Measuring Inflation Persistence (a Case Study in four Asian Countries)

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ABSTRACT

This study discusses about the relationship between inflation targeting framework and its impact on inflation persistence in four Asian countries. The aim of this study is to explore the impact of the adopting Inflation Targeting Framework which could be inferred from the coefficient of persistence of inflation. Inflation persistence coefficient will be measured by an autoregressive model, a median unbiased estimator and bootstrapped confidence bands. The results showed that the average of inflation persistence tends to decline when inflation targeting framework was adopted. The use of structural break test for some macroeconomic variables in this study indicated shocks in 1998.

Keywords: inflation targeting, inflation persistence, median unbiased estimator, bootstrapped confidence bands, and structural break

1. Background

Inflation Targeting Framework policy framework is popular monetary policy that adopted by Asian countries after the economic crisis of 1998. Some economists argue that the ITF is a solution of the exchange rate turbulence that occurs at that time. Some Asian countries are adopting the policy framework is Korea in 1998, Indonesia and Thailand in 2000, and the Philippines in 2002 as quoted in Ito and Hayashi (2004).

This paper aims to look at the effectiveness of the policy framework in controlling inflation as the purpose of the framework adopted. A few different arguments about the effectiveness of ITF much discussed by other writers such Goncalves and Salles (2008) and Lindan Ye (2009) who found a significant reduction in inflation after adopting Inflation Targeting, but Brito and Bystedt (2010) did not find such results.

The contradictive results made the authors interested to prove whether Inflation targeting is sufficient to work effectively in reducing inflation in four Asian countries such as Indonesia, Thailand, Korea and the Philippines.

2. Theoretical Review

Considering the relationship between monetary aggregates and goal variables such as inflation, many countries have recently adopted inflation targeting as their monetary policy regime. New Zealand was the first country to formally adopt the inflation targeting in 1990, then followed by Canada in 1991, England in 1992, Sweden in 1993, Finland in 1993, Australia in 1994 and Spain in 1994. Israel and Chile also have adopted inflation targeting framework.

Inflation Targeting is a monetary policy strategy that includes 5 (five) elements, namely: 1) Notice to the public about the medium-term target for inflation, 2) institutional commitment on price stability as the primary objective of monetary policy; 3) Information about the strategies included in the several variables, not simply monetary aggregates or the exchange rate, which is used in deciding the setting of policy instruments; 4) Improve the transparency of monetary policy through communication with the public and the markets about the plans, goals and

decisions of the monetary authorities, and 5) Improve accountability of monetary Central Bank to achieve the inflation goal. The fifth element of bias should clarify one crucial point about inflation targeting: that it requires more than the announcement to the public about numerical targets for inflation for next year. This becomes especially important for countries that are members of the emerging market countries, because most of them are routinely reported numerical inflation targets or objectives as part of the government's economic plan for the coming year, and yet they are not monetary policy strategy should be marked as inflation targeting, which requires that the other four elements for sustainable medium-term objective (Mishkin, 2000)

Inflation targeting, such as exchange rate targeting, also has the major advantage that it is easily understood by the public and can be very transparent. Monetary targets tend to be easily understood by the public of the inflation target, and if the relationship between monetary aggregates and inflation goal variables subject to unexpected changes, as happens in many countries, including countries that has long been applying inflation targeting such as Switzerland, the monetary targets will lose transparency because they are no longer able to send an accurate signal of the monetary policy stance. But since the time-inconsistency is more likely to come from the political pressures on the central bank to engage in overly expansionary monetary policy, the main advantage of inflation targeting is that it can help focus the political debate on what a central bank can do in the long term (ie control inflation, promote economic growth and the number of jobs permanently through expansionary monetary policy). Thus inflation targeting has the potential to reduce political pressure on the central bank to pursue inflationary monetary policy and therefore less time inconsistent from policy makers.

