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Article

Threshold effects of inflation on growth in the ASEAN-5 countries: A Panel Smooth Transition Regression approach

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ABSTRACT

The relationship between inflation and economic growth is a contentious issue. The present study is undertaking to test hypothesis that the relationship between inflation and economic growth is nonlinear. This pane data study involves ASEAN-5 countries over the period 1980–2011. Panel Smooth Transition Regression (PSTR) model is employed to estimate the threshold of inflation and its effects on economic growth. Furthermore, we also check robustness by using GMM-IV specification. The study finds that there exists a statistically significant negative relationship between inflation and growth for the inflation rates above the threshold level of 7.84%, above which inflation starts impeding economic growth in the ASEAN-5 countries. The results suggest that central banks in the ASEAN-5 countries could improve economic growth by reducing inflation when it is above or near the estimated thresholds. The threshold inflation level can be considered, therefore, as inflation targeting indicator to conduct monetary policy.

Los efectos umbral de la inflación en el crecimiento en los países del sudeste asiático: un enfoque del modelo de regresión fluida

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RESUMEN

La relación entre la inflación y el crecimiento económico es una cuestión polémica. El presente estudio trata de probar la hipótesis de no linealidad la relación entre la inflación y el crecimiento económico. Este estudio de regresión fluida incluye a los países ASEAN-5 durante el periodo 1980–2011. Se utiliza el modelo -*Panel Smooth Transition Regression* (PSTR)- para calcular el umbral de la inflación y sus efectos sobre el crecimiento económico. Además, revisamos también la solidez utilizando la especificación GMM-IV. El estudio encuentra que existe una relación negativa estadísticamente significativa entre la inflación y el crecimiento para las tasas de inflación superiores al umbral del 7.84%, por encima del cual la inflación impide el crecimiento económico en los países del sudeste asiático. Los resultados sugieren que los bancos centrales de estos países podrían mejorar el crecimiento económico mediante la reducción de la inflación, cuando esta es superior o cercana a los umbrales estimados. Por tanto, el nivel umbral de la inflación puede considerarse como un indicador objetivo de la misma para la realización de las políticas monetarias.

1. Introduction

Inflation's effects on an economy are various and can be simultaneously positive and negative. The relationship between inflation and economic growth is the subject that has long been intensely discussed and debated in the literature (López-Villavicencio & Mignon, 2011). A high economic growth in relation with low and stable inflation is the main objective of macroeconomic policy (Khan & Senhadji, 2001; Seleteng, Bittencourt, & van Eyden, 2013; Vinayagathasan, 2013). Some studies provide evidence that inflation has negative impact on medium and long run growth (Khan & Senhadji, 2001). These findings imply that inflation maintained at a certain magnitude is necessary to foster the development

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Table 1
Mean of real GDP growth rate per capita and mean of inflation rate over the period of 1980-2011 in the ASEAN-5 countries.

Country	Real GDP growth rate per capita (%)	CPI %
Indonesia	3.73	10.53
Malaysia	3.33	3.13
Philippines	0.85	9.18
Thailand	4.02	4.35
Vietnam	4.62	62.06

Author's calculation using data from Penn World Table (8.0) and Economy Watch.

of economy. All schools of economic thought have not favored accelerating inflation for undesirable distribution and social welfare effects (Eggoh & Khan, 2014). In the literature, various factors are considered as strong forces for determining and controlling price inflation. These factors include money supply, interest rate, potential output, exchanges rate, wage rate, trade openness and expectations (Zaman, Khan, Ahmad, & Ikram, 2011; Naz, Mohsin, & Zaman, 2012; Bhattacharya, 2014; Ghosh, 2014).

If inflation is detrimental to economic growth, the policy makers may keep low rates of inflation in order to achieve economic policy targets. Inflation targeting is a helpful policy tool in controlling inflation (Ayres, Belasen, & Kutan, 2014; Öztürk, Sözdemir, & Ülger, 2014). However, a few questions remain unanswered that how low is inflation rate? At what level is inflation detrimental to long-term economic growth? Answering these questions, it is not surprising that optimal level of inflation is detected in several recent empirical studies (see Ghosh & Phillips, 1988; Sarel, 1996; Khan & Senhadji, 2001; Bick, 2010; Seleteng et al., 2013; Vinayagathasan, 2013; Baglan & Yoldas, 2014; Eggoh & Khan, 2014). Optimal level or threshold level of inflation is at inflexion point which positive effects of inflation on growth exist when the inflation rate is low and negative effects when the inflation rate is high (Seleteng et al., 2013). If threshold level of inflation exists, the relationship between inflation and growth is non-linear, switching from positive to negative. Although, it seems that non-linear relationship of inflation and growth is widely accepted, there are still controversies about *(i)* the threshold level of inflation; *(ii)* the change of this relationship to used methodology, studied countries and time series... The threshold level is various depending upon country-specific characteristics (Khan & Senhadji, 2001; Eggoh & Khan, 2014; and Baglan & Yoldas, 2014). These authors explain that country-specific and time-specific structural break in inflation-growth relationship is higher for developing economies than for developed ones.

