

Monetary Policy Rules in Emerging ASEAN Economies: Adaptability of Taylor Principle

Mesa Wanasilp, Saitama University, Saitama, Japan

ABSTRACT

This paper examines the monetary policy rules for five emerging ASEAN economies—Indonesia, the Philippines, and Thailand as the adopters of inflation targeting (IT) and Malaysia and Vietnam as the non-IT adopters. For the methodology, this study applies a generalized method of moments that provides a consistent and efficient estimator for the estimation that contains endogenously determined variables. The questions are whether the rules of the IT adopters have fulfilled the Taylor principle and what has been the difference in the rules between the IT adopters and the non-IT adopters. The main findings are as follows: Regarding the IT adopters, their rules are characterized by inflation-responsive rules fulfilling the Taylor principle. As for the non-IT adopters, Malaysia follows solely an output-gap responsive rule, and Vietnam exhibits the mixed rules. The policy implications are that for the IT adopters there might be room to make their policy-rate responses more elastic to inflation, and that for the non-IT adopters, there would be a need to adopt an explicit IT framework.

KEYWORDS

Emerging ASEAN, Fear of Floating, Generalized Method of Moments (GMM), Inflation Targeting, Monetary Policy Rules, Taylor Principle

INTRODUCTION

The monetary policy rules in emerging ASEAN economies have made great progresses since the 2000s. As a typical example, some of their economies, Indonesia, the Philippines, and Thailand, have adopted the inflation targeting (hereafter, IT) framework to control inflation, and have managed their policy interest rates for materializing the IT system. The major background of their IT adoption was that they experienced the Asian currency crisis in the late 1990s; the crisis made them switch their exchange rate regimes from a pegged one to a floating one, and there came the necessity to search for an alternative anchor for price stability instead of a pegged currency regime (see Mishkin, 2000, for instance). Another background was that emerging ASEAN economies had ever applied a monetary aggregate target before the 2000s; the monetary aggregate approach had lost its significance since the financial deregulation and innovation during the recent decades have weakened the linkage between monetary aggregate and inflation rate, thereby requiring an alternative framework for monetary policy target. Regarding the evaluations of the IT performances in emerging ASEAN economies, there have been rather less evidence due to their relatively shorter histories of its adoption and to

DOI: 10.4018/IJABIM.20210701.0a16

This article, published as an Open Access article on May 14, 2021 in the gold Open Access journal, International Journal of Asian Business and Information Management (converted to gold Open Access January 1, 2021), is distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and production in any medium, provided the author of the original work and original publication source are properly credited.

some difficulties in its management, while the IT performances in advanced countries are widely appreciated (Mishkin & Posen, 1998; Mishkin & Schmidt-Hebbel, 2007).

One of the criteria for judging a monetary policy rule's relevance is, in general, the adaptability of the "Taylor principle": for inflation to be stable, the central bank must respond to an increase in inflation with an even greater increase in the nominal interest rate (Mankiw, 2016). The Taylor principle is considered to hold in the monetary policy rules in advanced economies such as the US and Japan (Clarida & Gertler, 1997; Clarida et al., 1998a; Clarida et al., 1998b; Belke and Polleit, 2007). For emerging market economies, however, there are relatively less evidence that their policy rules fulfil the Taylor principle, although the principle would be of vital importance particularly for the adopters of the IT framework.

Another point to be noted is that the monetary policy rules of emerging market economies have happened not to work well enough to control inflation, due to the "fear of floating" suggested by Calvo and Reinhart (2002). The monetary policy independence for controlling inflation is secured only under floating exchange rate with capital mobility according to the "impossible trinity" constraint. Emerging market economies are, however, afraid of their exchange rate fluctuations due to a lack of confidence in their currency values, and thus tend to face a trade-off between keeping their monetary autonomy and managing their exchange rate.

This paper aims to examine the monetary policy rules for emerging ASEAN economies: Indonesia, the Philippines and Thailand as the IT adopters, and Malaysia and Vietnam as the non-IT adopters. This study estimates monetary policy reaction functions by using the Generalized Method of Moments (GMM) on each sample economy. The major research questions in this study are twofold: whether the monetary policy rules of the IT adopters have fulfilled the Taylor principle for controlling inflation, and what has been the difference in monetary policy rules between the IT adopters and non-IT adopters, including the reaction to the fear of floating.

The rest of the paper is structured as follows: Section 2 introduces the monetary policy frameworks in five ASEAN sample economies; Section 3 reviews the literature and clarifies this study's contributions; Section 4 conducts the GMM estimation of monetary policy rules; and the last section summarizes and concludes.

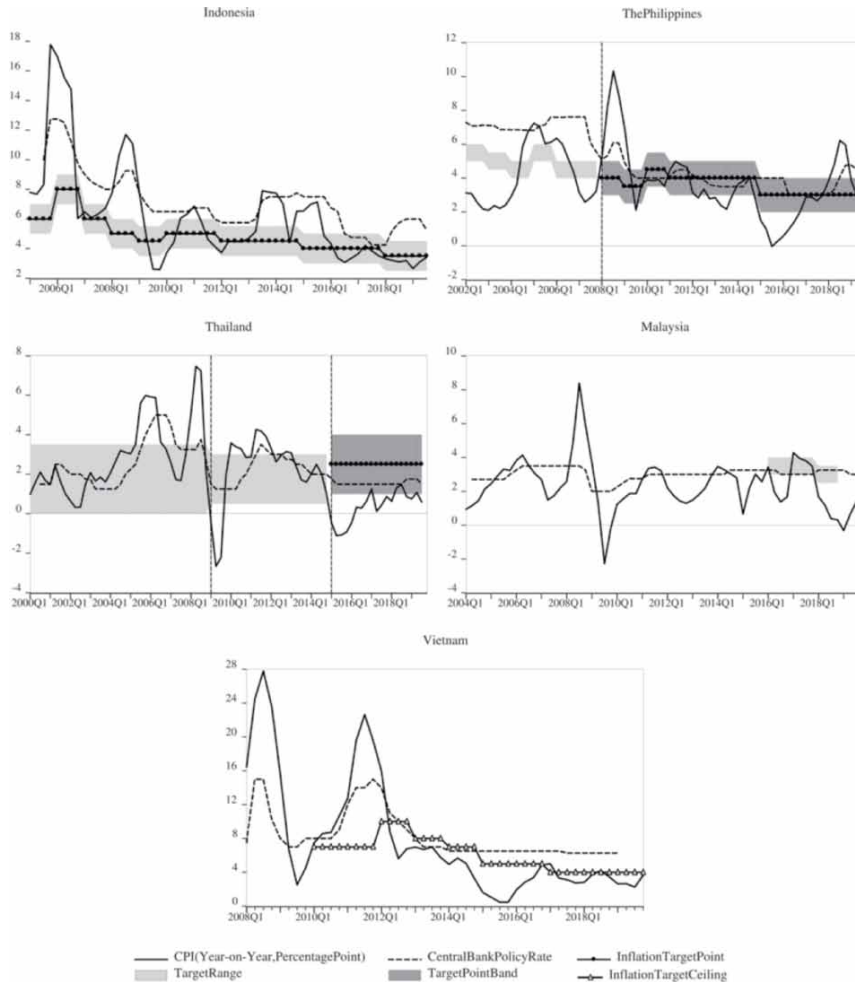
Monetary Policy Frameworks in Five ASEAN Sample Economies