Although the rhetoric of effort into achieving "price stability" in practice all that apply inflation targeting countries have selected to target the inflation at the level of the prices they charge their own. In addition, all inflation targeting countries have selected midpoints for their inflation targets to be far above zero, and on a reasonable estimate measurement bias likely increase in the inflation rate calculated from the consumer price index. For example, when New Zealand had the lowest midpoint of the inflation target of 1.5% while Canada and Sweden set the mid-point inflation target of 2%, the UK, Australia and Spain currently has a midpoint of 2.5% while Israel is at 8.5 %. It is important to recorded that Germany even considered as one of the most firmly against inflation, it can be proved to establish long-term inflation goal of 2% for many years (later changed to 1.5 to 2% in December 1996), appropriate in the middle of the pack for the targeter inflation country..

The decision Targeter inflation countries (and countries such as Germany, hybrid targeters) to select target inflation far above target of zero price does not reflect the level of concern of monetary policy that inflation is too low or even very low, then this will have a negative impact on economic activity real sector. There are very strong reasons about the fear of the threat of deflation, including the possibility that it may encourage financial instability and trigger a severe economic contraction (Miskhin 1997). Indeed deflation is associated with a deep recession or even depression, as in the 1930s, and the recent deflation in Japan has become one of the factors that undermine the financial system and the economy. The target inflation rate over zero makes a small possibility that the period of deflation. Evidence from surveys on inflation expectations and interest rates (Almeida and Goodhart, 1998, Laubach and Posen (1997) and Bernanke, Laubach, Mishkin and Posen, 1998) suggests that maintaining an inflation target above zero (but not too far above the level) for an extended period will cause instability in inflation expectations or decrease the credibility of the central bank.

Other key features of the inflation targeting regime is that in fact they do not neglect the "traditional stabilization". Central bank governor who responsibly in implementing inflation targeting countries continue to express their concern about fluctuations in output and employment, and the ability to accommodate short-term stabilization objectives built up a certain level of inflation targeting regime. All countries are implementing inflation targeting has been willing to take a gradualist approach to disinflation in order to minimize the decline in output by lowering the medium-term inflation target towards the long term goal slowly over time.

Inflation persistence by Marques (2005) is defined as the rate of inflation rate to return to its equilibrium level after the onset of a shock. A high levels of speed indicates that the low level of inflation persistence and conversely high levels of inflation persistence shown by the length of the inflation rate back to its equilibrium level. Almost similar definitions presented Willis, 2003 (in Marques, 2005) who interprets the inflation persistence as the time required by inflation to return to baseline after the shock. Meanwhile, a more diverse alternative definition proposed by Batini (2002) discusses three types of inflation persistence, which (i) “positive serial correlation in inflation”; (ii)”lags between systematic monetary policy actions and their (peak) effect on inflation”; (iii)”lagged responses of inflation to non-systematic policy actions”.

In measuring the persistence of inflation, there are three important things to consider. First of all, inflation persistence estimation depends on the value of the assumed long-term inflation. To find out if the inflation moves fast or slow in the face of shocks, it is required information on the inflation path will be followed, if no shocks happen and how large the expected rate of inflation after a shock effect is lost. Second, if the long-term value of inflation must be assumed exogenous (determined by monetary policy) or endogenous (determined by the data). Third, the inflation target is moving can be a source of inflation persistence. For example, if the central bank's inflation target change, then the public will need time to learn the new inflation target. In this empirical study can be identified by the use of structural models.

Study on inflation persistence is important for improving the ability of forecasting inflation, gain visibility the dynamic effects of exogenous price shocks, provide information / guidance and improve monetary policy, and to assess whether a different monetary policy regimes will produce different persistency.

3. Data and Methodology

In this paper we use yearly inflation rates, interest rates, output gap and exchange rates. The data set spans the period 1961-2011 and are taken from the IMF's International Financial Statistics database. We study Indonesia, Korea, the Philippines and Thailand which all conduct monetary policy using IT. Many research on inflation persistence are using unit root tests that provide limited information on the degree of persistence, as in the unit root test, the unit root test is actually simply focused on testing the null hypothesis that states the sum of the autoregressive coefficients is unity in the representation of an AR series against the alternative hypothesis that states the sum of the autoregressive coefficient is less than 1. Conversely, the confidence intervals of summation AR coefficients provide much description of the statistical information of a variable persistence. In this study, will be tested using a more modern econometric procedure is a bootstrap Grid by Hansen in 1999 to estimate the 95% confidence interval for the sum of AR coefficients in the AR representation for inflation persistence unlike conventional techniques or bootstapped confidence interval, Hansen 1999 Grid Bootstrap procedure produces confidence closest to integration variable interval with coverage of the first order asymptotic summation AR coefficients. This technique is good enough to estimate the finite sample.

