ANALYSIS OF EXCHANGE RATE PASS-THROUGH, FEAR OF FLOATING, AND IMPLEMENTATION OF INFLATION TARGETING FRAMEWORK

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ABSTRACT

This paper analyze the exchange rate pass-through and fear of floating behavior on 18 countries that adopting Inflation Targeting Framework (ITF). Vector Error Correction Model (VECM) is used: (1) to estimate the effect of exchange rate depreciation to inflation (passthrough); and (2) to examine the indication of fear of floating behavior. The result shows that passthrough effect has decreased in most countries after ITF where middle income countries have higher passthrough than high income countries. This effect did not disappear completely and still has a significant role to drive inflation. The interventions on exchange rate movement can be interpreted more as control of inflation than fear of floating. The implementation of ITF especially in middle income countries needs further to be reconsidered since it requires inflation as the only nominal anchor.

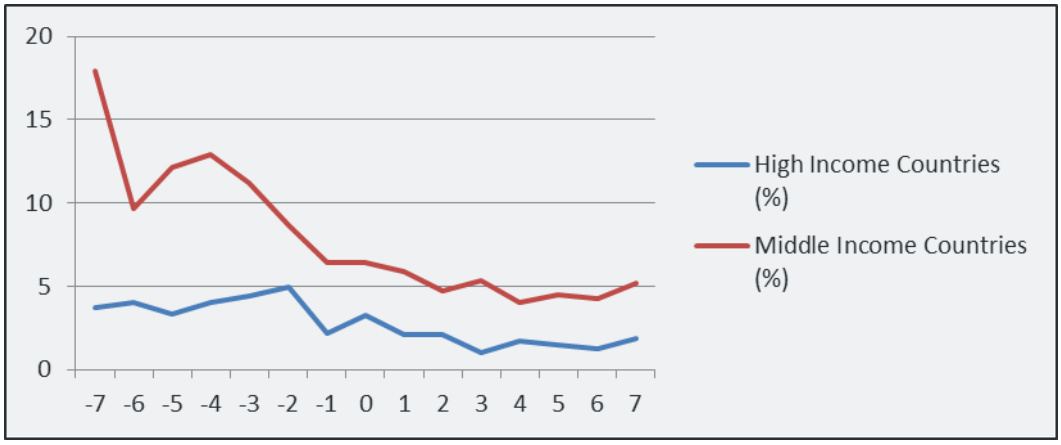
Keywords: Fear of floating, Inflation Targeting Framework, Passthrough, VECM

INTRODUCTION

Inflation Targeting Framework (ITF) is a new monetary framework which is mostly used by industrial countries at the begining, such as: New Zealand (1990), Canada (1991), United Kingdom (1992), Sweden (1993), and Australia (1993). The implementation of ITF in those developed countries lead to a positive effect towards the inflation and stability of economics where the inflation rate tends to be low and stable so it can increase the economic growth in those countries (Pohan, 2008).

The economic crisis in 1997/1998 which is mostly occured in developing countries brings a change on their exchange rate regime, from pegged or fixed exchange rate regimes to floating exchange rate regimes. In addition, there was a change in monetary framework from money targeting framework or exchange rate targeting framework to inflation targeting framework.

The impact of exchange rate movement towards the prices in a country, can be analyse by exchange rate passthrough (ERPT) which is define as percentage of the change of domestic price if domestic exchange rate changed by 1%. Its impact to goods and services in a country can occured either directly (direct exchange rate passthrough) or indirectly (indirect exchange rate passthrough) (Majardi, 2000).



Source: Internasional Monetary Fund (2014)

Figure 1 The average of inflation rate in high income countries and middle income countries before and after the implementaton of ITF

Various studies have shown that after ITF, passthrough was still higher for middle income than high income countries. This shows that role of exchange rate movement affecting inflation is high particularly in middle income countries, thus makes the central bank more difficult to mantain inflation target. The implementation of fullpleged ITF makes the central bank should commit with attainment of inflation target that has been set before. In other side, the openness of economy that is getting large lately makes the movement of inflation always linked to exchange rate movement. The central bank can be trapped on exchange rate targeting and make it as nominal anchor instead of inflation targeting which should be the nominal anchor of ITF. This is often define as *fear of floating* (Nogueira, 2006).