This section describes the monetary policy frameworks of the five ASEAN sample countries.¹ Figure 1 displays key indicators related to the monetary policy operation: consumer prices, central bank policy rates, and inflation targeting points and bands.

The section first illustrates the IT adopters' policy frameworks: Indonesia, The Philippines and Thailand. The IT framework was introduced in Indonesia in July 2005, the Philippines in January 2002, and Thailand in May 2000, respectively. The primary objective of their central banks is "price stability" as a matter of course. Their targeted inflation settings have the following two kinds: a point target with a tolerance band in Indonesia and the Philippines (3 ± 1 percent for 2020), and a range target in Thailand (1-3 percent for 2020).² Their IT operational instrument is a policy interest rate set by the central bank: BI (Bank Indonesia) 7-day reverse repo rate, BSP (Bangko Sentral ng Pilipinas) overnight reverse repurchase rate or borrowing rate, and BOT (Bank of Thailand) 1-day bilateral repurchase rate. As for a role to manage exchange rate, the following statements are contained in the BI and BOT mandates: "Bank Indonesia also operates an exchange rate policy designed to minimize excessive rate volatility" and "the Bank of Thailand stands ready to intervene in the foreign exchange market such that volatility of the exchange rate is at a level that the economy can tolerate". According to the exchange rate arrangements published by International Monetary Fund (hereafter IMF) (2019a), on the other hand, the Philippines and Thailand are classified as "floating", whereas Indonesia as "stabilized arrangement".

Malaysia, a non-adopter of the IT framework, shows a difference from the IT adopters in the mandate of the central bank. The Bank Negara Malaysia (BNM) states as the mission in the following

Figure 1. Key Indicators on Inflation Targeting (Sources: IFS of IMF and each central bank's website (see Note 1))



way: “promoting monetary and financial system stability and fostering a sound and progressive financial sector, to achieve sustainable economic growth”. Thus, the BNM seems to prioritize “growth” in its objective, and IMF (2016) also evaluates the BNM’s mandate as emphasizing a sustainable growth over the medium-term, distinguished from inflation targeting and other regimes. The BNM’s policy instrument is the overnight policy rate similar to those of the IT adopters, and its exchange rate regime is classified as “floating” according to IMF (2019a).

Vietnam, another non-IT-adopter, has a different framework of monetary policy. Its objectives, according to the recent resolution in 2014, contain multiple mandates such as “control inflation”, “support economic growth”, “ensure the value of Vietnam dong” and so forth. For controlling inflation, the State Bank of Vietnam (SBV) has started setting “inflation ceiling” since 2010 with the operation of policy rate (refinancing interest rate). As for the exchange rate arrangement, on the other hand, Vietnam is classified as “stabilized arrangement” according to IMF (2019a). The latest version of IMF country report, IMF (2019b), pointed out: “in addition to the target inflation rate, the SBV daily announces the target foreign exchange rate vis-à-vis US dollar as an external nominal anchor”, and “there is consensus in the SBV for a shift to inflation targeting (IT)”, and recommended introducing more exchange rate flexibility for modernizing their monetary policy framework toward

the IT regime. From this evaluation, Vietnamese monetary policy appears to be in a transition process from pervasive “fear of floating” toward the IT framework.

LITERATURE REVIEW AND THIS STUDY’S CONTRIBUTIONS

This section reviews the literature related to the studies on monetary policy rules focusing on ASEAN and clarifies this study’s contributions. There are a limited number of studies targeting a group of ASEAN economies. Hsing (2009) estimated monetary policy reaction functions for Indonesia, Malaysia, the Philippines, and Thailand, and verified the existence of inflation-responsive rule in the contemporaneous manner. Taguchi and Kato (2011) and Taguchi and Sohn (2014) examined the implementation and performance of monetary policy rules in East Asian emerging market economies. With regard to ASEAN economies, they found that Indonesia and Thailand conducted inflation-responsive but backward-looking policy rules, whereas Malaysia and the Philippines did not follow inflation-responsive rules.

Regarding individual countries’ studies, Wimanda et al. (2011) showed that the inflation rate in Indonesia is significantly determined by backward-looking inflation expectations with higher weight than by forward-looking ones, although Wimanda et al. (2012) argued that the most efficient rule for Indonesia is an inflation forecast-based rule. For Malaysia’s monetary policy rule, IMF (2016) reported its significant positive reaction to output gap, but its insignificant reaction to inflation. Regarding the Philippines’s policy rule, Salas (2006) revealed that the policy rate reacted to inflation effectively enough to stabilize inflation in a forward-looking manner after the IT adoption. As for Thailand’s policy rule, Lueangwilai (2012) verified the contemporaneous rule of the policy rate responding to inflation and exchange rate movement; and McCauley (2006) and Taguchi and Wanasilp (2018) identified the inflation-responsive rule with forward-looking manner. Vietnam’s monetary policy rule has not examined specifically by a policy reaction function, although the monetary policy was studied from the administration perspective (e.g., To et al., 2012) and from the transmission mechanism (e.g., Bui and Tran, 2015).

