EXPLORING THE RELATIONSHIP BETWEEN INFLATION AND ECONOMIC GROWTH: A PANEL DATA STUDY ON SOUTH ASIA

By

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A thesis submitted to the Department of Economics and Social Sciences in partial
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Declaration

It is hereby declared that

1. The thesis submitted is my own original work while completing degree at Brac University.

2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.

3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.

4. I have acknowledged all main sources of help.

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Abstract

Inflation and economic growth are two very important macroeconomic variables that stir a lot of interest. This paper explores the relationship between inflation and growth for six countries in South Asia, namely Bangladesh, Bhutan, India, Sri Lanka, Nepal and Pakistan. The study consists of panel data techniques like the LLC unit root test, and the fixed effect model to explore the relationship between inflation and growth for the countries in the sample over the time period 2000-2019. The study finds an overall positive relationship between the two variables for the overall sample. However, the country specific effects dissipated through OLS regression shows a positive relationship between inflation and economic growth for Bangladesh, Sri Lanka and Nepal, and a negative relationship for India, Bhutan and Pakistan. The study further finds a significantly negative non-linear relationship for the sample, where the threshold of inflation of is 5.80% and above this rate, inflation can have negative impacts on economic growth and vice versa.

Keywords: Inflation, Economic Growth, South Asia, Consumption, Net Exports

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List of Acronyms

ADF	Augmented-Dickey Fuller
GDP	Gross Domestic Product
CONS	Consumption
GCF	Gross Capital Formation
INF	Inflation
LLC	Levin–Lin–Chu
NX	Net Exports
OLS	Ordinary Least Squares

CHAPTER 1

Introduction

Inflation and economic growth are two very important macroeconomic variables. The relationship between the two is a question of great significance as inflation is an integral part of the formulation and implementation of monetary policies. Most empirical findings suggest that high rates of inflation are detrimental to economic growth (Tsoukis & Naqvi, 2007; Eggoh & Khan, 2014) but they also find that up to a certain level, inflation can positively impact the economic growth rate (Khan & Senhadji, 2001; Espinoza et al., 2012; Behera & Mishra, 2017). The Keynesian framework suggests that inflation can be useful for growth when it arises from rising aggregate demand; and it can be impeding when it results from supply shocks (Pollin & Zhu, 2006). Hence the exact relationship between inflation and growth has always been a debate.

According to Asian Development Bank (ADB), collectively the economies of South Asia are expected to grow 5.2% in 2022. However, growing inflation is a problem that is growing alongside the economy and is expected to grow to 3.7%. Hence, authorities are urged to closely monitor inflation levels.

Since inflation is an integral part of macroeconomics, it has been stirring up interest for several years now. Given the ambiguity regarding the inflation growth relationship, there is not much recent research covering the relationship for South Asia, as far as this study could find.

Hence, this study is aimed towards finding the relationship between inflation and growth in six South Asian countries[1], namely Bangladesh, India, Bhutan, Nepal, Sri Lanka and Pakistan, and also estimating a threshold of inflation for the sample. By the use of quantitative analysis on panel data, this study attempts to answer the following research questions:

1. What is the overall relationship between inflation and economic growth for South Asia?
2. Is the inflation-growth relationship non-linear?
3. What are the country-specific relationships?
4. What is the threshold (if any) of inflation in South Asia?

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[1] The threshold model used in the empirical analysis required a strongly balanced panel. Hence among the eight countries in South Asia, Afghanistan, and Maldives have been left out due to unavailability of data.

The research questions have been addressed by using empirical methods like the fixed effect model, OLS regression and the dynamic panel threshold model. The findings suggest an overall positive but insignificant relationship. The country specific effects were found to be positive and significant for Bangladesh, Sri Lanka and Nepal, while it was found to be negative for India, Bhutan and Pakistan. Inflation and economic growth were found to have a negative, non-linear relationship whereby the threshold was found to be at 5.80%, with higher levels of inflation having a negative impact on growth and vice versa. The results of this research can be considerations on how macroeconomic policies in South Asia that involve inflation and growth are to be formulated. The results imply that the countries mentioned should keep their inflation levels under 5.80% in order to avoid the negative impacts of inflation on economic growth.

This paper contributes to existing literature by analyzing the non-linear relationship between inflation and economic growth for the sample using recent data for the time period 2000-2019. It further adds to literature by investigating the presence of a non-linear relationship for each country in the sample, which has not been done distinctively in the past.

The next sections of the paper are organized as follows: Chapter 2 explains the previous literature that is coherent with this study followed by Chapter 3 where the methodology and model specifications are described. Chapter 4 shows the data and some descriptive statistics and Chapter 5 presents all results of the panel unit root test, regressions and the threshold estimation. Finally, Chapter 6 concludes the study.

