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Monetary policy framework changes and the money demand function

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Abstract. This paper investigates whether the monetary policy framework has changed since the introduction of inflation targeting in Thailand. We analyze the changes in the model of monetary policy and estimate its effects by estimating the demand function for money. We obtain four results from our analysis. First, changes in the monetary policy framework did not change the model of the money demand function. Second, the adoption of inflation targeting policy leads to structural changes. Third, the effects of monetary policy changed with the adoption of inflation targeting policy. Interest rate elasticity is positive before the framework change but negative after the policy change. However, its value is weak. Fourth, the interest rate elasticities of M2 and r are stable and predictable. This is important because the domestic interest rate, not the exchange rate or the foreign interest rate, controls monetary policy. It can also be applied with the same money demand function as in advanced economies.
Keywords. Monetary policy; Inflation targeting; Fully modified least square; Stability test.
JEL. E50; E51; E52; E41.

1. Introduction

The aim of this paper is to investigate whether a change of the monetary policy framework—such as the adoption of an inflation targeting policy—changes the effect of monetary policy. After the financial crisis in Thailand in 2000, the Bank of Thailand adopted just such an inflation-targeting policy that attempts to manage interest rates.

This paper tests and verifies two hypothesis: First, I investigate whether the model of the money demand function changes from one of a developing country to the one of a developed country with the adoption of an inflation targeting policy. I find that a monetary policy framework does indeed change the model of the money demand function. Second, I test the effect of monetary policy changes through changes to the monetary policy framework. I estimate interest rate elasticity to investigate the effect of monetary policy.

This paper aims to investigate whether and how a monetary policy framework change affects the model and the effect of monetary policy.

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2. Literature Review

This section reviews findings from the previous literature. If an equilibrium relationship is observed with the money demand function, financial authorities can achieve a reasonable inflation rate by changing the money supply. The inflation rate is predictive. In this paper, I look at variables that influence the money demand by analyzing the money demand function.

Since the 1980s, many previous reviews have analyzed the question of whether money demand and money supply is consistent (Boughton, 1990). If it is not consistent, the economy can become unstable and the effect of monetary policy yields unpredictable results. If the variables of the money demand function (such as income, money demand, and interest rate) exhibit cointegration, this means that money demand and money supply are consistent. Much of the previous literature, however, has focused on developed countries. Money supply and money demand converge at an equilibrium over time.

In the U.S., Hoffman & Rasche (1991) show that cointegration is established using the M1 definition of money, but they also find that interest rate elasticity is unstable. Ball (2001) considered the question of whether interest rate elasticity can stabilize when controlling for income elasticity. Miyao (1996) finds that, in Japan, whether cointegration is established depends on the estimation method and value of income elasticity.

In developing countries, for example, Arize *et al*. (1991) and Chowdhury (1997), show that the national interest rate does not influence demand for money in Thailand. Arize *et al.* (1991) confirm that a model of the money demand function excluding the national interest rate is reliable. Because of monetary administrations' desire to receive more capital inflow from foreign countries, many developing countries are often tempted to adopt higher interest rate policies. In this case, the authority sets an upper interest rate limit, and interest rates are not determined by the money supply. The authority then buys and sells foreign money to maintain to a fixed exchange rate system. This influences money supply, so the relationship between the interest rate and money supply don't appear to be strong. This situation potentially limits the applicability of studies looking at interest rate elasticity in developing countries. Arize et al consider whether foreign interest rates and exchange rates influence the demand for money.

Chowdhury (1997) used quarterly data for a period from 1974 to 1993 to perform cointegration tests. He was not able to confirm a cointegration relationship when using four variables (M1, M2, production and price level), but was able to confirm a cointegration relationship when including the exchange rate variable in his estimation. He was also able to show that income elasticity is 1[1].

Bahmani-Oskooee & Chomsisengphet (2002) argue that it is necessary to test for uniformity of the long-run dynamics in the stability test once cointegration has been established. Many studies in developing countries

have estimated only the money demand function without performing any stability tests. Interest rate elasticity must be estimated using specific econometric methods when the variables exhibit cointegration. However, few studies which estimate interest rate elasticity using these specific methods have been performed using data from developing countries.