Bootstrap Approach (Grid Bootstrap by Hansen 1999) for Inflation Persistence

This method is another method used in estimating inflation persistence based grid bootstrap presented by Hansen in "The Grid Bootstrap and the Autoregressive Model" written in 1999. Mathematically to calculate the value of the persistence of inflation is based on the following equation:

$$\pi_t = \alpha + \rho\pi_{t-1} + \sum_{j=1}^{k} \gamma_{j\Delta}\pi_{t-k} + \varepsilon_t \quad \text{.....(1)}$$

Where $\Delta\pi_t = \pi_t - \pi_{t-1}$. If ρ =1, inflation process will contain unit root. In the terminology of the model above, it will be thought of as a situation in which inflation control is weak and variance of the permanent shock is greater than the variance of transitory shocks. If conversely, [ρ] <1, the process is stationary and there is at least some control over inflation. In the empirical application below, appropriate lag length is $q \leq qmax$ were selected based on Akaike Information Criterion (AIC) with a maximum lag is Qmax = 6 (quarter).

Estimate of ρ obtained from least squares estimation bias hold of decline as a result of ρ close to 1. Further, confident bands based on the normal distribution ρ which does not have the correct coverage. Therefore, this study followed the literature that used Hansen (1999) the median Unbiased estimator of ρ. Grid bootstrap approach is used to build confident bands for ρ with correct coverage.

This research will use the 200 grid points and 1999 replication, the value obtained from a previous study using the same method. For example, research from Zhang and Clovis (2009), "Modeling China Inflation Persistence" which also uses 200 grid points and 1999 replication.

Econom̃terics Model Grid-Bootstrap Hansen (1999)

Consider the autoregressive process for *yt*:

$yt = \mu + \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \ldots + \alpha_p y_{t-p} + e_t$ ……..(2)

For *t = 1, 2, 3, ... T*. Arguments Andrews and Chen (1994) stated that informative scalar measure of persistence in the AR process is the sum of the AR coefficients, the cumulative impulse response (CIR is the sum of the impulse response function of the time) is connected with through *CIR α = 1 / (1 - α)*. Andrews and Chen (1994) saw α is more informative than the roots of a large unit of the model AR (*p*), since the two models AR (*p*) with identical unit root is most likely very different about the persistence property.

Yt is stationary, if <1 when yt is a unit root process if α = 1. Need to be considered if there is a condition if α> 0, as in accordance with the relevant range for inflation data. Thus directly be estimated through an equation α with designing and using OLS techniques to estimate the Augmented Dickey Fuller (ADF, 1981) and Said and Dickey (1984) regression model:

$$yt = \mu' + \alpha yt - 1 + \sum_{j=1}^{k} \beta j \Delta yt - j + et$$

……..(3)

Where $\Delta y_t = y_t - y_{t-1}$ the design of the above models of α confidence interval is problematic because the asymptotic distribution of the OLS estimator (as convergence rate) is different in the case of stationary and unit root. Rigidly expressed, if α < 1, the confidence intervals of α can be calculated through conventional methods based on asymptotic standard normal distribution. However, the conventional procedure asymptotic bad enough when applied to the sample is limited, especially when α is close to unity. In fact, if formalized cases of near-unit-root in the framework of local-to-unity, where $\alpha = 1 + c / T$ where c is assumed constant as $T \rightarrow \infty$. Conventional t-statistic is used to create the asymptotic interval for α which has a nonstandard distribution. In this case, the conventional confidence interval is not valid in the asymptotic and will show poor results in the limited sample. We can not avoid this difficulty by relying only on conventional bootstrap procedures, as well as conventional bootstrapping will fail to produce a confidence interval with coverage of first-order asymptotic (Basawa et al, 1991). The problem that occurs is the asymptotic t-statistic depends on *c* and *α*, while the conventional bootstrap procedure implicitly assumes that the t-statistic is important.