The recent years have seen an increase in the degree of social and economic integration in the members of ASEAN. The ASEAN Economic Community will be the goal of regional economic integration by 2015. They are emerging economies, while their initial development conditions are various. ASEAN countries show wide diversity in level of economic development, income per capita and inflation. Means of inflation rates in ASEAN countries ranged from 3.13 to 62% over the period of 1980-2011. The lowest inflation rates were observed in Malaysia and Thailand, at 3.13 and 4.35%, respectively, while the highest was posted by Vietnam, at 62%. Indonesia and Philippines maintained inflation rates at 9.18 to 10.5%, respectively. Meantime, the ASEAN countries showed rather low real GDP growth rate per capita. The lowest growth rate was posted by Philippines, at close to 1%, whereas the highest rate was topped by Vietnam at 4.6%. Malaysia, Indonesia and Thailand managed to temper growth rate from 3.3 to 3.7 and 4.02%, respectively (see Table 1). Table 1 also shows preliminary relationships between inflation and growth in the ASEAN countries. Countries such as Thailand and Malaysia had moderate growth rate when accompanied by a low inflation rate in long run. High level of inflation halted economic growth for Philippines in long run.

In the ASEAN's region context, research in inflation-growth non-linear relationship has been rather few. We hypothesize that there exists non-linear relationship between inflation and growth in the ASEAN countries. The present study is designed to test the hypothesis by empirically estimating threshold level of inflation and the smoothness of the transition from a low to high regime inflation in the ASEAN-5 countries, namely Indonesia, Malaysia, the Philippines, Thailand and Vietnam. By using a panel data of the ASEAN-5 countries over the period of 1980-2011, we adopt the Panel Smooth Transition Regression (PSTR) model developed by González, Teräsvirta and Dijk (2005) and GMM-IV specification for inflation threshold and inference. With regard to the specifications of panel analysis or PTR, the main advantage of the PSTR is that it allows the inflation-growth coefficient to vary according to the country and with the time. The PSTR model allows individuals move between groups and over time depending on changes in the threshold variable. The PSTR model also provides a parametric approach of the cross-country heterogeneity and of the time instability of the inflation-growth coefficients, since these parameters change smoothly as a function of a threshold variable.

The remainder of the paper is as follows. The next section briefly presents previous literature review. Section 3 reviews panel threshold estimation. Section 4 introduces variables and data. Section 5 presents the estimated results for the inflation-growth nexus. Finally, Section 6 concludes the study.

2. Literature review

What level of inflation is harmful to economic growth? Economic theories come to various conclusions about the response of output growth to inflation. The aggregate supply-aggregate demand (AD-AS) model also explains a positive relationship between inflation and output growth where, as output rises, so do inflation. Phillips curve shows a trade-off between inflation and unemployment rate. Phillips curve interprets that the higher rate of inflation, the lower the unemployment and vice-versa. However, Phillips curve fails to justify the situations of stagflation, when both inflation and unemployment are alarmingly high. Keynesian and Neo-Keynesian theory provide a more comprehensive model for linking inflation to growth under the AD-AS framework. Under this model, there is a short-run trade-off between output and the change in inflation, but no permanent trade-off between output and inflation. The quantity theory of money emphasizes the critical role of monetary growth in determining inflation. Monetarism suggests that if the growth in the money supply is higher than the output growth, inflation will result. Neo-classical and endogenous growth theories account for the effects of inflation on growth through its impact on investment and capital accumulation. In general, each economic theory makes its particular contribution to the inflation-growth relationship. No schools of economic thought have favored accelerating inflation for undesirable distribution and social welfare effects. Inflation's effects on growth are subject to certain macroeconomic conditions that can vary substantially from one country to another (Eggoh & Khan, 2014). Thus, in empirical studies various factors are considered as strong forces for determining and controlling price inflation. These factors include money supply, interest rate, potential output, exchanges rate, wage rate, trade openness and expectations (Zaman et al., 2011; Naz et al., 2012; Bhattacharya, 2014; Ghosh, 2014).

While doubts that very high inflation is bad for growth, empirical studies conducted in the last two decades have clearly confirmed the negative and nonlinear impact of inflation on economic growth. In empirical models, inflation-growth nexus is