There are vast literatures and studies about exchange rate passthrough in various countries, such as: Taylor (2000), Campa and Goldberg (2002), and Dilla (2014). However, the studies about comparison of the implementation of ITF and behaviour of fear of floating in high income countries and middle income countries is still rare. That is why this theme is important to understand the impact of the change on this framework.

METHODS

This study use time series and secondary data in 18 countries that adopting inflation targeting framework and divided into two groups: High income countries and middle income countries, in period before and after the implementation of ITF, so every country has different time periode between each other.

The data was collected from *Internasional Financial Statistics* (IFS), CEIC, dan OECD's iLibrary. Such as, Consumer Price Index (CPI), nominal exchange rate (domestic exchange rate/ US Dollar), interest rate (money market rate), and output (industrial production index).

Table 1 Countries that adopting ITF

No	Countries	Start Year	Period	
			Pre ITF	Post ITF
		High Income Countries		
1.	Canada	1991: M2	1984:M2-1991:M1	1991:M2-2014:M6
2.	Sweden	1993: M1	1986:M1-1992:M12	1993:M1-2014:M5
3.	Norwich	2001: M3	1994:M3-2001:M2	2001:M3-2009:M10
4.	Switzerland	2000: M1	1993:M1-1999:M12	2000:M1-2014:M6
5.	South Korea	2001: M1	1994:M1-2000:M12	2001:M1-2014:M5
6.	Australia	1993: M4	1984:M3-1993:M3	1993:M4-2013:M12
7.	Finland	1993: M1	1985:M3-1992:M12	1993:M1-1998:M12
8.	Poland	1998: M10	1991:M3-1998:M9	1998:M10-2014:M6
9.	New Zealand	1990: M1	1985:M1-1989:M12	1990:M1-2014:M3
10.	UK	1992: M9	1988:M2-1992:M8	1992:M9-2014:M6
		High Income Countries		
11.	Indonesia	2005: M7	1997:M7-2005:M6	2005:M7-2014:M5
12.	Thailand	2000: M5	1993:M5-2000:M4	2000:M5-2014:M7
13.	Philipine	2002: M1	1995:M1-2001:M12	2002:M1-2014:M6
14.	Mexico	2001: M1	1994:M1-2000:M12	2001:M1-2014:M7
15.	South Africa	2000: M2	1993:M2-2000:M1	2000:M2-2014:M6
16.	Brazil	1999: M6	1995:M1-1999:M5	1996:M6-2014:M6
17.	India	1990: M12	1982:M3-1990:M11	1990:M12-1998:M5
18.	Peru	2002: M1	1995:M10-2001:M12	2002:M1-2014:M4

Correction Model Analysis (VECM)

Vector Error correction Model (VECM) is restricted VAR that used for unstationer variable at the level but have cointegration between them. This restriction should be given due to unstationer variable at level but have cointegration. Then, VECM use that cointegration restriction information into the spesification. VECM is often called VAR design for unstationer series that have cointegration relationship. Thus, there is a speed of adjustment from short term to long term in VECM (Firdaus, 2011).

The spesification of VECM model generally, as follows:

$$\Delta y_t = \sum_{i=1}^{k-1} \Gamma_k \Delta y_{t-1} + \mu_0 + \mu_1 t + \alpha\beta y_{t-1} + \varepsilon_t$$

Where y_t , μ_{0x} , μ_{1x} , t , Π_x , y_{t-1} , Γ_k , k-1 , εt are vector which contained of analysis variable, *intercept* vector, regression coefficient vector, *time trend,* αxβ where b' contained of long term cointegration equation, variable in-level, regression coefficient matrix, VECM order from VAR, and *error term,* respectively.

VECM Model

$$\begin{bmatrix} \Delta Y_t \\ \Delta NER_t \\ \Delta INF_t \\ \Delta R_t \\ \Delta i_t \end{bmatrix} = \begin{bmatrix} \gamma_{11} & \gamma_{12} & \gamma_{13} & \gamma_{14} & \gamma_{15} \\ \gamma_{21} & \gamma_{22} & \gamma_{23} & \gamma_{24} & \gamma_{25} \\ \gamma_{31} & \gamma_{32} & \gamma_{33} & \gamma_{34} & \gamma_{35} \\ \gamma_{41} & \gamma_{42} & \gamma_{43} & \gamma_{44} & \gamma_{45} \\ \gamma_{51} & \gamma_{52} & \gamma_{53} & \gamma_{54} & \gamma_{55} \end{bmatrix} \begin{bmatrix} \Delta Y_{t-1} \\ \Delta NER_{t-1} \\ \Delta INF_{t-1} \\ \Delta R_{t-1} \\ \Delta i_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \end{bmatrix}$$

Where Y_t , NER_t , INF_t , R_t , i_t , γ_{tij} , ε_{it} , are Output, Exchange Rate (Domestic exchange rate/US Dollar, Inflation rate, International reserve, Money market rate, Coefficient of VECM Model regression, Error term, respectively.

