have used the three macroeconomic indicators to analyze how the exchange regimes affected performance of emerging economies. However, in terms of macroeconomic performance, the standard deviation of the three macroeconomic indicators is an important alternative indicator. This is because high short-term volatility implies that the macroeconomy is unstable and highly uncertain. Therefore, in this section, we use the standard deviations of the economic growth rate, the exchange rate depreciation, and the inflation rate as indicators of economic performance and analyze how the exchange regimes have made any difference in the short-term volatilities of these indicators in emerging economies.

In the analysis, we downloaded the seasonally adjusted monthly data of the industrial production index (IIP), the exchange rate against the dollar, and the consumer price index from the IMF's *International Financial Statistics*. We then calculate their standard deviations using the data from July of the previous year to June of the following year to obtain the "volatility" of the respective macroeconomic indicator for each year. We estimated the following equations regressing each standard deviation on the exchange regime dummy  $regime_{j,t}^i$ , the time dummy  $time_{T,t}$ , and control variables  $X_{j,t}^k$ 's.

$$STD(\Delta y_{j,t}/y_{j,t}) = constant + \sum_{i=1}^m \alpha_i regime_{j,t}^i + \sum_{T=2006}^{2021} \beta_{y,t} time_{T,t} + \sum_{k=1}^{n1} \gamma_k X_{j,t}^k, \quad (4)$$

$$STD(\Delta EX_{j,t}/EX_{j,t}) = constant + \sum_{i=1}^m \delta_i regime_{j,t}^i + \sum_{T=2006}^{2021} \beta_{ex,t} time_{T,t} + \sum_{h=1}^{n2} \epsilon_h X_{j,t}^h, \quad (5)$$

$$STD(\Delta P_{j,t}/P_{j,t}) = constant + \sum_{i=1}^m \varphi_i regime_{j,t}^i + \sum_{T=2006}^{2021} \beta_{p,t} time_{T,t} + \sum_{l=1}^{n3} \theta_l X_{j,t}^l, \quad (6)$$

where  $STD(\bullet)$  denotes the standard deviation of each variable.

Equations (4), (5), and (6) are identical to equations (1), (2), and (3), respectively, except that  $y_{j,t}$  is the IIP and the dependent variable is the standard deviation of each variable. How-

ever, control variables with very small significance in the estimation were excluded when estimating equations (4), (5), and (6). The estimation was performed with and without the control variables but without country fixed effects, respectively.

Tables 9, 10, and 11 summarize the estimation results when the standard deviation of each macroeconomic indicator is used as the dependent variable. First, when the standard deviation of the growth rate of IIP was used, the exchange rate anchor dummy and the fixed exchange rate regime dummy had a significant positive impact, regardless of the control variables (Table 9). The result suggests that countries with the fixed exchange rate or exchange rate anchor regimes, which do not have flexibility in monetary policy, not only tended to suppress economic growth but also tended to have higher short-term growth rate fluctuations. By contrast, no such significant positive effect (higher volatility) was observed for the inflation targeting dummy. This indicates that countries adopting the inflation targeting regime had higher growth rates but did not have larger short-term growth rate fluctuations.

On the other hand, when the standard deviation of the exchange rate depreciation rate was used as the dependent variable, the exchange rate anchor dummy had a significant negative impact in the estimation without the control variables, while the inflation targeting dummy and floating exchange rate regime dummy had significant positive impacts in the estimation with the control variables (Table 10). The result suggests that the exchange rate anchor regime not only tended to suppress the exchange rate depreciation but also tended to reduce its short-term fluctuations (volatility). By contrast, countries adopting the inflation targeting regime, that tended to have smaller exchange rate depreciation, tended to have larger short-term fluctuations (volatility) of the exchange rate as countries adopting the floating exchange rate regime did.

Finally, when the standard deviation of the inflation rate was used as the dependent vari-

Table 9. The estimation results of the impacts on the IIP growth rate volatilities

	coeff.	t value	coeff.	t value	coeff.	t value	coeff.	t value
constant term	0.023	5.41 ***	0.184	2.99 ***	0.022	6.38 ***	0.172	2.84 ***
inflation targeting dummy	0.003	0.60	-0.004	-0.82	-0.002	-0.29	-0.013	-2.04 **
anchor dummy	0.023	4.51 ***	0.011	1.75 *				
floating rate dummy					0.006	1.04	0.013	2.08 **
fixed rate dummy					0.032	6.65 ***	0.012	2.01 **
savings rate			-0.001	-1.44			-0.001	-1.95 *
working age pop. ratio			-0.002	-2.68 ***			-0.002	-2.49 **
trade volume ratio			0.000	-1.82 *			0.000	-1.23
foreign direct investment			0.002	3.94 ***			0.002	3.76 ***
external debt ratio			0.000	2.62 ***			0.000	2.21 **
Adjusted R <sup>2</sup>	0.289		0.495		0.346		0.504	
The number of samples	264		200		264		200	

Note: \*\*\* = 1% significance level, \*\* = 5% significance level, and \* = 10% significance level.

