Exchange Rate Pass-through to Domestic Prices in Thailand, 2000-2017

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Abstract

This paper explores the degree of exchange rate pass-through to domestic prices in Thailand using quarterly data from 2000Q1 to 2017Q4. Johansen cointegration tests are employed in the analysis. The degree of exchange rate pass-through is found to be partial and modest. The stable pass-through effect in the long-run is found for import price index. The findings give some implications for risk perception by firms and investors regarding the future inflationary environment of the country.

Keywords: Exchange rate, domestic prices, cointegration
JEL Classification: C22, E31, F31

1. Introduction

Many countries have tried to fight against inflation in order to maintain purchasing power by adopting the inflation targeting as an explicit monetary policy objective. However, monetary policy aims at maintaining price stability requires a more flexible exchange rate. Under the flexible exchange rate regime, exchange rate fluctuations can transmit to domestic prices. This type of transmission is known as the exchange rate pass-through (ERPT). Campa and Goldberg (2005) examine the ERPT into import prices of 23 OECD countries. They find compelling evidence of partial pass-through in the short run, especially within manufacturing industries. In the long run, producer-currency pricing is more prevalent for many types of imported goods. The pass-through elasticities are higher in countries with higher exchange rate volatility. Furthermore, the pass-through changes due to the dramatic shifts in the composition of imported bundles. Ito and Sato (2008) examine the pass-through effects of exchange rate changes on the domestic prices in the East Asian economies using the monthly data from March 1993 to August 2005. They find that the high degree of consumer price index responsiveness to exchange rate is found in the most crisis-hit country, namely Indonesia. The degree of exchange rate pass-through to import prices is quite high in these crisis-hit economies. Devereux and Yetman (2010) find that the ERPT seems to be low in the low inflation countries. The low ERPT is partly due to slow adjustment of nominal prices. In addition, the ERPT is sensitive to the monetary policy regime. Beirne and Bijsterbosch (2011) find that the ERPT to consumer prices in nine central and eastern European member states is quite high. Ben Cheikh and Louhichi (2014) examine the ERPT in the Euro area using cointegration framework. They find that there are different degrees in the rates of pass-through across countries. Jiang and Kim (2013) find

that the ERPT to producer price and retail price indexes are incomplete in China even though the ERPT to producer price index is higher than that to retail price index. Aziz et al. (2014) find that the ERPT to import price is complete in Bangladesh even though the second ERPT is partial in both the short and long run. Mendali and Das (2017) examine the ERPT to domestic prices in the post-reform period in India. They find that the ERPT to wholesale price index is very modest. Smaili and safouane Ben asisa (2018) examine the ERPT to domestic prices for five Middle Eastern and North African countries. They find that the ERPT to consumer prices is small in the long-run in the sub-sample period. Moreover, the degree of ERPT to domestic prices decreases across different price indices. The effect of ERPT to import prices is largest.

This paper contributes to the empirical literature in that it provides evidence of of partial ERPT to domestic prices, which is in accordance with the majority of previous empirical studies. The paper re-examines the responses of domestic prices to changes in the nominal exchange rate in Thailand using quarterly data for the 2000-2017 period. The empirical methodology is similar to the one used by Beirne and Bijsterbosch (2011), Ben Cheikh and Louhichi (2014) and Smaili and safouane Ben asisa (2018). The ERPT to consumer price, producer price and import price indices are tested by multivariate cointegration framework. In other words, the null hypotheses of full ERPT and zero ERPT are tested by imposing restrictions on long-run parameters. The paper is organized as follows. Section 2 describes the data used in the analysis and empirical methodology. Section 3 presents empirical results and the last section concludes.

2. Data and Methodology

2.1 Data

The quarterly data for the 2000-2017 period are used in the analysis. The data are retrieved from various sources. Consumer price index (CPI with 2015 base year) and producer price index (PPI with 2010 base year) are obtained from Ministry of Commerce. Import price index (MPI with 2012 base year), nominal effective exchange rate index (NEER with 2012 base year) and narrowly defined money supply (M1) are obtained from the Bank of Thailand. Chain volume measured real gross domestic product (GDP with 2002 reference year) is obtained from the Office of National Economic and Social Development Board. The GDP and M1 series are measured in billions of baht (domestic currency). All series are seasonally adjusted before being transformed into logarithmic series. The number of observations is 72 dictated by the availability of MPI series.

Three unit root tests namely, ADF, PP and KPSS, are used to determine the order of integration of each series. The results are reported in Table 1.