Impulse response function (IRF) was used to examine the comparison of exchange rate passthrough among the countries before and after implementation of ITF. IRF is used to identify the responses of inflation rate toward shock of exchange rate. This value is the parameter of exchange rate passthrough.

Forecast error variance de-composition was used to see the impact of implementation of ITF toward monetary policy responses while there is a shock in exchange rate, hence we can obtain the analysis of fear of floating behavior. Based on Nogueira (2006), a country is indicated with fear of floating symptom if there is intervention to exchange rate either through international reserves or interest rate, meanwhile the exchange rate passthrough is considerably low. It makes the intervention of exchange rate cannot be linked as control of inflation.

RESULT

Comparison of exchange rate passthrough before and after implementation of ITF

Table 2 shows the exchange rate passthrough which is responses of inflation in 12 months to 1 percent exchange rate shock.

Table 2 *Exchange Rate Passthrough*

Negara	Pre ITF	Post ITF
High Income Countries		
Canada	0.196	0.007
Sweden	0.006	-0.001
Norwich	0.003	-0.009
Switzerland	-0.02	0.001
South Korea	0.06	0.06
Australia	0.023	-0.028
Finland	0.008	0.003
Poland	0.024	-0.008
New Zealand	0.131	-0.001
UK	0.079	-0.003
Middle Income Countries		
Indonesia	0.39	0.025
Thailand	0.006	-0.04
Philipine	0.072	-0.003
Mexico	0.463	0.012
South Africa	0.068	0.007
Brazil	0.08	0.019
India	-0.076	0.099
Peru	0.013	0.005

Notes: The Numbers shows responses of inflation in 12 months to 1 standard deviation exchange rate shock

Table 2 shows that there is decreasing of passthrough in most countries after implementation of ITF, where middle income countries still have higher passthrough than high income countries. New Zealand is noted as the most succesfull country in lowering passthrough in high income countries group from 0.131 to -0.001 after the implementation of ITF. South Korea has same passthrough before and after ITF.

So does Switzerland which has low and constant passthrough for both periods.

The passthrough in middle income countries group is also decreasing, but the average is still higher than high income countries group. Indonesia, Mexico, Brazil, and India relatively have higher passthrough than other middle income countries after ITF. Thus, exchange rate is still important variable to drive domestic inflation.

Fear of floating analysis

Table 3 monetary policy responses analysis

No	Countries	Behavior
High Income Countries		
1.	Canada	*Fear of inflation*
2.	Sweden	*Fear of floating*
3.	Norwich	*Fear of inflation*
4.	Switzerland	*Fear of inflation*
5.	South Korea	*Fear of inflation*
6.	Australia	*Fear of floating*
7.	Finland	*Fear of inflation*
8.	Poland	*Fear of floating*
9.	New Zealand	*Fear of inflation*
10.	UK	*Fear of inflation*
Middle Income Countries		
1.	Indonesia	*Fear of inflation*
2.	Thailand	*Fear of floating*
3.	Philipine	*Fear of inflation*
4.	Mexico	*Fear of inflation*
5.	South Africa	*Fear of inflation*
6.	Brazil	*Fear of inflation*
7.	India	*Fear of inflation*
8.	Peru	*Fear of inflation*

Forecast Error Variance Decomposition (FEVD) analysis shows that intervention on exchange rate either direct intervention by using international reserve instrument or indirect intervention by using interest rate instrument decreased in most countries after implementation of ITF. It is seen from decreasing of variance of international reserve and interest rate explained by variance of exchange rate.

Meanwhile, the variance of interest rate explained by variance of inflation increased after ITF. It means that most countries focused on inflation control instead of exchange rate control after ITF.

Considering that exchange rate shock still has effect on domestic inflation (exchange rate passthrough), intervention on exchange rate can be interpreted as control of inflation rather than fear of floating behavior. However, in this results, there are some countries with indication as fear of floating behavior. Countries with fear of floating symptom are Sweden, Australia, and Poland in high income countries group, and Thailand in middle income countries group.