The previous studies, in this way, reveal mixed results of monetary policy rules in terms of the policy rate’s responsiveness and the expectational (forward-looking or backward-looking) specifications, and also do not necessarily clarify the relationship between the IT adoption and the adaptability of the Taylor principle. This study’s contributions are thus summarized as follows. First, this study provides the updated evidence of monetary policy rules of emerging ASEAN economies, in particular, with a focus on the linkage between the IT adoption and the Taylor principle’s adaptability: the counter-cyclical reaction of the policy rate to inflation is a vital key factor for the IT successful performance. As mentioned in the introduction, the Taylor principle has already been identified in “advanced” countries’ monetary policy rules by several studies such as Clarida & Gertler (1997), Clarida et al. (1998a), Clarida et al. (1998b) and Belke and Polleit (2007). Thus, for advanced economies, there is no gap between a theoretical policy rule and actual policy practices. As for emerging ASEAN economies, however, there might remain the gap between the theoretical Taylor principle and actual IT practices, due to difficulties in their IT management and the lack in empirical evidence. This study contributes to filling this gap by enriching empirical evidence for emerging ASEAN economies.

Second, this study uncovers the difference in the policy rules between the IT adopters (Indonesia, the Philippines and Thailand) and non-IT adopters (Malaysia and Vietnam). In particular, it would be significant to investigate Vietnam’s monetary policy rule in a quantitative way due to a lack of the evidence in the literature.

EMPIRICAL ANALYSIS

This section conducts empirical analyses of the monetary policy rules by policy reaction functions on five sample economies. The main focus of the analyses is how the announced monetary policies

(shown in Section 2) are linked with the estimated policy rules in individual economies, in particular, from the perspective of the adaptability of the Taylor principle under the IT framework. The section first clarifies the data and methodology, and then presents estimation results and their interpretations.

Variables and Data

The policy reaction function contains the following four variables: central bank policy rate (denoted by *por*), consumer prices (*cpi*), output gap (*gap*) and exchange rate (*exr*). The consumer prices are seasonally adjusted and expressed as the year-on-year percentage change; the output gap is expressed as the deviation of volume index of seasonally-adjusted Gross domestic Product (GDP) from the potential GDP generated by Hodrick-Prescott filter of the same series; and exchange rate is expressed as the year-on-year percentage change of domestic currency per U.S. dollar in period average. The data for the variables are in quarterly frequency, and retrieved from the International Financial Statistics (IFS) of the IMF.³ The sample periods basically target the adoption periods of policy rate and inflation targeting, and are also limited by the data availabilities. To be specific, the time-series of sample data are ranged as follows: from 2005q3 (the third quarter of 2005) to 2018q3 in Indonesia, from 2002 q1 to 2018q4 in the Philippines, from 2000q3 to 2019q2 in Thailand, from 2004q2 to 2018q4 in Malaysia, and 2008q1 to 2019q1 in Vietnam.

Monetary Policy Reaction Function

The monetary policy reaction function is renowned for its widely application in analyzing or describing the monetary policy rule practiced by the central bank. Its standard specification is that a central bank adjusts the nominal policy interest rate in response to the gaps between expected inflation and output, and their respective targets. The function originated from so-called Taylor rule. Taylor (1993) showed that the average reaction of the Federal Reserve to US inflation and output gap could be captured by the following simple equation:

$$r = p + 0.5y + 0.5(p - 2) + 2$$

where *r* is the federal funds rate, *p* is inflation rate, and *y* is output gap. The rule has the feature that the federal funds rate rises if inflation rate increases above a target of 2 percent or if real GDP rises above trend GDP. If both inflation rate and real GDP are on target, then the federal funds rate would equal 4 percent, or 2 percent in real term that can be interpreted as the neutral level of real interest rate.

The policy reaction function could be interpreted as a more generalized rule of the Taylor rule - the simple backward-looking reaction function. Before the function is specified later on, the following points are worth noting on designing the function. The first point is the adaptability of the Taylor principle: for inflation to be stable, the central bank must respond to an increase in inflation with an even greater increase in the nominal interest rate (Mankiw, 2016). When there is an increase in inflation, if the nominal interest rate does not rise enough, the real interest rate would decline; it reduces the cost of borrowing, and thus increases the demand of output beyond the natural level; and the higher demand of output would then pressure firms to set higher prices, which leads to higher actual inflation afterwards. After all, the economy finds itself in a vicious circle of ever-higher inflation and expected inflation. Inflation spirals out of control. In the aforementioned Taylor rule, a 1-percentage-point increase in inflation *p* induces an increase in the nominal interest rate *r* by $1 + 0.5 = 1.5$ percentage points, and thus whenever inflation increases, the central bank raises the nominal interest rate by an even larger amount.

Second, the policy reaction function demonstrates a “forward-looking” rule as well as a backward-looking one like the Taylor rule. The forward-looking manner means that a central bank reacts to not

a lagged inflation but an expected one. The forward-looking estimation originated from Clarida et al. (1998a and 1998b) and Mehra (1999). They predicted the behavior of the federal funds rate, and found that the US Fed pursued a forward-looking rule, responding to anticipated inflation as opposed to lagged inflation. Since then, the forward-looking specification has been applied in general to the analyses of monetary policy rules in both advanced and emerging-market countries, though some of the emerging-market country might follow backward-looking rules due to the difficulties of their IT management as argued by Eichengreen (2002).

Third, the policy reaction function often considers the reaction to exchange rate movements, in particular, when the monetary policy rules in emerging market economies are analyzed. Emerging market economies have the problem of a “fear of floating”, as suggested by Calvo and Reinhart (2002). They argued that although a developing country announced “floating” in its exchange rate regime, it would hold soft-pegging or managed-floating in practice, due to a lack of confidence in its currency value. The IT could work well only if the independency of monetary policy is secured under floating exchange rate with capital mobility under the “impossible trinity” constraint, and thus emerging market economies tend to face a trade-off between a fear of floating and the IT management.