CHAPTER 2

Literature Review

The existing literature on inflation and economic growth shows that inflation might impact economic growth via its components. It also reveals inconsistency in the findings of the relationship between inflation and growth. This is section is divided into two parts: the first part reviews some of the ways in which inflation can affect economic growth and the second part elaborates on the correlation and thresholds found in previous literature.

2.1 How Inflation Affects Economic growth

Inflation is defined as the increase in price levels across a time period. Inflation is not directly a part of how economists define the national income identity, that is, it is not taken into account while estimating growth or GDP. Economists define the national income identity as follows: GDP is a sum of consumption expenditures, investment expenditures, government expenditures and net exports (exports minus imports). However, inflation affects almost all components of the aggregate output or economic growth in one way or another and the previous literature on the topic can help understand the association of inflation with these components. The findings from relevant literature on each of the components of GDP are briefly discussed below.

The relationship between inflation and consumption is well established, and the relationship arises via interest rates. Real interest rates are negatively related to inflation rates in the short run and since the relationship between real interest rate and consumption is negative, it follows from here that inflation and consumption are positively related. Thus, the propensity to consume is directly proportional to the rate of inflation and inversely proportional to the nominal interest rate (Gylfason, 1981). Inflation increases consumption at the cost of saving; when inflation increases, the nominal interest rates increase and income (output) increases. Then, for investment to increase, savings fall and so does the real interest rate. Inflation is sure to affect consumption and unemployment in the short run, regardless of whether there are changes in investment (Gylfason, 1981).

Inflation is known to be strongly correlated to investment in the long run. Early studies confirm this and empirical evidence finds that the long run relationship between inflation and investment are significantly positive (McClain & Nichols, 1993). However, some studies also find that inflation can discourage investors for investments that take a long time to mature (Iqbal and Nawaz, 2009). This study further suggested that similar to the effects on economic growth, inflation also has a non-linear relationship with investment, which is positive at low levels and negative at higher levels of inflation.

Inflation can cause structural changes in the economy which may encourage imports and discourage exports (Lovasy, 1962). Hence inflation tends to reduce diversification and hampers the expansion of exports in the long run (Lovasy, 1962). Studies have found inflation to affect trade (Afzal et al., 2013, Sahoo & Sethi, 2020); and trade openness or higher trade is a suggested to be a measure to control inflation (Jin, 2006). There is an inverse relationship

between inflation and openness, which is more robust in the short run than the long run (Afzal et al., 2013). In a recent study based on India, a stronger influence was found for exports on inflation compared to imports (Sahoo & Sethi, 2020). There also exists a negative relationship with inflation and trade. High inflation causes less output to be traded and trade is more feasible at lower rates of inflation (Lagos & Rocheteau, 2005).

As discussed above, since previous literature finds inflation to evidently affect the components of economic growth, like consumption, investment and trade, inflation is also likely to affect economic growth through these components. Inflation affects output depending on how money and its functions are incorporated into the model (Mohaddes & Raissi , 2014).The relationship between inflation and economic growth have been studied by multiple scholars for decades in the past and since inflation plays a fundamental role in macroeconomic policies, it is still an area of concern. The available literature on this relationship shows both positive and negative association among the two. The next section elaborates on the findings of the previous studies regarding the inflation-growth relationship.

2.2 The Relationship between Inflation and Economic Growth

Studies from the early 1990s confirmed a non-linear relationship between inflation and economic growth. (Fischer 1993; Sarel 1996). The non-linear relationship can be explained in various ways. A study on the effect on inflation on endogenous growth concluded that the non-linear relationship is proportional to the decrease of real interest rates and increase in capital to effective labor rate (Gillman & Kejak, 2005).

The debate between whether the relationship between inflation and output is positive or negative divides economists into two: structuralists and monetarists. Structuralists believe that inflation is helpful for economic growth while monetarists believe the opposite (Malik and Chowdhury, 2001). Some studies also found that low levels of inflation are either positive or insignificantly related to economic growth (Sarel, 1996; Ghosh and Phillips, 1998). However, inflation was thought to always have a negative impact on growth except for at very low rates.

There is much disparity as to why higher levels of inflation can have negative impacts on the growth of an economy. In the early 1990s, the negative association found between the two was explained to have arisen from investment such that inflation affects investment and productivity growth and thus high inflation rates are inconsistent with sustained growth (Fischer, 1993). As inflation and economic growth have a negative relationship, some studies thoroughly discuss the negative effects of inflation on growth. A negative association was also

proven to exist between inflation and welfare, whereby higher inflation comes with higher price dispersion. This higher dispersion in prices affects consumer welfare because when high rates of inflation persist, there is inefficient allocation of resources. This inefficiency in turn holds back the economic growth rate (Peterson & Shi, 2004). Inflation can have a negative effect on economic growth via inventories whereby inventories increase as inflation increases and hence the resources available for growth decreases (Tsoukis & Naqvi, 2007). An analysis on developing and developed countries showed that heavy public size amplifies the negative effects of inflation on economic growth (Eggoh & Khan, 2014). This study also states that for open and developed economies, the cost of inflation is high.