In a more recent study, Amara Sriphayak *et al.* (2006)[2] report that the effect of exchange rates and foreign interest rates on money demand have become weaker. This article investigated whether the model of the money demand function has changed due to recent changes in monetary policy frameworks.

The most important feature of this paper is its investigation of the possibility that the relationship between the real and financial sectors has changed after the monetary policy framework changes.

To this end, Section III explains monetary policy and reports basic statistics. Section IV explains the model of the money demand function and estimation methods. My estimates are in Section V. I estimate income elasticity using panel data for each prefecture to confirm Chowdhury's (1997) result that income elasticity is 1. Section VI modifies the model of the money demand function econometrically using the income elasticity that has been estimated earlier[3], and investigates whether the money demand function can be established using time series data. I perform unit root tests and a cointegration test. Section VII estimates the values of interest rate elasticity, and looks at whether interest rate elasticity is stable before and after a framework change. I investigate whether its value changes before and after a framework change. This section discusses whether the effect by which monetary policy influences the real economy has changed. Section VIII concludes.

The contributions of this article are as follows. First, unlike previous studies, the model used in this paper includes the national interest rate into the money demand function in empirical studies. Second, this paper uses recent the data from after the financial crisis. Finally, this paper estimates not only the existence of cointegration but also the interest rate elasticity in order to investigate changes in the effect by which the interest rate influences the real economy.

3. Monetary policy changes and basic statistics in Thailand

3.1. Monetary policy

Monetary policy in Thailand has passed through three stages. The first was a period of fixed exchange rates (from the end of World War II to June 1997). The Thai exchange rate was determined via a basket pegging system based on major currency around the world. That said, the component ratio of the U.S. dollar in the basket was about 80% just before financial crisis. Therefore, this was virtually a dollar pegging system. For this reason the US economy had a major impact on Thailand, and Thailand had almost no

the leeway to conduct traditional monetary policy such as rapid changes to the money supply and interest rate policies.

Second was a period of monetary targeting (July 1997 to April 2000)[4]. Thailand had received support from the IMF during financial crisis, had changed its monetary policy to one based on a managed float, and had chosen to adopt money supply as the intermediate target of monetary policy. The central bank set a target value for the growth rate of monetary base and conducted management of liquidity on a day-to-day basis.

Today, Thailand is in a period of inflation targeting (April 2000 -). The end of the support from the IMF has led to the adoption of inflation targeting which takes the price level as the target of monetary policy. The central bank has committed itself to maintaining an inflation rate range of 0 to 3.5% for foreign investors. The exchange rate system is a managed floating system[5].

3.2. The change of monetary variables

Change in monetary variables can be used to confirm whether the change of monetary policy frameworks described above influenced financial variables in the data.