Estimation Methodology

This study basically applies the methodology of Clarida et al. (1998b), and modifies it following this study’s analytical concerns. The original form of the policy reaction function presented by Clarida et al. (1998b) is shown as the following equation (1):

$$r_t^* = \bar{r} + \beta \left(E[\pi_{t+n} | \Omega_t] - \pi^* \right) + \gamma \left(E[y_t | \Omega_t] - y_t^* \right) \quad (1)$$

where \bar{r} is the long run equilibrium nominal rate, π_{t+1} is the rate of inflation between periods t and $t+n$. y_t is real output, π^* and y_t^* are respective bliss points for inflation and output (y_t^* is given by the potential output), E is the expectation operator, and Ω_t is the information available to the central bank at the time it sets interest rates.

Rearranging the equation (1), the implied target of the ex-ante real interest rate is also presented as follows:

$$rr_t^* = \overline{rr} + (\beta - 1) \left(E[\pi_{t+n} | \Omega_t] - \pi^* \right) + \gamma \left(E[y_t | \Omega_t] - y_t^* \right) \quad (2)$$

where \overline{rr} represents the long run equilibrium of the real interest rate. This equation shows that the target real rate adjusts in response to deviations of either expected inflation or output from their desired targets. Clarida et al. (1998b) herein emphasized that the parameter β provides an important yardstick for evaluating a central bank’s policy rule: if the magnitude β is more than unity, the target real rate adjusts to stabilize the inflation, whereas if it is less than unity, the target real rate moves to accommodate changes in inflation instead. This condition on the magnitude β is just the aforementioned “Taylor principle”.

The equation (1) can be rewritten for an empirical specification. Since the equation (1) does not capture the practice of “smoothing” changes in interest rates of the central bank, the parameter ρ ($0 < \rho < 1$), the degree of interest rate smoothing, is added with the assumption that the actual policy rate partially adjusts to the target. The estimable specification also eliminates the unobserved forecast variables from the expression by rewriting the equation in terms of realized variables, and reorganizes

it by adding the exchange rate terms due to the aforementioned “fear of floating” problem and a linear combination of forecast errors of inflation and output, ε :

$$por_t = (1 - \rho) * \alpha + (1 - \rho) * \beta * cpi_{t+n} + (1 - \rho) * \gamma * gap_t + (1 - \rho) * \delta * exr_t + \rho * por_{t-1} + \varepsilon_t \quad (3)$$

where por , cpi , gap , and exr are the variables defined in the previous section and are applied for the empirical specification reorganized from the equation (1). In this equation, the subscript n of cpi_{t+n} could take positive values: 1, 2, 3 and 4 as a forward-looking specification in the inflation responsiveness, and zero and negative values: 0, -1, -2 and -3 as a backward-looking one.

For the technique to estimate the parameter vector $[\alpha, \beta, \gamma, \delta, \rho]$, the study adopts the generalized method of moments (GMM). One of the assumptions required for regression analysis is that the explanatory variables are uncorrelated with the disturbance term. In the case that the equation contains endogenously determined variables as explanatory ones, however, the assumption is violated, and the estimator of ordinary least squares is biased and inconsistent. The case could be applied to the estimation Equations (3) in this study since the policy interest rate might also affect the explanatory variables. The standard approach to eliminate the effect of variable and residual correlation is to estimate the equation using “instrumental variables” regression. In this context, the GMM estimator is excellent in terms of consistency, asymptotic normality, and efficiency in its property, and has been widely used since the seminal works such as Hansen (1982) applied the estimator to their empirical works. Thus, this study adopts the GMM estimator and equips the instrumental variables of one- and two-quarter lagged values of cpi , gap , and exr . For confirming the validity of instrumental variable estimators, Table 11 reports the J-statistics. The estimated J-statistics implies that these instrumental variables are valid in the sense that the over-identifying restrictions cannot be rejected, except for the case of cpi_{t+4} in Thailand.

Estimation Results

This section discusses the results of the policy reaction function estimations. Tables 1-10 reports the estimation results of Indonesia, the Philippines, Thailand, Malaysia, and Vietnam by forward-looking and backward-looking specifications, and Table 11 summarizes them. In each category of Tables 1-10, the upper section reports the short-term coefficients, and based on those coefficients, the lower section calculates the long-term coefficients. Some of the long-term coefficients are blanked with the degree of smoothing ρ being unexpectedly over unity. The results with the long-term coefficients are summarized as follows.

Focusing on the IT-adapters, Indonesia, the Philippines, and Thailand, it is worth noting that the inflation-responses satisfying the Taylor principle are significantly identified in all three countries regardless of their different specifications: the cases of π_{t+2} in Indonesia ($\beta=1.909$), π_{t-2} in the Philippines ($\beta=1.316$) and π_{t+1} in Thailand ($\beta=1.145$). The responses to output gap are, on the other hand, not significant in majority cases except a few Thailand cases. The significant reactions to exchange rate are found in the case of π_{t+2} in Indonesia and π_{t+1} in Thailand.

Malaysia exhibits a clear contract with the IT-adapters in the policy reactions: the responses to output gap are significant in her majority cases, whereas the ones to inflation (and exchange rate) are not significant in any cases.

Vietnam shows a mixed result in the reactions to inflation and exchange rate: the Taylor principle on the response to inflation is confirmed in the π_{t+3} case ($\beta=1.565$), and at the same time the reactions to exchange rate are also verified in majority cases.

Table 1. Estimation Results of Policy Reaction Function [Indonesia]

Forward-looking	cpi_{t+1}	cpi_{t+2}	cpi_{t+3}	cpi_{t+4}
$(1 - \rho)\alpha$	1.136***	-0.476	-1.507**	-1.916**
	(3.125)	(-1.129)	(-2.629)	(-2.138)
$(1 - \rho)\beta$	0.314***	0.189**	0.075	0.081
	(7.699)	(2.626)	(1.038)	(0.716)
$(1 - \rho)\gamma$	-0.394**	0.159	0.570*	0.681**
	(-2.129)	(0.558)	(1.752)	(2.077)
$(1 - \rho)\delta$	0.007	0.014*	0.012	0.012
	(1.001)	(1.769)	(0.792)	(0.649)
	0.567***	0.901***	1.145***	1.200***
	(7.472)	(8.919)	(14.861)	(16.139)
J-statistics	1.126	1.180	1.237	1.135
	(0.570)	(0.554)	(0.539)	(0.567)
Long-term Coefficients				
	2.624***	-4.808	-	-
	0.725***	1.909**	-	-
	-0.910**	1.606	-	-
	0.016	0.141*	-	-

Discussions

The followings are the discussions on how to interpret the estimations above in relation to the official monetary policy stances of sample countries in Section 2, and to the previous studies presented in Section 3.