Hansen (1999) devised a procedure for designing a confidence interval for α with the correct first-order asymptotic coverage. Hansen (1999) grid-bootstrap procedure is an alternative to conventional bootstrap percentile-t which provides a correct first-order asymptotic coverage in the local-to-unity framework. The key difference between conventional and grid-bootstrap bootstrap procedure is that the grid-bootstrap to calculate the empirical quantile of the t-statistics for the entire grid of α values and can not be estimated with OLS. Specifically, consider the grid value of α, αi (i = 1, ... B), cover value of $\hat{\alpha}$. To estimate the data-generating process for each *αi*, can be estimated with the following equation *αi* limit *α*, use restricted OLS for each *αi*. Restricted OLS estimated parameters, together with the re-sample the restricted OLS residuals, which are used to increase the number of pseudo-samples for each αi. For each of the 2000 pseudo-samples for each *αi*, then the t-statistic can be calculated $t_i^* = (\hat{\alpha}_i^* - \alpha_i) / s(\hat{\alpha}_i^*)$.

Zivot and Andrews (1992) Unit Root and Structural Break

Stationarity test is a precondition for any cointegration test. Many previous studies using the ADF unit root test to examine the stationarity properties of the data. However, this test does not allow for a structural break in the time series that has a significant impact on the results of stationary data. The test results are likely to be biased towards not rejecting the unit root, especially with the data that have a short time span (Perron, 1989).

To explain the structural changes, Perron (1989) introduced a dummy variable to test ADF. The null hypothesis of this test is a unit root with exogenous structural break occurs at a particular time and T_b is the alternative hypothesis that the data series is stationary with exogenous changes in the current trend of a particular T_b. This procedure has received critique as exogenous determination of break time to allow the risk of a wrong choice period. Zivot and Andrews (1992) argues that the selection of the exogenous structural break may lead to rejection of the unit root

hypothesis. They emphasized that the conclusion of the break point of the examination of data can make a critical value of the conventional test parameters become invalid. This is supported by Christiano (1992) who showed that the rejection procedure distribution theory underlying conventional testing.

Zivot and Andrews (1992) develop a unit root test procedures that allow for structural breaks that might occur in a series of data, without defining first a break point. The procedure is simply to determine the structural break point endogenously without worrying problem of choosing the break point subjective. They show that the selection of the break point endogenously have a great impact on the results of the unit root. They can not reject the unit root hypothesis for the four data series Nelson and Plosser (1982), which was rejected by Perron (1980).

This study tested the data for four variables that enter into the scope of the study, namely: (i) inflation, (ii), exchange rate, (iii) interest rate, and (iv) the output gap for the four countries that used research sample. Then from each of these data series are distinguished by the pre crisis in 1998, and after the 1998 crisis. There are three models for unit root testing. The first model (Model A) possible changes in the level of the time series data. The second model (Model B) permit one time change in the slope of the trend function. The third model (Model C) combines the time series of changes in the level and slope of the trend function.

Model A $$:\Delta yt = c + ay_{t-1} + \beta t + \gamma DUt + \sum_{j=1}^{\kappa} dj\Delta y_{t-j} + \varepsilon t \quad \text{.....(4)}$$

Model B $$:\Delta yt = c + ay_{t-1} + \beta t + \vartheta DTt + \sum_{j=1}^{\kappa} dj\Delta y_{t-j} + \varepsilon t \quad \text{.....(5)}$$

Model C $$:\Delta yt = c + ay_{t-1} + \beta t + \vartheta DUt + \gamma DTt + \sum_{j=1}^{\kappa} dj\Delta y_{t-j} + \varepsilon t \quad \text{.....(6)}$$

The equation above similar to the ADF unit root test but by including dummy variables. DU_t is an indicator dummy variable for a mean shift occurring at each possible break date (TB), while DT_t is the corresponding trend shift variable, then formally:

$$DU_t \begin{cases} 1 \dots\dots if \rightarrow t \succ TB \\ 0 \dots\dots otherwise \end{cases}$$

and

$$DU_t \begin{cases} t - TB \dots\dots if \rightarrow t \succ TB \\ 0 \dots\dots otherwise \end{cases}$$

To calculate the number of *k*, this study followed the procedures used in Zivot and Andrews (1992) to enable a maximum lag of 12. In accordance with the specified amount of lag when the value of I has been chosen such that the t-statistics θi is greater than the absolute value of 1.6, and statistics for θi + n for n> 0 is less than 1.6. Rejection of the unit root hypothesis decision is determined by the critical values are generated. Asymptotic distribution of the minimum t-statistic and the critical value for rejecting the null hypothesis provided by Zivot and Andrews (1992).