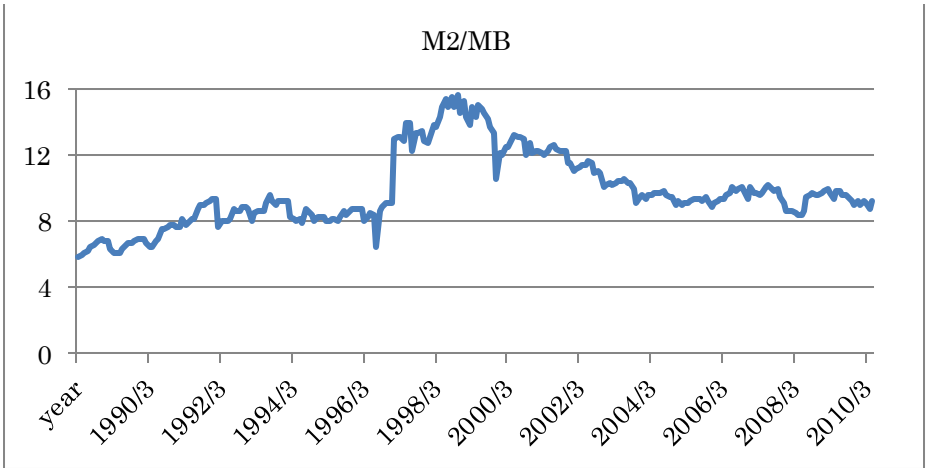

Figure 1. *Ratio of Money Supply to Monetary Base*

Figure 1 shows ratio of the M2 money supply to the monetary base (MB). In this Figure we can see that the level of the variable changes three times following changes in the monetary policy framework. The value increased gradually during the fixed exchange rate period. During the money supply targeting period it changed rapidly. It increased sharply from 1997 to 1999 as a result of the financial crisis. This value has decreased steadily since 1999 with the support of the IMF. It achieved its maximum value in 1999 after the financial crisis at approximately twice its value in 1988. During the period where price level was used as a target, the variable was stable.

Figure 1 shows the change in money supply relative to the monetary base. It can be used to confirm the change in money variables related to three monetary policy changes in Thailand. First, its value doubled from

1988 to 1999. During the financial crisis, from 1997 to 1999, it rose rapidly because of a dramatic increase in the money supply. Under the terms that the IMF specified for Thailand, it decreased steadily[6]. In 2005, it recovered the values of its low for the 1990s.

Figure 2 shows the change of money velocity. The velocity of money declined until 1999. In 1988, it reached 0.6, but it has remained lower since 1988. This means that money velocity was stable in 1999 after the financial crisis. Figure 1 shows that the change in money supply has recently been smaller than during the financial crisis, and Figure 2 shows that the relationship between income and money supply has recently been stable. From the two Figures we can see that the change for money variables had been become smaller in recent years.

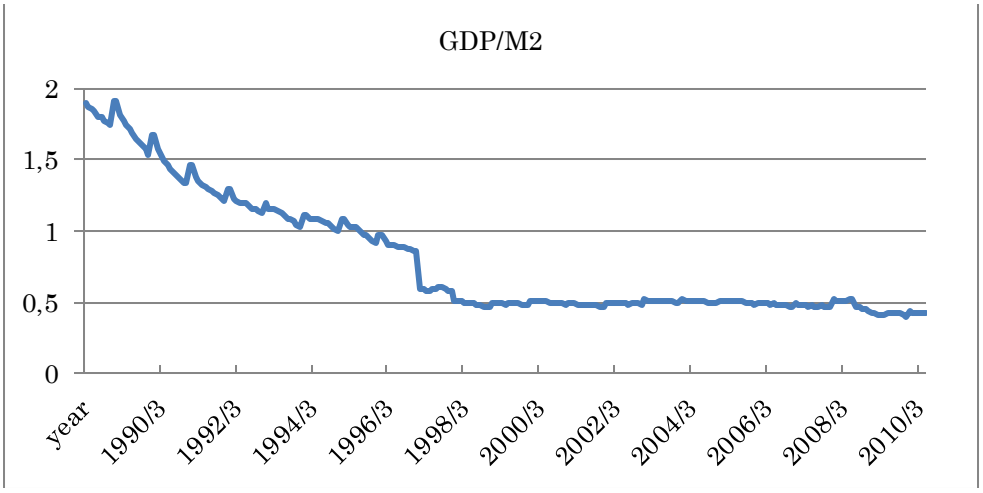

Figure 2. *Velocity Speed*

In order to estimate the money demand function, it is important to confirm whether the relationship between money supply and income is stable. Lower velocity of money might weaken the effect that the change in money supply has on economic growth. This means the relationship between income and money supply is weaker than it used to be before. The stabilization of the money velocity after the financial crisis indicates that the relationship between money supply and income is stable. Regarding the reason for this stability, I think that the change from a fixed exchange rate system to a floating exchange rate system meant that changes in the money supply in order to maintain fixed exchange rates were no longer necessary. Therefore, the relationship between money supply and exchange rates has become weaker.

These two Figures show that the monetary policy framework influences real money variables. I also confirmed that monetary policy changes easily influence money demand and that the relationship between income and money supply is stable.