The estimation result on the IT adopters reveals that their monetary policies are characterized by inflation-responsive rules fulfilling the Taylor principle, with a forward-looking manner in Indonesia and Thailand and with a backward-looking way in the Philippines. This result is consistent with the IT adopters' primary objective, price stability. Compared with the previous studies, there are several differences in estimation outcomes on the policy rates' reaction to inflation: for Indonesia, a forward-looking rule in this study vs. a backward-looking rule in Hsing (2009), Taguchi and Kato (2011) and Wimanda et al. (2011); for the Philippines, a backward-looking rule in this study vs. no inflation-responsive rule in Taguchi and Kato (2011) and a forward-looking rule in Salas (2006); and for Thailand, a forward-looking rule in this study vs. a backward-looking rule in Hsing (2009), Taguchi and Kato (2011), Taguchi and Sohn (2014) and Lueangwilai (2012). These differences might come from the differences in sample periods between this study and the previous studies: the updated samples in this study might reflect the recent progresses in the IT management and operation except for the study of Salas (2006). The significant responses to exchange rate in Indonesia and Thailand,

Table 2.

Backward-looking	cpi_t	cpi_{t-1}	cpi_{t-2}	cpi_{t-3}
$(1-\rho)\alpha$	1.428***	1.628	1.189	-0.764
	(3.006)	(1.675)	(1.331)	(-0.825)
$(1-\rho)\beta$	0.209***	0.156	0.027	-0.180*
	(4.437)	(1.473)	(0.297)	(-2.29)
$(1-\rho)\gamma$	-0.108	0.082	0.241	0.224
	(-0.467)	(0.287)	(1.033)	(0.858)
$(1-\rho)\delta$	0.008	0.008	0.009	0.012*
	(1.046)	(0.908)	(1.517)	(2.333)
	0.609***	0.618***	0.783***	1.247***
	(6.301)	(2.814)	(3.917)	(6.288)
J-statistics	2.313	2.899	2.796	1.650
	(0.315)	(0.235)	(0.247)	(0.438)
Long-term Coefficients				
	3.652***	4.262	5.479	-
	0.535***	0.408	0.124	-
	-0.276	0.215	1.111	-
	0.020	0.021	0.055	-

confirmed in this study, seem to be in line with their police stances of the interventions in foreign exchange market to avoid excessive rate volatilities, in particular, with the “stabilized arrangement” in Indonesia. These “fear of floating” effects, however, have a limited effect on monetary policy independence, just because the Taylor principle still holds even under the reactions to exchange rate volatilities.

Regarding Malaysia as a non-IT adopter, this study’s estimation result of output-gap responsive rules is clearly consistent with the central bank’s policy stance to prioritize an economic growth and the quantitative evaluation by IMF (2016). As for Vietnam as another non-IT adopter, the mixed result in the reactions to inflation and exchange rate might reflect the current transition process of the monetary policy framework: the central bank has set an inflation ceiling while keeping the “stabilized arrangement” as exchange rate management and is preparing for the IT adoption by raising exchange rate flexibility, according to IMF (2019b).

Another point to be discussed is a comparison in the degree of policy rate reaction to inflation between emerging ASEAN economies’ policy rules and those of advanced economies. This study obtained the inflation-responsive coefficients: 1.909 in Indonesia, 1.316 in the Philippines, 1.145 in Thailand, and 1.565 in Vietnam. On the other hand, the coefficients are, for instance, 2.27-2.57 in the United States (Belke and Polleit, 2007), and 2.04 in Japan (Clarida et al., 1998b). Thus, although

Table 3. [The Philippines]

Forward-looking	cpi_{t+1}	cpi_{t+2}	cpi_{t+3}	cpi_{t+4}
$(1 - \rho)\alpha$	-0.814	-1.449**	-0.534	-0.162
	(-1.661)	(-2.262)	(-0.770)	(-0.385)
$(1 - \rho)\beta$	0.071	0.001	-0.079	-0.064*
	(1.228)	(0.015)	(-1.663)	(-1.695)
$(1 - \rho)\gamma$	-0.058	0.197	0.266	0.175
	(-0.237)	(0.676)	(1.064)	(1.192)
$(1 - \rho)\delta$	0.036	0.061*	0.031	0.023
	(1.370)	(1.866)	(0.923)	(1.008)
	1.099***	1.257***	1.148***	1.071***
	(10.508)	(12.313)	(8.565)	(11.269)
J-statistics	0.037	1.529	3.376	2.779
	(0.982)	(0.466)	(0.184)	(0.249)
Long-term Coefficients				
	-	-	-	-
	-	-	-	-
	-	-	-	-
	-	-	-	-

emerging ASEAN economies' policy rules fulfil the Taylor principle, their policy rate reactions to inflation are less elastic than those of advanced economies.

The policy implications derived from the estimation outcomes are summarized as follows. First, in the IT adopters, their policy-rate reactions have an effect to stabilize inflation under the Taylor principle, but there might be room to make their reactions more elastic to inflation, compared with those of advanced economies. Second, the Philippines has still stayed at a backward-looking manner in its policy rule. Thus, there would be a policy space to transform it into a forward-looking rule, since the forward-looking rule makes it easier for private agents to form their expectations, consistent with the targeted inflation by sharing reliable inflation-forecasting information presented by the central bank. Third, for the non-IT adopters, it can be recommended that they adopt an explicit IT framework to ensure a robust effect of policy rate on stabilizing inflation. Vietnam, though its policy rule has already satisfied the Taylor principle, can improve elasticity of policy rate to inflation together with raising exchange rate flexibility under an explicit IT management.

CONCLUSION

This paper examined the monetary policy rules for five emerging ASEAN economies: Indonesia, the Philippines and Thailand as the IT adopters, and Malaysia and Vietnam as the non-IT adopters.

Table 4.