According to Perron (1989), most of the time series can be modeled quite well by a Model A or Model C. Consequently, many subsequent studies that focus on both models in their time series analysis. Sen (2003) revealed that the application of Model A cause great loss of power when in fact break occurred in Model C. however, if a break occurs in Model A but Model C is used, it will be minimal loss of power. This show Model C is better than Model A.

4. Findings

Several studies on the impact of the ITF is already much developed, one of which is the linking between the ITF and the persistence of inflation. This research will be discussed on the calculation of inflation persistence and high

volatility proving that indeed the case with macroeconomic variables during the financial crisis in 1997-1998. The crisis phenomena later that became the the reason why some Asian countries choose the policy as introduced by Bernanke and Mishkin (1997) is the solution of economic turbulence that occurred at the time. There are other such expert opinions Walsh (2009) who has opinion that several unsuccessful monetary policy based on monetary aggregates (monetary base) and exchange rates (exchange rate). In this research will try to detect the impact of monetary policy on the persistence of inflation ITF before and after the financial crisis.

Descriptive Statistics Macroeconomic Data in Four Asia Countries that Adopted ITF

Below will be described how the condition of some economic variables that are interrelated and considered into research objects.

Table 1. Inflation Descriptive Statistics four countries that adopted ITF

Variable	Mean		Varian	
	Pre-1997	Post-2000	Pre-1997	Post-2000
Indonesia				
Interest Rate	11.44	3.71	21.33	21.83
Inflasi	65.55	7.91	36404.05	10.34
Output Gap	-0.40	-0.06	6.80	0.01
Exchange Rate	-0.026	0.024	0.045	0.010
Korea Selatan				
Interest Rate	2.41	3.61	8.00	1.47
Inflasi	10.30	3.18	52.51	0.61
Output Gap	0.06	-0.01	0.03	0.01
Exchange Rate	-0.011	0.002	0.011	0.010
Filipina				
Interest Rate	5.15	4.44	36.00	2.35
Inflasi	11.05	4.58	90.83	2.85
Output Gap	0.003	-0.04	0.02	0.01
Exchange Rate	-0.008	0.025	0.022	0.006
Thailand				
Interest Rate	7.76	3.56	11.53	2.73
Inflasi	5.47	2.63	27.61	3.27
Output Gap	0.03	-0.05	0.02	0.01
Exchange Rate	-0.014	0.016	0.003	0.004

Source : author's calculation, 2013

Based on the descriptive statistics above is shown a decrease in the average of several macroeconomic variables before 1997 and after 2000. The subdivision distinguished based on crisis that occurred in 1998. A significant decrease in the variable inflation, which in the four Asian countries that adopted the ITF are decreasing significantly. There are other variables, that is the level of interest rates (interest rate) which also decreased on average, only in South Korea, which increased the average. Such a condition is actually an early evidence of how inflation targeting framework works well enough to reduce the volatility of inflation and other macroeconomic variables. This finding is widely supported by the findings of Gerlach and Tillmann (2012) which also mention that the monetary policy framework in favor of inflation targeting does have a significant impact in decreasing inflation after 2000 or after the 1998 financial crisis.

Unit Root Test (ADF Test and KPSS Test)

Unit root test is a test of the most fundamental test in the analysis of time series. The following will be shown unit root test results for several macroeconomic variables using ADF test and KPSS tests.