4. Estimation method

The estimation method used in this paper is as follows. In this paper I estimate the money demand function in three steps. First, I estimate income elasticity by using prefectural panel data (Section V). Second, I make a new variable by using the income elasticity results from section V. I estimate the unit root test and consider whether it is appropriate to divide the sample from the unit root test (DF-GLS test) which can reflect the existence of the structural change. I also estimate whether a cointegration relationship exists between the new variable and interest rate (Section VI). If the cointegration relationship is present then money demand and supply are at equilibrium. Third, I estimate the value of interest rate elasticity and whether this elasticity stabilizes over time.

The theoretical model I use is the money demand function. The money demand function equation shown below is generally based on the Keynesian liquidity preference hypothesis.

$$\frac{M}{P} = L(r, Y)$$

M is the money supply. P is the general price level, Y is the real income, and r is nominal interest. L depends on the income and interest rate. Income is positive and the interest rate is negative. Equation (1) is the LM curve and the money demand function. t is the time period.

$$\ln\left(\frac{M_t}{P_t}\right) = \alpha_1 + \beta_1 \ln Y_t + \beta_2 \ln r_t + u_t \tag{1}$$

Equation (2) assumes 1 as the income elasticity when the income term is moved to the right-hand side.

$$\ln\left(\frac{M_t}{P_t}\right) - \ln y_t = \alpha_2 + \beta_3 \ln r_t + \varepsilon_t \tag{2}$$

β_3 is interest elasticity. If we use the logarithm of interest rate we call this a double-log model. If we use the original unmodified interest rate, we call this a semi-log model. Equation (1) is a double-log model. Equation (2) is semi-log model.

The estimation in this paper is based on Equation (2). If we use relatively few variables, then we can stabilize the result by increasing the degrees of freedom (Maddala & Kim, 1998). In section V I look at whether income elasticity is really 1.

5. Estimating income elasticity using cross sectional data

Below I estimate the income elasticity of money demand using panels of 1997-2014 data.

The equation that corresponds to equation (1) for panel data estimation is equation (3):

$$\ln(Deposit_{it}) = \alpha_{it} + \beta_{1t} \ln(Expenditure_{it}) + \beta_{2t}(Branch_{it}) + u_{it} \quad (3)$$

Data on demand deposits held by individuals and firms at domestically licensed banks by prefecture (end of year standing) are available online from the Bank of Thailand.

Table 1. *Income Elasticity Using Panel Data*

Dummy Var.	α	β_1	β_2
Time Dummy		0.855***	
		(0.001)	
Time and Random	-241.22***	2.04***	
Dummy	(0.000)	(0.000)	
Time and Regional		1.641***	
Dummy		(0.000)	
Time		0.858***	-0.004
		(0.002)	(0.606)
Time and Random	-28.510	0.994***	0.004
Dummy	(0.660)	(0.000)	(0.908)
Time and Regional	-44.110	1.032***	0.001
Dummy	(0.541)	(0.000)	(0.761)

Note: P value reported in parentheses. *** denotes significance at the 1% level; ** at the 5% level; * at the 1% level.

Table 1 shows results of an estimate of equation (3) using panel data. Rows (2)-(4) show results that include the number of banks branches per capita per prefecture. These three results show income elasticity between 0.95 and 1.05, or very close to 1. Rows (5)-(7) show results that do not include the number of bank branch per prefecture. These results are also close to 1, ranging between 0.97 and 1.02.

Above, income elasticity is close to 1 using both cross-section data (with a range of 0.8 - 1.2) and using panel data (with a range of 0.95 - 1.03). Chowdhury (1997) calculates income elasticity of 0.91 using time-series data and thus I consider this result as reasonable and valid in comparison with previous reviews.

6. Unit root test and cointegration test

In this section I estimate the unit root and cointegration tests to investigate whether a money demand function can be established. As the variables have cointegration, money demand and supply are equal. This means that changes of monetary variables such as interest rate and money supply influence variables in the real sector.

