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On the nonlinear relationship between inflation and economic growth ☆

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ABSTRACT

Using a large panel data set from both developed and developing economies and employing the PSTR and dynamic GMM techniques, this study highlights two aspects of the inflation–growth relationship. First, it analyzes the nonlinearity of the relationship and identifies several thresholds for the global sample and for various income-specific sub-samples. Second, it identifies some country-based macroeconomic features that influence this nonlinearity. Our empirical results substantiate both views and validate the fact that inflation–growth nonlinearity is sensitive to a country's level of financial development, capital accumulation, trade openness and government expenditures. Moreover, these country-specific characteristics result in some marked differences in this nonlinear relationship.

1. Introduction

The relationship between inflation and economic growth has long been a debatable element of the discussion between policy makers and researchers. The idea of positive long-run money growth due to nominal rigidities has been so widely accepted that the idea of a negative inflation rate—proposed by Friedman, 1969 and his followers—has never held a place on the policy agenda of any central bank around the world.[2] Nevertheless, accelerating inflation has also been unanimously discouraged by all schools of economic thought for its undesirable re-distributional and welfare effects. A few questions remain unanswered. First, are the detrimental effects of inflation on economic growth immune to the level of development of an economy? Second, at what level does inflation start inhibiting long-term growth? And lastly, what country-specific characteristics alter the direction and intensity of inflation's effects on economic activity?

Empirical studies conducted in the last two decades have unanimously confirmed the negative and nonlinear impact of inflation on the economic growth beyond some threshold levels, although various inflexion points have been reported in the literature.[3] One possible explanation for this lack of consensus is the fact that the inflation–growth relationship depends

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[2] A recent phase of deflation in the Japanese economy in the 1990s showed that by adopting a zero nominal interest rate, a central bank loses its policy tool to respond to adverse supply shocks in the economy.

[3] See Fischer (1993), Bruno and Easterly (1998) and Burdekin et al. (2004).

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upon country-specific characteristics. The nature of the relationship and its degree of sensitivity are therefore influenced by differences in the degree of economic development of different countries. This all implies country-specific and time-specific structural breaks in the inflation–growth relationship (Khan and Senhadji, 2001). These authors also advance the view that because inflation could be considered a characteristic of an underdeveloped economy, this structural break is higher for developing economies than for their more advanced counterparts.

However, inflation's effects on growth are subject to certain macroeconomic developments that can vary substantially from one country to another. One such feature is the level of financial deepening, which directly affects growth through capital formation. In more financially developed economies, inflation exacerbates the price variability in goods and money markets, further increasing the cost of hedging financial assets among potential trading partners.[4] Thus, the adverse effects of inflation on growth are more severe for economies with higher levels of financial development. The same is true of other macroeconomic developments that condition this nonlinearity, such as trade openness, public expenditures and capital accumulation. A higher degree of trade openness also exacerbates the cost of inflation through exchange rate volatility and export competitiveness. Similarly, a higher level of public expenditure results in inescapable inflation through seigniorage tax and cost overruns on public projects, reinforcing the adverse effects of inflation on growth. Inflation also reduces capital accumulation by lowering the real interest rate and saving rates. All of these country-specific characteristics condition inflation–growth nonlinearity. Nevertheless, these conditional variables have been overlooked in the literature.

Another reason for the imprecise threshold determination is that, in the majority of the previous studies, the threshold has first been assumed exogenously and then tested for empirical significance. This drawback of the external threshold determination has been resolved by Omay and Kan (2010) and López-Villavicencio and Mignon (2011), using a panel smooth transition regression (PSTR) model for six and 44 countries, respectively. Nevertheless, their studies focused only on limited sets of countries and ignored the country-specific characteristics discussed above. Our paper fills these gaps by enlarging the dataset and analyzing how the degrees of trade openness, financial development, capital accumulation and government expenditures can influence the nonlinearity of the inflation–growth relationship.

Most of the previous studies have also been based on the assumption that the inflation–growth relationship can only be affected by cross-country variations in the level of inflation.[5] Consequently, these studies neglected the changes that occur in inflation and economic environments over time. To overcome these deficiencies, we use a PSTR model that authorizes a smooth transition for a weak number of thresholds over a continuum of regimes. This approach has two main advantages. First, PSTR model enables us to transcend variation among countries and over time. This provides a simple way to appraise the heterogeneity of the inflation–growth relationship by country and over time. Second, this approach allows a smooth change in the country-specific correlation, depending on the threshold variables. Our final contribution is to analyze the role of income level in determining the nonlinearity of the inflation–growth relationship by splitting the data into sub-samples of countries based on their per capita GDP. Our main findings support the findings of previous studies concerning inflation–growth nonlinearity and propose different thresholds for rich and emerging countries. We also tested the hypothesized role of macroeconomic developments for our sub-samples.

The rest of the paper is organized as follows. Section 2 summarizes some important previous research and provides a brief discussion of the role of country-specific characteristics on the inflation–growth relationship. Section 3 presents our PSTR and GMM model settings and the specifications tested. Sections 4 and 5 present the data and the empirical findings, respectively. Lastly, Section 6 offers conclusions.

2. Review of the literature

2.1. The inflation–growth relationship: empirical developments

It is not unfair to say that the empirical inflation–growth literature is inconclusive and that the results are fragile with respect to model specifications and information sets. The studies that have tested the robustness of this relationship (see Levine and Renelt (1992) and Hineline (2007)) have concluded that the inflation–growth nexus is brittle, changing with the model specification employed. Notwithstanding ambiguities concerning the intensity of this relationship, the recent literature is consistent concerning the overall nature of this relationship, i.e., a negative effect of inflation on long-term growth (Fischer, 1993).[6] Nonlinearity tests by Fischer (1993) also suggest that the adverse effect of inflation decreases at excessively high inflation rates. Based on these findings, Sarel (1996) identifies a specific structural break in this relationship at an 8% inflation rate; below this rate, inflation is innocuous, and above this rate, it is harmful to growth. Khan and Senhadji (2001) find different thresholds for developed and developing countries of 1% and 11% inflation rates, respectively.

As stated earlier, most of the previous research on this subject did not properly take into account inflation–growth nonlinearity. Past attempts to take into account these nonlinearities have either exogenously determined the threshold level or

[4] Rousseau and Wachtel (2002) and Rousseau and Yilmazkuday (2009) offer some useful discussion on this issue.

[5] Exceptions include the above-mentioned studies by Omay and Kan (2010) and López-Villavicencio and Mignon (2011). However, their analyses are based on limited number of countries and focus only on the direct effects of inflation.

[6] Bruno and Easterly (1998) reveal an important aspect of this negative relationship. Their study shows that this inverse relationship is mainly driven by high inflation episodes and that averaging the data for longer time periods eliminates this effect.