Backward-looking	cpi_t	cpi_{t-1}	cpi_{t-2}	cpi_{t-3}
$(1-\rho)\alpha$	-0.688	-0.494	0.079	-0.044
	(-1.226)	(-1.187)	(0.204)	(-0.086)
$(1-\rho)\beta$	0.057	0.071*	0.129***	0.101**
	(1.152)	(1.849)	(2.930)	(2.220)
$(1-\rho)\gamma$	-0.021	-0.014	-0.088	0.064
	(-0.101)	(-0.090)	(-0.724)	(0.576)
$(1-\rho)\delta$	0.033	0.030	0.016	0.027
	(1.197)	(1.483)	(0.831)	(1.184)
	1.086***	1.041***	0.902***	0.939***
	(8.921)	(11.412)	(9.596)	(7.790)
J-statistics	0.091	0.039	0.940	0.397
	(0.956)	(0.981)	(0.625)	(0.819)
Long-term Coefficients				
	-	-	0.806	-0.721
	-	-	1.316***	1.656**
	-	-	-0.898	1.049
	-	-	0.163	0.442

The major research questions in this study were twofold: whether the monetary policy rules of the IT adopters have fulfilled the Taylor principle for controlling inflation, and what has been the difference in monetary policy rules between the IT adopters and the non-IT adopters, including the reaction to the fear of floating.

The main findings from an empirical study are summarized as follows. Regarding the IT adopters, their monetary policy rules are characterized by inflation-responsive rules fulfilling the Taylor principle, with a forward-looking manner in Indonesia and Thailand and with a backward-looking way in the Philippines. The “fear of floating” effects, identified in Indonesia and Thailand, seem to have no serious repercussions on their monetary policy independence. As for the non-IT adopters, Malaysia follows solely an output-gap responsive rule, which is consistent with the central bank’s policy stance to prioritize an economic growth; and Vietnam exhibits the mixed rules of inflation- and exchange rate- responsive ones, which might reflect the transition process from pervasive “fear of floating” toward the IT framework.

The policy implications derived from the estimation outcomes are that for the IT adopters there might be room to make their policy-rate responses more elastic to inflation, based on a comparison with those of advanced economies; and that for the non-IT adopters there would be a need to adopt an explicit IT framework to ensure a robust effect of policy rate on stabilizing inflation.

Table 5. [Thailand]

Forward-looking	cpi_{t+1}	cpi_{t+2}	cpi_{t+3}	cpi_{t+4}
$(1-\rho)\alpha$	-0.031	-0.342	-0.338	0.386
	(-0.214)	(-1.480)	(-1.043)	(1.066)
$(1-\rho)\beta$	0.133***	0.072*	0.058	-0.013
	(3.901)	(1.793)	(1.570)	(-0.416)
$(1-\rho)\gamma$	0.012	0.030	0.078	0.160**
	(0.276)	(0.336)	(0.829)	(1.996)
$(1-\rho)\delta$	0.016**	0.013	0.013	0.009
	(2.200)	(1.098)	(1.164)	(0.667)
	0.906***	1.113***	1.128***	0.820***
	(12.177)	(11.887)	(8.328)	(5.223)
J-statistics	1.265	1.857	2.332	5.942*
	(0.531)	(0.395)	(0.312)	(0.051)
Long-term Coefficients				
	-0.330	-	-	2.14
	1.145***	-	-	-0.072
	0.128	-	-	0.889**
	0.170**	-	-	0.05

The limitation of this study and the future scope of works are as follows. First, the study needs more in-depth analyses of selected individual economies (i.e., case studies). Reviewing and comparing the economies using different monetary policies and investigating the antecedents and outcomes due to the differences would contribute to enriching the evidence and justifying the policy implications. Second, this study depends on a single monetary policy reaction function for the analysis and lacks macroeconomic foundation. To check the consistency of monetary policy rules with macroeconomic frameworks, the study can be further developed and extended, for instance, to applying a New Keynesian dynamic stochastic general equilibrium model. It would contribute to providing a more comprehensive perspective for reviewing monetary policy rules.

Table 6.

Backward-looking	cpi_t	cpi_{t-1}	cpi_{t-2}	cpi_{t-3}
$(1 - \rho)\alpha$	0.120	0.160	0.343***	0.653***
	(0.578)	(1.159)	(2.789)	(3.155)
$(1 - \rho)\beta$	0.097***	0.034	0.059	0.099**
	(2.660)	(0.963)	(1.137)	(2.328)
$(1 - \rho)\gamma$	0.008	0.055	0.100**	0.192**
	(0.206)	(1.022)	(2.195)	(2.481)
$(1 - \rho)\delta$	0.010	0.006	0.007	0.012
	(1.357)	(0.740)	(0.818)	(5.044)
	0.865***	0.902***	0.797***	0.632***
	(7.334)	(13.075)	(9.326)	(5.044)
J-statistics	1.785	1.991	1.615	0.058
	(0.410)	(0.369)	(0.446)	(0.972)
Long-term Coefficients				
	0.889	1.633	0.14***	1.774***
	0.719***	0.374	0.291	0.269**
	0.059	0.516	0.493**	0.522**
	0.074	0.061	0.034	0.033

Table 7. [Malaysia]

Forward-looking	cpi_{t+1}	cpi_{t+2}	cpi_{t+3}	cpi_{t+4}
$(1 - \rho)\alpha$	0.562	0.820	0.860	0.852*
	(1.570)	(1.672)	(1.940)	(1.865)
$(1 - \rho)\beta$	0.012	-0.010	0.003	-0.007
	(0.541)	(-0.436)	(0.107)	(-0.532)
$(1 - \rho)\gamma$	0.050	0.085*	0.088***	0.081**
	(1.233)	(1.842)	(2.770)	(2.324)
$(1 - \rho)\delta$	-0.004	-0.003	-0.004	-0.004
	(-1.031)	(-1.052)	(-1.162)	(-1.147)
	0.809***	0.736***	0.714***	0.726***
	(6.994)	(4.840)	(5.206)	(4.926)
J-statistics	3.373	3.434	2.194	2.204
	(0.185)	(0.180)	(0.334)	(0.332)
Long-term Coefficients				
	2.942	3.106	3.007	3.109*
	0.063	-0.038	0.010	-0.026
	0.262	0.322*	0.308***	0.296**
	-0.021	0.011	-0.014	-0.015

Table 8.