In this section I use time series data. I perform my analysis using monthly data over the period of February 1989 to June 2014. I use nominal GDP, a GDP deflator, the one-day interbank rate, CPI, M1, and M2 published by the Bank of Thailand. M1 and M2 are deflated using the CPI. Nominal GDP is deflated with the GDP deflator. I assume income elasticity of 1 based on the result described in the previous section. In other words, I am using two deflated variables (M1 and M2) subtracted from the deflated nominal GDP, as well as the interest rate to perform this estimation.

Table 2. *Unit root test*

Level Variable				
	M1	M2	r	lnr
1989February-1999June				
ADF	-2.817(2)	-2.992(4)	-1.886(2)	-0.592(3)
	(0.630)	(0.200)	(0.165)	(0.458)
PP	-7.227(2)	-2.447(6)	-2.734(2)	0.801(7)
	(0.531)	(0.396)	(0.302)	(0.872)
July 1999 – June 2010				
ADF	-0.445(10)	-2.402(8)	-0.402(5)	0.498(7)
	(0.741)	(0.403)	(0.669)	(0.824)
PP	-0.301(10)	-0.271(9)	-0.151(5)	-0.139(3)
	(0.743)	(0.520)	(0.656)	(0.655)
Entire Sample				
ADF	-1.999(2)	-3.402(8)	-0.528(5)	-0.592(3)
	(0.673)	(0.444)	(0.569)	(0.458)
PP	-8.433(2)	-0.271(9)	-0.1342(5)	-0.159(3)
	(0.601)	(0.720)	(0.716)	(0.672)
Diffenrential Variable				
	M1	M2	r	lnr
1989February-1999June				
ADF	-6.422***(2)	-6.117***(5)	-7.468***(2)	-3.423***(4)
	(0.000)	(0.000)	(0.000)	(0.001)
PP	-112.234***(2)	-90.554***(5)	-125.822***(2)	-120.315***(6)
	(0.000)	(0.000)	(0.000)	(0.000)
1999July-2010June				
ADF	-6.381***(10)	-5.698***(10)	-3.085***(4)	-2.929***(6)
	(0.000)	(0.000)	(0.002)	(0.003)
PP	-106.230***(10)	-99.349***(7)	-71.718***(4)	-74.730***(2)
	(0.000)	(0.000)	(0.000)	(0.000)
All Sample				
ADF	-6.381***(10)	-5.698***(10)	-3.124***(4)	-4.115***(2)
	(0.000)	(0.000)	(0.002)	(0.000)
PP	-100.477***(10)	-99.349***(7)	-230.563***(2)	-74.730***(2)
	(0.000)	(0.000)	(0.000)	(0.000)

Note: P value reported in parentheses. *** denotes significance at the 1% level; ** at the 5% level; * at the 1% level.

I estimate unit roots tests to investigate whether each variable variables has a unit root. If variables have unit roots, unconditional variance does not converge as the sample size increases. M1 and M2 in Table 2 indicate the variables of money (M1 and M2) minus GDP, which correspond to left hand of equation (2). I estimate the Phillips and Perron test (PP) and

Augmented Dickey Fuller test (ADF) as unit root tests. The upper result is for level variables. The lower result is for differential variables. As a result of the unit root tests, the level of each variable was found to have a unit root, whereas the first difference of each variable was found not to have a unit root. Thus, we can assume that all variables are non-stationary variables with a unit root. If we perform a regression using variables which have a unit root our results may have cointegration. If our results have cointegration, we can perform an estimation without using differential variables. For this reason, we need to estimate a cointegration test.

I estimate three cointegration tests. First, I estimate an ADF type test based on residuals. Second, I estimate a test (the trace test) proposed by Johansen (1988) and Johansen & Juselius (1990). Third, I perform a test proposed by Gregory & Hansen (1996) that allows the possibility of structural changes (in other words, it allows shifts of the cointegration vector). The null hypothesis is that money demand minus income (the left side of equation (2)), and interest rate (the right side of the same equation) do not have a cointegration relationship.

However, there are problems with the first two tests. Augmented Dickey Fuller (ADF) type tests have weak power. Rejection region tends to be much bigger because the Johansen (JOH) test has the feature that the size distortion of the distribution is bigger. For this reason, I have chosen to use both tests.