The factors that makes a country has fear of floating behavior are: High foreign debt in foreign exchange rate; competitiveness effect; balance of payment effect (Ball and Reyes, 2004). Another factor that makes a country has fear of floating behavior is exchange rate fleksibility can increase uncertainty and decrease middle income countries access to international financial market.

CONCLUSIONS

In this paper we have analyse exchange rate passthrough and fear of floating behavior in high income and middle income countries before and after implementation of ITF. The results shows that exchange rate passthrough decreased after implementation of ITF in most countries. However, pass-through effect does not dissappear completely, thus exchange rate still has significant role to determine domestic inflation. FEVD analysis shows that exchange rate intervention decreased after ITF in most countries. Exchange rate shock towards inflation makes intervention on exchange rate can be interpreted as

inflation control instead of fear of floating symptom.

The implementation of ITF as monetary framework needs to be reconsidered since it requires only inflation as nominal anchor. Efectivity of inflation targeting can decreased due to Exchange rate intervention. Passthrough effect is still exist after ITF particularly in middle income countries so that central bank should always make intervention on exchange rate to prevent domestic inflation caused by exchange rate shock. However, before central bank make the intervention, it needs to know clearly any factors that cause exchange rate depreciate. So it can make sure that it does not cause wrong policy respons.

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Table 4 Variance of interest rate explained by variance of exchange rate

Countries	Periods	1 Month	6 Month	12 Month
Canada	Pre ITF	7.81645	27.54942	30.20365
	Post ITF	1.071463	4.846230	5.211894
Sweden	Pre ITF	2.012271	3.85959	3.351868
	Post ITF	0.390066	3.113577	4.048951
Norwich	Pre ITF	0.781181	0.918619	0.910311
	Post ITF	0.179247	8.311035	9.466322
Switzerland	Pre ITF	11.66846	12.42228	12.016
	Post ITF	0.247990	0.063325	0.125192
South Korea	Pre ITF	14.32397	31.09765	28.15206
	Post ITF	3.315464	9.997735	11.99188
Australia	Pre ITF	0.564987	7.65411	8.109677
	Post ITF	3.836598	22.8387	26.7924
Finland	Pre ITF	4.257436	27.58337	22.47378
	Post ITF	4.441817	7.682253	8.743921
Poland	Pre ITF	0.653875	0.69058	0.34483
	Post ITF	0.106431	1.398875	1.334197
New Zealand	Pre ITF	0.995822	26.02252	36.48023
	Post ITF	0.001585	0.100124	0.095735
UK	Pre ITF	11.5008	8.630392	8.525447
	Post ITF	0.579219	6.966029	7.781542
Indonesia	Pre ITF	1.395129	37.75485	43.64112
	Post ITF	0.245056	0.310012	0.269653
Thailand	Pre ITF	4.486496	5.317761	6.272180
	Post ITF	3.489034	3.295796	3.412816
Philipine	Pre ITF	0.236608	4.216861	4.47853
	Post ITF	0.102992	0.203247	0.260488
Mexico	Pre ITF	25.10861	54.858	57.37533
	Post ITF	2.959431	7.413982	7.909458
South Africa	Pre ITF	9.323478	29.40928	32.23603
	Post ITF	1.071463	2.586435	2.753893
Brazil	Pre ITF	0.853838	11.6407	12.32674
	Post ITF	0.388557	3.502838	3.270021
India	Pre ITF	2.387195	10.37858	13.69432
	Post ITF	0.275673	0.447499	0.594767
Peru	Pre ITF	0.012164	25.33358	20.22895
	Post ITF	3.241689	8.458415	8.541282

Notes: The number is percentage of variance of interest rate explained by varianceof exchange rate after 1,6, and 12 months