Backward-looking	cpi_t	cpi_{t-1}	cpi_{t-2}	cpi_{t-3}
$(1-\rho)\alpha$	1.077**	0.494	1.072**	0.964**
	(2.197)	(0.729)	(2.032)	(2.167)
$(1-\rho)\beta$	0.033	-0.056	0.018	0.001
	(1.230)	(-0.722)	(0.632)	(0.036)
$(1-\rho)\gamma$	0.090**	0.606	0.102*	0.087*
	(2.122)	(1.277)	(1.922)	(1.990)
$(1-\rho)\delta$	-0.003	-0.003	-0.004	-0.003
	(-0.770)	(-1.150)	(-1.172)	(-1.004)
	0.618***	0.887***	0.635***	0.688***
	(3.499)	(3.124)	(3.239)	(4.340)
J-statistics	1.898	2.099	2.684	3.087
	(0.387)	(0.350)	(0.261)	(0.214)
Long-term Coefficients				
	2.819**	4.372	2.937**	3.080**
	0.086	-0.496	0.049	0.003
	0.236**	5.363	0.279*	0.279*
	-0.008	-0.027	-0.011	-0.010

Table 9. [Vietnam]

Forward-looking	cpi_{t+1}	cpi_{t+2}	cpi_{t+3}	cpi_{t+4}
$(1-\rho)\alpha$	1.089	0.746	-0.299	-1.698
	(1.093)	(1.145)	(-0.336)	(-0.835)
$(1-\rho)\beta$	0.116**	0.146**	0.133**	0.106
	(2.039)	(2.691)	(2.113)	(0.824)
$(1-\rho)\gamma$	-0.000	-0.002	-0.002	0.000
	(-0.119)	(-0.709)	(-0.395)	(0.041)
$(1-\rho)\delta$	0.133**	0.076	0.002	-0.065
	(2.054)	(0.752)	(0.016)	(-0.285)
	0.718***	0.756***	0.915***	1.123***
	(4.286)	(7.670)	(7.496)	(4.570)
J-statistics	5.653	2.962	0.649	0.605
	(0.059)	(0.227)	(0.723)	(0.739)
Long-term Coefficients				
	3.862	3.057	-3.518	-
	0.411**	0.598**	1.565**	-
	-0.001	-0.008	-0.023	-
	0.472**	0.311	0.024	-

Table 10.

Backward-looking	cpi_t	cpi_{t-1}	cpi_{t-2}	cpi_{t-3}
$(1-\rho)\alpha$	0.627	-1.721	-0.204	0.392
	(0.596)	(-1.065)	(-0.198)	(0.429)
$(1-\rho)\beta$	-0.017	-0.237***	-0.100***	-0.037**
	(-0.228)	(-2.793)	(-2.877)	(2.210)
$(1-\rho)\gamma$	-0.003	-0.005	-0.003	-0.003
	(-1.029)	(-0.753)	(-0.711)	(-1.127)
$(1-\rho)\delta$	0.206***	0.261***	0.186***	0.156**
	(3.080)	(3.346)	(2.441)	(2.086)
	0.845***	1.293***	1.028***	0.914***
	(4.605)	(4.646)	(5.612)	(5.646)
J-statistics	2.126	1.221	0.803	0.874
	(0.345)	(0.543)	(0.669)	(0.646)
Long-term Coefficients				
	4.045	-	-	4.558
	-0.110	-	-	-0.430**
	-0.019	-	-	-0.035
	1.329***	-	-	1.814**

Note: ***, **, * denote the rejection of null hypothesis at the 99%, 95% and 90% level of significance. The numbers in parentheses are t-values, except that those in J-statistics are their probabilities. Sources: IFS of IMF and author's estimation.

Table 11. Summary of Estimation Results

		Coefficient of Inflation β				
		Indonesia	Philippines	Thailand	Malaysia	Vietnam
Forward-looking	cpi_{t-4}	-	-	not sig.	not sig.	-
	cpi_{t-3}	-	-	-	not sig.	** >1
	cpi_{t-2}	** >1	-	-	not sig.	** <1
	cpi_{t-1}	*** <1	-	*** >1	not sig.	** <1
Backward-looking	cpi_t	*** <1	-	*** <1	not sig.	not sig.
	cpi_{t-1}	not sig.	-	not sig.	not sig.	-
	cpi_{t-2}	not sig.	*** >1	not sig.	not sig.	-
	cpi_{t-3}	-	** >1	** <1	not sig.	** <1
		Coefficient of Output Gap γ				
		Indonesia	Philippines	Thailand	Malaysia	Vietnam
Forward-looking	cpi_{t-4}	-	-	***	**	-
	cpi_{t-3}	-	-	-	***	not sig.
	cpi_{t-2}	not sig.	-	-	*	not sig.
	cpi_{t-1}	** neg.	-	not sig.	not sig.	not sig.
Backward-looking	cpi_t	not sig.	-	not sig.	**	not sig.
	cpi_{t-1}	not sig.	-	not sig.	not sig.	-
	cpi_{t-2}	not sig.	not sig.	**	*	-
	cpi_{t-3}	-	not sig.	**	*	not sig.
		Coefficient of Exchange Rate δ				
		Indonesia	Philippines	Thailand	Malaysia	Vietnam
Forward-looking	cpi_{t-4}	-	-	not sig.	not sig.	-
	cpi_{t-3}	-	-	-	not sig.	not sig.
	cpi_{t-2}	*	-	-	not sig.	not sig.
	cpi_{t-1}	not sig.	-	**	not sig.	**
Backward-looking	cpi_t	not sig.	-	not sig.	not sig.	***
	cpi_{t-1}	not sig.	-	not sig.	not sig.	-
	cpi_{t-2}	not sig.	not sig.	not sig.	not sig.	-
	cpi_{t-3}	-	not sig.	not sig.	not sig.	**

Note: ***, **, * denote the rejection of null hypothesis at the 99%, 95% and 90% level of significance in the coefficients; "not sig." means that the coefficients are not significant; and "neg." means that the coefficient is unexpectedly negative. ">1" and "<1" mean that the coefficients' magnitudes are more or less than unity, implying whether the Taylor principle is fulfilled or not. Sources: Author's estimation.