The Gregory and Hansen (GH) test is estimated in order to investigate whether the change to an inflation targeting framework causes structural change. If structural change occurs then the coefficient is incorrect, an indication that we should divide the data. The ADF is performed once for data up to and including each time period, and the GH test statistic is the maximum of these values. Table 3 shows cointegration results.

Table 3. *Cointegration tests using income elasticity of 1*

	M1		M2	
	r	lnr	r	lnr
February 1989 – June 1999				
ADF	-4.515***	-4.503***	-1.214	-1.312
	(0.009)	(0.008)	(0.961)	(0.550)
JOH	4.317*	1.019	5.016**	2.711*
	(0.050)	(0.497)	(0.023)	(0.092)
July 1999 – June 2010				
ADF	-4.110*	-3.766*	-3.410	-3.419
	(0.032)	(0.052)	(0.394)	(0.461)
JOH	3.425	2.811*	6.405**	2.832
	(0.163)	(0.086)	(0.017)	(0.231)
Entire Sample				
ADF	-5.311***	-6.306***	-1.532	-2.313
	(0.000)	(0.000)	(0.873)	(0.707)
JOH	8.423***	3.912***	2.661	-2.476
	(0.006)	(0.042)	(0.285)	(0.301)

Note: P value reported in parentheses. *** denotes significance at the 1% level; ** at the 5% level; * at the 1% level.

ADF is Augmented Dickey & Fuller (1979) test. JOH is Johansen trace test.

Table 3 shows the results of the cointegration tests. On the left are the results of an estimation using M1. On the right are results of an estimation using M2 as money demand. From the left, I use the variables combinations (M1,r) (M1,lnr) (M2,r) (M2,lnr). I use level variables (semi-log model) and logarithm variables (double-log model) for the interest rate.

All combinations are significant in at least one test on the first half of the sample. The second half results show that (M1,r) (M1,lnr) (M2,r) have cointegration regarding the money demand function, all sample results show that only (M1,r) (M1,lnr) have cointegration regarding the money demand function. The variable combination (M2,r) does not have cointegration regarding the money demand function.

Table 4 shows maximum statistic results for 1999 over the entire sample. This indicates that structural changes happened regarding the money demand function in 1999, quite close to 2000 when inflation targeting was adopted.

Chowdhury (1997), which produced the result that income elasticity is one in Thailand, suggests using M2 rather than M1 as money in the money demand function. The result reached in this paper is not same as that of Chowdhury. If significant results for a single test are acceptable, both M1 and M2 can be used. On the other hand, only M1 can be used if significant results for two tests are required.

Table 4. *Gregory and Hansen test*

r		lnr	
M1	M2	M1	M2
-6.914***	-7.511***	-6.412***	-6.063***
(0.000)	(0.000)	(0.000)	(0.000)

Note: P value reported in parentheses. *** denotes significance at the 1% level; ** at the 5% level; * at the 1% level.

Previous reviews were unable to find cointegration for a model which includes the national interest rate. This model, however, has cointegration in two tests and includes the national interest rate. The model is established before the monetary policy framework change. Moreover, in first half and second halves, I do not find a major differences in the results of the cointegration test. For this reason, in the next session I estimate stability tests of interest rate elasticity for each period. I test whether interest rate elasticity stabilizes by estimating fully modified least square (FMLS). Stability tests can test estimates if a cointegrating relationship exists.

7. Changes in the interest rate elasticity of the money demand function

In this section, I test the effect of monetary policy following monetary policy framework changes by estimating interest rate elasticity. Interest rate

elasticity using FMLS can be interpreted as the value of the effect of monetary policy. If variables have cointegration, the coefficient of OLS has bias. For this reason, we use FMLS to modify this bias.

In the sixth section, I obtained the result that money demand function in Thailand has a cointegrating relationship. Table 5 shows the results of FMLS from Hansen (1992).