Table 2. Unit Root Testing (ADF and KPSS) for Macroeconomics Variable

	ADF	KPSS	Prob
Indonesia			
Interest Rate	-9.158656	0.257709	0.0000
Inflation	-10.73729	0.225725	0.0000
Output Gap	-92.88308	0.123005	0.0001
Exchange rate Gap	-8.563392	0.053139	0.0000
Korea Selatan			
Interest Rate	-5.336487	0.081444	0.0001
Inflation	-6.550317	0.229543	0.0000
Output Gap	-9.239431	0.118110	0.0000
Exchange rate Gap	-7.844508	0.155541	0.0000
Filipina			
Interest Rate	-6.967813	0.215658	0.0000
Inflation	-8.810199	0.500000	0.0000
Output Gap	-7.459673	0.049040	0.0000
Exchange rate Gap	-7.076655	0.047723	0.0000
Thailand			
Interest Rate	-7.432363	0.043470	0.0000
Inflation	-7.244085	0.213688	0.0000
Output Gap	-5.520771	0.037674	0.0000
Exchange rate Gap	-6.818434	0.040259	0.0000

Notes : KPSS was also used and results were consistent with ADF tests.
Source : Author's calculation, 2013

Unit root test results that shown above that all macroeconomic variables observed are stationary at *1st difference* level. Once all the data is stationary then the next test can be done to see massive inflation persistence coefficient in the four countries included in the observation.

Inflation Persistence in Four Asian countries that adopted the Inflation Targeting Framework

Autoregresive model is helpful to understand how the success of inflation targeting to reduce the persistence of shocks to inflation, it is very easy to adjust the data collection. Following O'Reilly and Whelan (2005) and Levin and Piger (2006) in Gerlach and Tillmann (2012), a measure of inflation persistence are more inclined to the sum of the autoregressive coefficients of the univariate inflation process.

Some of the problems found in the use of autoregressive models in calculating the inflation persistence is because the model allows the unit root issues contained therein. Therefore, in the research Gerlach and Tillmann (2012) and Rapach and Wohar (2004) using the technique of Hansen (1999) grid-bootstrap adopted from the writings of Hansen (1999) on "The grid bootstrap and the autoregressive model". Thus by using the technique of existing problems can be resolved in the model Autoregresive.

The following are estimated for the calculation of inflation persistence using both techniques that have been presented above. The second use of this technique as a comparison value of the coefficient is reasonable. Table 3 presents the coefficients of inflation persistence for four Asian countries that adopted the ITF.

Table 3. Inflation Persistence in four Asian countries that adopted Inflation Targeting Framework

Economy	Sample	ρ_{ols}	ρ	90% confidence band
Indonesia	1961 – 1997	0.38	0.16	-0.058; 0.733
	2000 - 2011	0.65	-0.40	-1.005; 1.495
	2000 - 2007	0.61	NA	
	Full sample	0.38	0.24	0.067; 0.622
Korea Selatan	1961 – 1997	0.87	0.62	0.507; 1.087
	2000 - 2011	0.95	-0.72	-1.516; 1.549
	2000 - 2007	0.97	-0.16	-1.420; 2.752
	Full sample	0.87	0.62	0.516; 1.029
Filipina	1961 – 1997	0.69	0.06	-0.190; 0.55
	2000 - 2011	0.82	-0.76	-1.44; 1.55
	2000 - 2007	0.84	NA	
	Full sample	0.70	0.18	-0.021; 0.549
Thailand	1961 – 1997	0.78	0.42	0.254; 0.254
	2000 - 2011	0.63	-0.10	-0.507; 1.846
	2000 - 2007	0.92	-0.81	-1.879; 1.683
	Full sample	0.76	0.44	0.284; 0.797

Notes
- ρ_{ols} coefficient persistence of inflation is calculated based on AR model
- ρ is the calculation of Hansen's (1999)mean unbiased estimator of the sum autoregressive coefficient and the bootstrapped 90% confidence bands which is based on the 200 grid points and 1999 replication. Selection of the number of grid points and replication is based on Stefan Gerlach and Peter Tillmann (2012)
- NA = can not be estimated caused less sample

Source : Author's calculation, 2013

From the calculation above shows that the phenomenon of decline in inflation persistence coefficient occurred after the 1998 crisis period. This can shown in the coefficient ρ is shown to decline following the crisis and the adoption of ITF to several Asian countries. Declining in inflation persistence coefficient is a reflection of the impact of the adoption of ITF in the four countries. The estimation results are also supported by the results of studies conducted by Gerlach and Tillmann (2012) which also showed more or less the same results.