At least two out of three tests show that the PPI series is integrated of order one while all the three tests show that other series are integrated of order one. Therefore, all series are treated as I(1) series.

Table 1
Unit root tests.

Variable	ADF	PP	KPSS
CPI	-1.172	-1.122	1.140
ΔCPI	-6.920***	-6.847***	0.022***
PPI	-1.506	-1.343	0.705
ΔPPI	-5.804***	-5.803***	0.157***
MPI	-1.379	-2.907**	1.045
ΔMPI	-4.763***	-4.683***	0.175***
GDP	-1.488	-1.482	1.127
ΔGDP	-10.025***	-10.52***	0.179***
NEER	-0.667	-0.694	1.034
ΔNEER	-8.296***	-8.369***	0.143***
M1	-2.551	-2.360	1.125
ΔM1	-6.242***	-7.781***	0.405**

Note: ***, ** and * denote significance at the 1%, 5% and 10%, respectively.

2.2 Methodology

If the variables are found to be integrated of order one, Johansen cointegration tests proposed by Johansen and Juselius (1990) and Johansen (1991) can be used. The tests employ the maximum likelihood procedure to determine the existence of cointegrating equations in nonstationary time series as a VAR model. The reduced form VAR model of order p is expressed as:

$$\Delta x_t = \Gamma_1 \Delta x_{t-1} + \Gamma_2 \Delta x_{t-2} + \ldots\ldots\ldots\ldots + \Gamma_{p-1} \Delta x_{t-p-1} + \alpha\beta' x_{t-1} + \varphi D_t + e_t \qquad (1)$$

where x is a vector of first differences of nonstationary variables, Γ_i is the matrix of short-run parameters, and $\alpha\beta'$ is the information coefficient matrix between the levels of nonstationary series. The relevant elements of the matrix α are adjusted coefficients while the matrix β contains cointetrating equations. D_t is the intervention dummy that will captures the impact of the 2008 global financial crisis occurred during the 2007-2008 period and peaked in 2008. There are two likelihood ratio test statistics for the number of cointegrating equations, i.e., trace and maximum eigenvalue statistics. If the two test statistics are greater than the critical values at the 5% level of significance, cointegrating equation(s) will exist. The 4-variable models are used. The vector is expressed as:

$$x_t^{'} = [DP_{it}, NEER_t, GDP_t, M1_t]^{'} \qquad (2)$$

where DP_i is the log of domestic price indexes, which comprise CPI, PPI and MPI, NEER is the log of nominal effective exchange rate index, GDP is the log of real GDP, and M1 is the log of narrowly defined money supply as a nominal monetary variable. Therefore, there will be 3 cointegration tests for the relationship between domestic prices and the other three variables.

The optimal lag order of each vector error correction mechanism (VECM) can be determined by Akaike Information Criterion (AIC). If the trace and maximum Eigen statistics

are larger than the 5% critical values provided by MacKinnon et al. (1999), cointegrations will exist.

3. Empirical Results

Since all series are I(1) series as reported in Table 1, Johansen cointegration tests are used. The results of cointegration tests are shown in Table 2.

Table 2
Cointegrated VAR model.

Domestic prices	VAR lags	Number of CE	Model specification
CPI	1	1	Unrestricted intercept
PPI	1	1	Unrestricted intercept
MPI	1	2	Unrestricted intercept

Note: VAR lags are determined by AIC from unrestricted VAR estimate on the first differences of variables and CE denotes cointegrating equation.

The most statistical models are the ones that have long-run relationship among variables. According to Johansen and Juselius (1992), the first cointegrating vector provides the highest Eigen-value statistic. The results in Table 2 show that at least one cointegrating vector is present for each model. The unrestricted long-run parameters of each VECM are presented in Table 3.

Table 3
Normalized long-run coefficients of first cointegrating vector.

CPI_t	$NEER_t$	GDP_t	$M1_t$
1	-0.913***	1.281**	-0.715**
	(0.214)	(0.559)	(0.262)
PPI_t	$NEER_t$	GDP_t	$M1_t$
1	-4.906*	8.182***	-2.999**
	(1.258)	(3.393)	(1.586)
MPI_t	$NEER_t$	GDP_t	$M1_t$
1	-0.481**	1.893**	-0.945***
	(0.212)	(0.566)	(0.265)

Note: Standard errors are in parenthesis; ***, ** and * denote significance at the 1%, 5% and 10%, respectively.