FMLS results are not reliable if a cointegrating relationship does not exist. Packages that exhibit cointegrating relationships include all packages in the fourth sample, (M1,r)(M1,lnr)(M2,r) in the latter one, and (M1,r)(M1,lnr) in the complete one. Packages that exhibit cointegration in Table 4 and have significant results in Table 6 are (M1,r) (M1,lnr) in the latter sample. The coefficient -0.002 on (M1,lnr) over the latter sample means that money demand minus income decreases 0.2% if interest rate rises by 1%.

From these results, I believe that using that the package consisting of (M1,r) (M1,lnr) as the money demand function after the adoption of inflation targeting policies is appropriate.

The interest rate elasticity of the double-log model using M1 in Japan is about -0.1, and by comparison the same value using M1 in the latter sample in Thailand is about -0.002. The effect of monetary policy is clearly much smaller than in Japan. Thus, it is necessary to raise the interest rate more to control money demand than in Japan. In addition, the results of OLS and FMLS for interest rate elasticity are both positive before adoption of an inflation targeting policy. Since adoption of an inflation targeting policy, interest rate elasticity has been negative.

Next, I estimate stability tests from Hansen (1992) to test whether interest rate elasticity is stable. Stabilization of interest rate elasticity means that the effect of monetary policy can be predicted. I consider whether interest rate elasticity changes before and after the adoption of an inflation targeting policy[7]. I estimate two tests, the Sup-F test and the Mean-F test, which is a stabilization test from Hansen (1992).

The stability test from Hansen (1992) estimates an F-value for each term. The maximum F-value is the Sup-F statistic and the average is the Mean-F statistic. The null hypothesis of two tests is that the parameters (cointegration vectors) are constant. The alternative hypothesis of the Sup-F test is that parameters change at unknown times. The alternative hypothesis of the Mean-F test is that this changes depends a random walk. The Sup-F statistic is preferable in order to determine whether structural change happens at a particular time. The Mean-F statistics is preferable in order to determine whether the difference of the coefficient between before and after a structural change is large. I estimate both tests.

Table 5. *Interest Rate Elasticity and FMLS*

	M1			M2		
	Const.	r	lnr	Const.	r	Lnr
	February 1989 – June 1999			February 1989 – June 1999		
OLS	-2.182***	0.003		-0.008	0.007	
	(0.033)	(0.311)		(0.07)	(0.005)	
	-2.109***		-0.019	0.298**		-0.100
	(0.057)		(0.026)	(0.11)		(0.089)
FMLS	-1.062***	0.002**		-0.302***	0.009**	
	(0.014)	(0.001)		(0.04)	(0.004)	
	-1.086***		0.018**	-0.512***		0.052
	(0.021)		(0.008)	(0.08)		(0.053)
	July 1999 – June 2010			July 1999 – June 2010		
OLS	-1.637***	0.017		0.754***	-0.010*	
	(0.031)	(0.012)		(0.014)	(0.006)	
	-1.602***		0.003	0.756***		-0.041***
	(0.024)		(0.029)	(0.011)		(0.024)
FMLS	-0.797***	-0.009***		0.416***	-0.009	
	(0.006)	(0.002)		(0.019)	(0.078)	
	-0.602***		-0.006**	0.302***		-0.022*
	(0.004)		(0.000)	(0.015)		(0.013)
	Entire Sample			Entire Sample		
OLS	-0.171***	-0.039***		0.694***	-0.048***	
	(0.022)	(0.001)		(0.034)	(0.004)	
	-1.521***		-0.251***	0.715***		-0.304***
	(0.000)		(0.015)	(0.032)		(0.017)
FMLS	-1.183***	0.000		-0.143	0.003	
	(0.015)	(0.001)		(0.16)	(0.009)	
	-1.032***		-0.003	-0.004		-0.031
	(0.011)		(0.005)	(0.102)		(0.040)

Note: Standard error reported in parentheses. *** denotes significance at the 1% level; ** at the 5% level; * at the 1% level.

Table 6 shows the results of a stability test of interest rate elasticity that was obtained by FMLS. This test can also be used when cointegration relationships exist.