Table 10. The estimation results of the impacts on the exchange rate volatilities

	coeff.	t value	coeff.	t value	coeff.	t value	coeff.	t value
constant term	1.776	2.21 **	0.030	2.35 **	1.323	1.98 **	0.032	2.49 **
inflation targeting dummy	-1.781	-1.64	0.008	3.41 ***	-0.476	-0.38	0.002	0.62
anchor dummy	-1.730	-1.84 *	-0.003	-1.22				
floating rate dummy					-0.990	-0.80	0.011	4.34 ***
fixed rate dummy					-1.326	-1.52	0.001	0.63
money supply growth rate			0.000	3.30 ***			0.000	3.64 ***
inflation rate			0.001	6.15 ***			0.001	6.00 ***
per capita GDP			0.000	3.70 ***			0.000	3.89 ***
GDP growth rate			-0.001	-3.47 ***			-0.001	-3.23 ***
working age pop. ratio			0.000	-1.62			0.000	-1.99 **
external debt ratio			0.000	-2.33 **			0.000	-2.94 ***
Adjusted R <sup>2</sup>	0.001		0.165		0.000		0.180	
The number of samples	1,455		909		1,453		907	

Note: \*\*\* = 1% significance level, \*\* = 5% significance level, and \* = 10% significance level.

Table 11. The estimation results of the impacts on the inflation rate volatilities

	coeff.	t value	coeff.	t value	coeff.	t value	coeff.	t value
constant term	0.011	8.04 ***	0.012	7.88 ***	0.011	10.17 ***	0.012	9.75 ***
inflation targeting dummy	-0.003	-1.62	-0.003	-1.94 *	-0.003	-1.35	-0.003	-1.36
anchor dummy	-0.001	-0.50	-0.001	-0.70				
floating rate dummy					-0.001	-0.36	-0.001	-0.65
fixed rate dummy					-0.002	-1.33	-0.002	-1.52
depreciation rate			0.000	1.89 *			0.000	1.76 *
GDP growth rate			0.000	-2.28 **			0.000	-2.37 **
Adjusted R <sup>2</sup>	0.184		0.177		0.184		0.177	
The number of samples	1,305		1,287		1,301		1,287	

Note: \*\*\* = 1% significance level, \*\* = 5% significance level, and \* = 10% significance level.

able, the inflation targeting dummy took a negative sign but with lower significance level, regardless of the control variables. No significant impact was observed for the dummy variable related to any of the other monetary regimes (Table 11). These results suggest that while the fixed exchange rate, exchange rate anchor, or inflation targeting regimes tended to suppress the inflation rate, they had a limited effect in suppressing short-term fluctuations (volatility) of the inflation rate.

## VIII. Conclusions

This paper examines how the choice of the exchange regime has affected the three mac-

roeconomic performances, that is, economic growth rate, exchange rate depreciation, and inflation rate, for 97 emerging economies since the late 2000s. The analysis was conducted by comparing not only the effects of traditional exchange regimes such as floating and fixed exchange rate regimes but also those of the inflation targeting and exchange rate anchor regimes. The analysis revealed that the fixed exchange rate and exchange rate anchor regimes had a tendency to reduce the exchange rate depreciation and the inflation rate but to suppress economic growth rate. On the other hand, the inflation targeting regime, like the floating exchange rate regime, had a tendency not to reduce economic growth. However, unlike the floating exchange rate regime, it also had a tendency to mitigate the exchange rate depreciation and the inflation rate. The results indicate that countries adopting inflation targeting, like those adopting the floating exchange rate regime, have achieved higher economic growth by allowing flexibility in monetary policy, while achieving more stable inflation rates than those adopting the floating exchange rate regime. However, as far as the estimation results including country fixed effects are concerned, the inflation-suppressing effect of the inflation targeting regime may not be so great immediately after the inflation targeting is introduced. The suppression effect of short-term fluctuations (volatility) due to inflation targeting was also observed to some extent with respect to the growth rate, but not significantly with respect to the exchange rate or inflation rate.

In the 2000s, many emerging economies undertook various structural reforms to withstand external shocks. As a result, the risk posed by the original sin is now not as serious as before. However, many emerging economies still face the risk of crises under further progression of financial globalization in the 2000s, that has increased capital inflows and outflows on an unprecedented scale. In the global economy, capital flows from advanced economies to emerging economies are likely to expand significantly in the future. On the other hand, there is concern that even a small external shock might cause capital flight from emerging countries and destabilize their economies. To reduce the potential risk, a major theme is how to stabilize emerging economies and achieve sustainable growth. It is important to continue to deepen our understanding of desirable exchange rate regimes in emerging economies by further comparing between the floating and fixed exchange rate regimes as well as between inflation targeting and exchange rate anchor regimes.

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