According to the results of cointegration tests, the degrees of long-run ERPT to domestic prices differ across different types of domestic prices. MPI has the lowest pass-through and PPI has the highest pass-through. However, the coefficient of the pass-through to PPI is significant at the 10% level only. The long-run elasticity of pass-through to MPI is 0.48, which indicates that a 1% home currency depreciation causes MPI to increase by 0.48%. The long-run elasticity of pass-through to CPI is 0.91, which indicates that a 1% depreciation of home currency leads to an increase in CPI by 0.91%. In the long run, the ERPT to CPI is higher than that of MPI.

The estimated adjustment coefficients or loading factors that describe the speed of adjustment toward the long-run equilibrium is presented in Table 4.

Table 4
Adjustment coefficients of the cointegrated VAR models.

CPI_t	$NEER_t$	GDP_t	$M1_t$
-0.028	0.148***	-0.103	-0.211***
(0.022)	(0.054)	(0.559)	(0.080)
PPI_t	$NEER_t$	GDP_t	$M1_t$
-0.065	0.094***	-0.031*	-0.033***
(0.039)	(0.025)	(0.019)	(0.015)
MPI_t	$NEER_t$	GDP_t	$M1_t$
-0.173***	0.087***	-0.083	-0.182***
(0.050)	(0.047)	(0.038)	(0.030)

Note: Standard errors are in parenthesis; ***, ** and * denote significance at the 1%, 5% and 10%, respectively.

As shown in Table 4, the adjustment coefficients or the error correction terms (ETCs) of the cointegrated VAR models for CPI and PPI are not significant even though they have correct signs with the absolute values of less than one. This means that any short-run deviation from the long-run equilibrium will not be corrected. However, the ECT for MPI is -0.173 and significant at the 1% level. This means that when MPI deviates from its long-run equilibrium level, it will adjust at a rate of 17.3% per quarter until the equilibrium is restored.

To check whether the ERPT to domestic prices is full or null, restrictions must be imposed on long-run parameters. For examining the full ERPT, two hypotheses should be tested, i.e., H_1: (1, 1, 0, 0) for the full ERPT to domestic prices with zero constraints on the long-run parameters, H_2: (1, 1, γ, η) for full ERPT to domestic prices with long-run parameters unrestricted. On the other hand, two hypotheses should be tested when examining the zero ERPT, i.e., H_3: (1, 0, 0, 0) for zero ERPT to domestic prices with zero constraints on the long-run parameters, H_4: (1, 0, γ, η) for zero ERPT to domestic prices with long-run parameters unrestricted. The test results are shown in Table 5.

Table 5
Restrictions on long-run parameters.

	Full ERPT		Zero ERPT	
Domestic prices	H_1	H_2	H_3	H_4
CPI	24.165	23.283	22.195	21.250
	(0.000)	(0.000)	(0.000)	(0.000)
PPI	21.383	18.276	20.622	17.388
	(0.000)	(0.000)	(0.000)	(0.001)
MPI	29.956	29.160	22.408	16.745
	(0.000)	(0.000)	(0.000)	(0.001)

Note: Restrictions are based on likelihood ratio tests with a chi-squared distribution, the test statistic is $\chi^2_{(3)}$, and p-values are in parenthesis.

The results in Table 5 suggest that the null hypotheses for full ERPT are rejected at the 1% level of significance for all price indexes. In addition, the null hypotheses for zero ERPT

are also rejected for all price indexes. This means that the long-run ERPT to domestic prices is neither complete nor null. Therefore, it can be concluded that the long-run pass-through to domestic prices is partial or incomplete. The finding is in line with the finding by Jiang and Kim (2013) in the case of China.

The overall results show that only the long-run pass-through to import price index is stable while those to CPI and PPI are not stable. Therefore, it is possible that imported inflation can stem from the country's imports of machinery, equipments and important raw materials that are used by the manufacturing firms. The rising cost of production can cause CPI to rise. Ben Cheik and Louhichi (2014) also stress the importance of the ERPT to import prices for some Euro area economies.

4. Conclusion

This paper examines the long-run pass-through of exchange rate to domestic prices in an emerging market economy. It is important to evaluate the degree of ERPT to domestic prices because exchange rate is a channel of monetary policy transmission. Many of previous empirical studies find a low degree of ERPT. However, the results in this study show a moderate degree of ERPT to domestic prices. When assessing the adjustment coefficients, the adjustment of import price index toward its long-run equilibrium is quite rapid. Since Thailand is dependent on imports of capital goods, the partial ERPT to import prices can have a larger impact on inflation in the future. The findings in this study have some important implications for risk perception by firms and investors regarding the future inflationary environment of the country.

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