Table 5 Variance of interest rate explained by variance of inflation

Countries	Periods	1 Month	6 Month	12 Month
Canada	Pre ITF	0.062416	0.01859	0.01177
	Post ITF	10.03711	15.64934	17.3414
Sweden	Pre ITF	0.634458	13.60431	26.18416
	Post ITF	11.29097	7.725303	7.435974
Norwich	Pre ITF	0.562069	0.545431	0.613425
	Post ITF	0.222713	0.431723	0.372064
Switzerland	Pre ITF	1.247193	6.92823	8.092511
	Post ITF	0.540293	0.298175	0.281116
South Korea	Pre ITF	4.974581	2.612050	1.933626
	Post ITF	1.4517	8.276547	9.093486
Australia	Pre ITF	1.457241	12.0587	14.52633
	Post ITF	0.007375	0.025908	0.012695
Finland	Pre ITF	0.276127	0.501099	2.405348
	Post ITF	12.00577	29.45717	28.23065
Poland	Pre ITF	5.275829	48.02014	60.49558
	Post ITF	2.394815	10.00942	12.67453
New Zealand	Pre ITF	0.63622	8.09879	11.39071
	Post ITF	1.081848	8.464353	11.92389
UK	Pre ITF	3.220354	1.259294	0.821387
	Post ITF	0.014216	0.088645	0.060417
Indonesia	Pre ITF	24.92612	32.47818	32.10813
	Post ITF	3.428209	26.0166	29.43829
Thailand	Pre ITF	0.403710	1.406325	0.712645
	Post ITF	0.0786	1.404071	1.490215
Philipine	Pre ITF	0.122975	9.796428	11.42763
	Post ITF	0.315427	4.668927	8.043556
Mexico	Pre ITF	18.94664	9.624112	8.759018
	Post ITF	0.842923	4.304827	4.748631
South Africa	Pre ITF	0.811872	4.192524	4.292827
	Post ITF	10.03711	15.64934	17.3414
Brazil	Pre ITF	6.738214	10.34006	13.50028
	Post ITF	2.840434	17.98737	23.86888
India	Pre ITF	7.847316	11.8941	12.71291
	Post ITF	7.783034	2.610035	1.583121
Peru	Pre ITF	0.034211	29.51039	43.51594
	Post ITF	4.634863	12.0619	13.70073

Notes: The number is percentage of variance of interest rate explained by varianceof inflation after 1,6, and 12 months

Table 6 Variance of international reserve explained by variance of exchange rate

Countries	Periods	1 Month	6 Month	12 Month
Canada	Pre ITF	13.23105	15.90569	16.99888
	Post ITF	10.27830	8.249491	8.161157
Sweden	Pre ITF	3.03057	3.83769	3.977690
	Post ITF	3.066112	7.11541	7.925348
Norwich	Pre ITF	3.591056	2.875646	2.676655
	Post ITF	3.271937	1.667908	1.264868
Switzerland	Pre ITF	3.354466	2.790583	2.956453
	Post ITF	0.328963	0.048934	0.041512
South Korea	Pre ITF	6.920251	1.491882	0.997184
	Post ITF	25.67501	30.68508	30.58824
Australia	Pre ITF	14.0071	20.30808	20.36699
	Post ITF	2.808203	2.785207	2.306681
Finland	Pre ITF	1.636326	4.903472	14.21598
	Post ITF	1.306822	2.22855	2.614411
Poland	Pre ITF	2.147112	2.087379	1.143587
	Post ITF	18.91141	22.44574	22.28565
New Zealand	Pre ITF	2.896759	1.849368	1.567321
	Post ITF	1.58064	5.158534	5.397957
UK	Pre ITF	48.10945	53.97087	55.4096
	Post ITF	7.207862	6.451812	6.545576
Indonesia	Pre ITF	0.082145	3.923148	3.670322
	Post ITF	7.868739	7.8562	7.872501
Thailand	Pre ITF	0.403978	7.809192	7.857587
	Post ITF	2.626072	5.991780	6.301078
Philipine	Pre ITF	2.145028	4.159129	4.217554
	Post ITF	7.651996	17.8571	18.82021
Mexico	Pre ITF	19.35459	14.60863	17.48311
	Post ITF	10.28903	4.460832	3.373705
South Africa	Pre ITF	14.74284	18.14091	20.12723
	Post ITF	10.27830	8.249491	8.161157
Brazil	Pre ITF	5.879066	7.801357	7.846514
	Post ITF	1.456550	5.408142	6.253920
India	Pre ITF	11.39702	27.62412	33.56837
	Post ITF	0.047237	0.494937	0.717778
Peru	Pre ITF	2.615471	0.568814	0.409158
	Post ITF	1.574132	9.918944	11.26945

Notes: The number is percentage of variance of international reserve explained by variance of exchange rate after 1,6, and 12 months