Unknown-Break Point Test (Zivot Andrews Unit Root Test)

Structural Break testing considered as one of the analysis that needs to be done when studies using time series data in the form of macroeconomic data. Perron argued in his essay that most of the macroeconomic data series are not characterized by unit root instead of persistence shocks arise only due to the large and uncertain, and that the economy will return to the deterministic trend after a small shock and sustained. Another opinion is delivered by Perron that most macroeconomic series are not characterized by the presence of unit root. Indeed stationary fluctuations around a deterministic trend function, demonstrated in the only shocks that have persistent effects are the 1929 crash and 1973 oil price shock.

As described by Dickey and Fuller (1979) which states that there are linkages between stationarity and cointegration that allow for a structural break in the data series. Then Perron (1989) stated that the presence of a break in the data series allows a decrease in the probability of rejection of the null hypothesis which states no unit root problem. To overcome this, lets consider the proposed Perron known and exogenous structural break in the Augmented Dickey-Fuller (ADF) unit root test. Refers to opinions expressed Perron, some authors such as Zivot and Andrews (1992) and Perron (1997) to formulate the determination of the break point endogenously by the data itself.

Below are presented for multiple testing structural break in macroeconomic variables in ITF countries included in the observation.

Table 4. Unknown Zivot-Andrews Break Point Test for Macroeconomic Variables in four Asian Countries that Adopted Inflation Targeting Framework

Variable	Zivot-Andrews test Statistics	Break Point	Observasi	Optimum lag
Indonesia				
Interest Rate	NA	NA	NA	NA
Inflasi	-41.34120*	1998	52	5
Output (GDP)	NA	NA	NA	NA
Exchange Rate	NA	NA	NA	NA
Korea Selatan				
Interest Rate	NA	NA	NA	NA
Inflasi	NA	NA	NA	NA
Output (GDP)	-2.775751	1984	52	2
Exchange Rate	-5.109906*	1998	52	1
Filipina				
Interest Rate	NA	NA	NA	NA
Inflasi	-7.105652*	1986	52	-
Output (GDP)	-3.167295	2003	52	-
Exchange Rate	-3.347320*	1998	52	3
Thailand				
Interest Rate	NA	NA	NA	NA
Inflasi	-6.000530*	1982	52	1
Output (GDP)	-3.046732	1986	52	3
Exchange Rate	-5.911443	1998	52	4

Catatan : - * = significant at α 1%
** = significant at α 5%
*** = significant at α 10%
- The selection of optimum lag and break location seen by the trend and intercept
- NA = can not be estimated caused less sample

Source : Author's calculation, 2013

Based on the test results Unknown-Break Point Test (Zivot Andrews Unit Root Test) above found some mixed results. But it can be concluded generally, the conditions for each of the data series macroeconomic shocks experienced in each series were tested.

The results of the above analysis can be described as follows, to inflation in Indonesia have a break in 1998. Whereas in other countries, such as the Philippines and Thailand break that occurred in 1986 and 1982. The most interesting are observed exchange rate variable break occurred in all three countries South Korea, the Philippines and Thailand in the same year, 1998. This happens a systemic effect caused by the financial crisis in 1997-1998. GDP variable is seen going to break in different in each country in South Korea, the Philippines and Thailand. This happens because there are different factors that lead to different variables experienced shocks.

5. Conclusion

The monetary policy of any country in the world must always focus on low inflation and stable prices. It's a lot of steps or monetary policy options be applied by each country in order to achieve these objectives. Begin from monetary policy based on money growth commonly referred to as the monetary base, targeting the exchange rate, interest rate targeting and inflation targeting. Inflation Targeting or referred to as the ITF (Inflation Targeting Framework) is perceived experts is monetary policy feels most capable of leading edge reaching these goals.

This study focuses on the phenomenon of ITF applications in four Asian countries are adopting the policy framework and examine whether it is true that the policy framework is quite capable of reducing inflation volatility that occurs especially during the financial crisis in 1997-1998.

The level of success of the policy will be seen from the persistence of inflation in each country before the crisis and post-crisis. By using AR model calculations and Hansen (1999) grid-bootstrap was found in some countries inflation was reduced inferred from the persistence coefficient decreased after the financial crisis of 1997-1998. In addition there are other findings that prove that the financial crisis in quite an impact strong enough to volatility of several macroeconomic variables that go into observation.

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