Regardless of the model chosen, the result is not all rejected under the null hypothesis that the parameter is constant when used in the first half. This indicates that the coefficient of the interest rate is stable. In latter half, only (M2,r) is not rejected null hypothesis. This indicates that the effect of monetary policy using the package (M2,r) is stable and predictive.

Table 6. *Stability test*

February 1989 – June 1999				
	(M1,r)	(M1,lnr)	(M2,r)	(M2,lnr)
MeanF	4.117	4.621	3.014	2.485
	(0.18)	(0.11)	(0.21)	(0.18)
SupF	8.629	12.147	8.013	6.411
	(0.17)	(0.11)	(0.19)	(0.18)
July 1999 – June 2010				
	(M1,r)	(M1,lnr)	(M2,r)	(M2,lnr)
MeanF	9.305***	9.364***	4.834	5.633*
	(0.01)	(0.01)	(0.12)	(0.07)
SupF	14.178*	14.662*	12.343	8.009
	(0.07)	(0.06)	(0.14)	(0.20)
Entire Sample				
	(M1,r)	(M1,lnr)	(M2,r)	(M2,lnr)
MeanF	7.256*	3.814	27.316***	7.441*
	(0.05)	(0.20)	(0.01)	(0.04)
SupF	35.754***	14.474	68.121***	7.312
	(0.01)	(0.19)	(0.01)	(0.20)

Note: P value reported in parentheses. *** denotes significance at the 1% level; ** at the 5% level; * at the 1% level. I choose to apply to the method proposed in Andrews (1991) the bandwidth which gained using unprewhitened bartlett kernel.

8. Conclusion

In this paper I investigate whether Thailand's change to an inflation targeting monetary policy framework in 2000 changed the model and the effect of monetary policy by estimating a money demand function. This paper does not use three variables that are used in previous works focused on developed countries. I eliminate one variable by performing a step to create a variable for money demand minus income to increase the effectiveness of my results.

I obtain five sets of finding. First, the monetary policy framework change did not affect the appropriate money demand function model. Thus, the model of this paper is sufficient. I found that the model should include the national interest rate before and after the adoption of an inflation-targeting policy. Second, structural change occurs via adoption of an inflation targeting policy. Third, the effect of monetary policy changes with the adoption of an inflation targeting policy. Interest rate elasticity is positive before the framework change but negative after that. Its value is weak, however. Fourth, the interest rate elasticity of the package (M2,r) is stable and predictive. Fifth, other packages become unstable after adopting an inflation targeting policy. The elasticity of all package were stable before adopting the inflation targeting policy.

This suggests that the national interest rate, rather than the exchange rate and foreign interest rates, is important to managing monetary policy. It also suggests that the same money demand function used in analyzing developed countries can be applied.

The task of investigating the causal relationship between the framework change to inflation targeting and the above results is left to future research.

Endnotes

[1] Hataiseree (1995) shows that the cointegration relationship between M1, M2 and Production exists using the quarterly date from 1980 to 1990.

[2] Stability tests should consider short term change. In order to accomplish this, Bahmani-Oskooee & Hafez (2005) perform a two-step estimation. First, they create an error correction model, and second they perform CUSUM and CUSUMSQ tests using an ARDL model. Because estimating interest elasticity is the goal of this paper, I have chosen not to include estimates of the CUSUM and CUSUMSQ tests.

[3] Econometrically, when using only two variables it is expected that a better estimated value can be obtained (in other worlds, the standard error will be smaller). Theoretically, if the utility function as the framework of a standard MIU model is specified, income elasticity is one.

[4] Shirai (1999) shows that population cannot predict the inflation rate and monetary management even when the central bank makes public the money supply as an intermediate target if the monetary authority chooses as the monetary policy monetary targeting under a system of floating exchange rates. He also shows that achieving a money supply target becomes difficult if capital movement is active.

[5] The central bank has made public information indicating that a depreciation of 10% in terms of baths (to US dollar) would increase the core inflation rate by 0.9% point (BOT, 2002).

[6] After the financial crisis, each bank established an Asset Management Company. However, the number of bad loans did not decrease. In 2002, the number of bad loans decreased with the foundation of Thailand Asset Management Company.

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