REFERENCES

- Belke, A., & Polleit, T. (2007). How the ECB and the US Fed set interest rates. *Applied Economics*, 39(17), 2197–2209. doi:10.1080/00036840600749623
- Bui, V. H., & Tran, T. M. T. (2015). *The Transmission Mechanism of Monetary Policy in Vietnam: A VAR Approach*. IHEID Working Papers, No. 15-2015.
- Calvo, G. A., & Reinhart, C. (2002). Fear of floating. *The Quarterly Journal of Economics*, 117(2), 379–408. doi:10.1162/003355302753650274
- Clarida, R., Gali, J., & Gertler, M. (1998a). *Monetary policy rules and macroeconomic stability: Theory and some evidence*. NBER Working Paper Series, No. 6442.
- Clarida, R., Gali, J., & Gertler, M. (1998b). Monetary policy rules in practice: Some international evidence. *European Economic Review*, 42(6), 1033–1067. doi:10.1016/S0014-2921(98)00016-6
- Clarida, R., & Gertler, M. (1997). How the Bundesbank conducts monetary policy. In *Reducing inflation*. University of Chicago Press.
- Eichengreen, B. (2002). *Can emerging markets float? Should they inflation target?* Working Paper (Banco Central do Brazil), No. 36.
- Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. *Econometrica*, 50(4), 1029–1054. doi:10.2307/1912775
- Hsing, Y. (2009). Is the monetary policy rule responsive to exchange rate changes? The case of Indonesia, Malaysia, the Philippines, and Thailand. *International Review of Economics*, 56(2), 123–132. doi:10.1007/s12232-008-0058-1
- International Monetary Fund. (2016). *Malaysia: Staff Report for the 2016 Article IV Consultation*. IMF Country Report, No. 16/110.
- International Monetary Fund. (2019a). *Annual Report on Exchange Arrangements and Exchange Restrictions 2018*. IMF.
- International Monetary Fund. (2019b). *Vietnam: Staff Report for the 2019 Article IV Consultation*. IMF Country Report, No. 19/235.
- Lueangwilai, K. (2012). Monetary policy rules and exchange rate uncertainty: A structural investigation in Thailand. *Procedia Economics and Finance*, 2, 325–334. doi:10.1016/S2212-5671(12)00094-9
- Mankiw, N. G. (2016). *Macroeconomics* (9th ed.). Worth Publishers.
- McCauley, R. (2006). Understanding monetary policy in Malaysia and Thailand: objectives, instruments and independence. In *Monetary Policy in Asia: Approaches and Implementation*. Bank for International Settlements.
- Mehra, Y. P. (1999). A Forward-Looking Monetary Policy Reaction Function. *Economic Quarterly*, 85(2), 33–53.
- Mishkin, F. S. (2000). Inflation targeting in emerging market countries. *The American Economic Review*, 90(2), 105–109. doi:10.1257/aer.90.2.105
- Mishkin, F. S., & Posen, A. S. (1998). *Inflation targeting: Lessons from four countries*. NBER Working Paper Series, No. 6126.
- Mishkin, F. S., & Schmidt-Hebbel, K. (2007). *Does inflation targeting make a difference?* NBER Working Paper Series, No. 12876.
- Salas, J. M. I. S. (2006). The Philippine Central Bank's Monetary Policy Reaction Function from 1992 to 2003. *The Philippine Review of Economics*, 43(2), 1–26.
- Taguchi, H., & Kato, C. (2011). Assessing the performance of inflation targeting in East Asian economies. *Asian-Pacific Economic Literature*, 25(1), 93–102. doi:10.1111/j.1467-8411.2011.01277.x
- Taguchi, H., & Sohn, W. K. (2014). Inflation Targeting and the Pass-through Rate in East Asian Economies. *Asian Economic Journal*, 28(2), 139–159. doi:10.1111/asej.12029

Taguchi, H., & Wanasilp, M. (2018). Monetary Policy Rule and its Performance under Inflation Targeting in Thailand. *Asian Journal of Economics and Empirical Research*, 5(1), 19–28. doi:10.20448/journal.501.2018.51.19.28

Taylor, J. B. (1993). Discretion versus policy rules practice. *Carnegie-Rochester Conference on Public Policy*, 39, 195-214.

To, T. A. D., Bui, Q. T., Pham, S. A., Duong, T. T. B., & Tran, T. K. C. (2012). *Inflation Targeting and Implications for Monetary Policy Framework in Vietnam*. Knowledge Publishing House.

Wimanda, R. E., Turner, P. M., & Hall, M. J. B. (2011). Expectations and the inertia of inflation: The case of Indonesia. *Journal of Policy Modeling*, 33(3), 426–438. doi:10.1016/j.jpolmod.2010.08.009

Wimanda, R. E., Turner, P. M., & Hall, M. J. B. (2012). Monetary policy rules for Indonesia: Which type is the most efficient? *Journal of Economic Studies (Glasgow, Scotland)*, 39(4), 469–484. doi:10.1108/01443581211255666

ENDNOTES

- ¹ Except for the text sentences with specific references, the description in this section is based on the website of each country's central bank: <https://www.bi.go.id/en/Default.aspx> for Bank Indonesia (BI); <https://www.bsp.gov.ph/index.asp> for The Bangko Sentral ng Pilipinas (BSP); <https://www.bot.or.th/English/Pages/default.aspx> for Bank of Thailand (BOT); <https://www.bnm.gov.my/> for Bank Negara Malaysia (BNM); <https://www.sbv.gov.vn/> for the State Bank of Vietnam (SBV).
- ² The Philippines changed her targeted inflation from a range target to a point target with a band from 2006, and Thailand, once she had changed it form a range target to a point target in 2015, let it come back again to a range target from 2020. The Philippines changed her targeted inflation from a range target to a point target with a band from 2006, and Thailand, once she had changed it form a range target to a point target in 2015, let it come back again to a range target from 2020.
- ³ For Vietnam, the study uses the data of industrial production instead of GDP, since the quarterly GDP is not available there. The industrial production is retrieved from the General Statistics Office of Vietnam.

Mesa Wanasilp received her Bachelor's degree in Economics from Chulalongkorn University in Thailand in 2015, and later earned her Master's degree in Japanese and Asian Economy and Management from Saitama University in Japan in 2018. Currently, she is a Japanese government scholarship (MEXT) doctoral student at Saitama University. Her main interest is on monetary policies in emerging ASEAN economies.