Inflation can especially be detrimental to transition economies as inflation causes higher money usage and so the higher the inflation rate, the higher the decrease in growth rate (Gillman & Harris, 2010). Also, when inflation rises, savings are discouraged and there is more speculative asset buying and consumption, which may pull down the growth of the economy (Das and Loxley, 2015). Inflation also impacts unemployment rates via growth. A study based on Bhutan (Tenzin, 2019) found that higher levels of inflation slow down economic growth which can lead to higher levels of unemployment in the long run.

The positive effects of inflation have also been reasoned in the past. Higher inflation was found to be associated with higher gross domestic product (GDP), that is, economic growth, in a cross-country analysis on lower and middle income countries (Polllin & Zhu, 2006). Studies suggest that inflation up to a certain level can trigger output as inflation makes capital easier to hold than money and since real wages become variable, labor markets are made more efficient (Das & Loxley, 2015). The proper estimation of inflation is emphasized because of its implications on medium and short run guides for policy making. Policy makers always refer to inflation rates while formulating monetary policies (Shahiduzzaman, 2009). This is because, high inflation aids monetary policy to reduce real interest rates in times of financial crises (Espinoza et al., 2012).

Since almost all scholars somewhat agree that high levels of inflation impede economic growth, economists have been wondering if there exists a threshold beyond which the relationship becomes negative. Studies have found threshold levels at as low as 1-3% and as high as 15-18%. The threshold for inflation found in the previous literature are unique to each sample. For example, the lower threshold was found for industrial countries (Khan & Senhadji, 2001), and middle income countries were found to have the highest threshold at 15-18% (Pollin & Zhu,

2006). An early study on a mixed sample of eighty-seven countries (Sarel, 1996) found a threshold level of inflation at 8%. For developing countries, the threshold was found to between 10-12% (Khan & Senhadji, 2001; Espinoza et al., 2012). Studies on South Asia like the sample in this research found thresholds as low as 5.73% (Vinayagathasan, 2013) to as high as 11% (Das and Loxley, 2015) with negative effects beyond the threshold, and positive effects below it.

A very recent study on the effect of inflation on economic growth and unemployment in South Asia (Nguyen, 2018) reported a negative long-run association of inflation and economic growth in South Asia. Another similar study (Khan & Khan, 2018) reported the same results for their sample of five Asian countries. But a positive relationship was also reported for South Asian countries (Behera, 2014). Other studies mentioned that the inflation and economic growth in South Asia are highly positively correlated up to a threshold (Pollin & Zhu, 2006; Das & Loxley, 2015).

Hence, despite some generalization, there are also disparities in the findings of literature which proves that the exact relationship between inflation and growth is not yet robustly pronounced. Studies based on South Asia are not much available on recent data as far as the literature here has been reviewed.

The methods used to find the inflation-growth relationships and inflation thresholds in some of the most relevant studies are summarized in Table 6 (Section B in Appendix). The pooled OLS, fixed effects and random effect models were mostly used to find the correlation between inflation and growth in panel data (Pollin & Zhu, 2006; Das & Loxley, 2015; Khan & Khan, 2018). The methods were unique to each study for the threshold estimation. However, as far as this study could find, the threshold of inflation was not found directly by the use of specific threshold models on recent data.

Thus, inspired by the works in the past, this paper attempts to explore the growth-inflation relationship for six countries in South Asia, namely Bangladesh, Bhutan, India, Sri Lanka, Nepal and Pakistan and contribute to existing literature by presenting results that are coherent with previous studies using recent data. This study also aims to fulfill the gap in literature by using a specific threshold model in order to estimate the threshold for South Asia using recent data. Also, previous studies have mentioned thresholds for each country but the non-linear relationship was always addressed to be for the entire sample. This study stands out in its

attempt to find the presence of a non-linear relationship (if any), individually, for each country, which hasn't been done such distinctively before.

The next section describes how the study uses empirical methods to address the research questions.

CHAPTER 3

Methodology

This study attempts a quantitative analysis to find the relationship between inflation and economic growth for South Asia. In line with the previous literature (Das & Loxley, 2015; Espinoza et. al., 2012), the study first seeks the overall relationship between inflation and economic growth and then wishes to see the country specific effects of inflation on economic growth. The study aims to find not only the correlation, but whether a non-linear relationship exists between inflation and economic growth for each country. The study further attempts to find a threshold of inflation (if any) for the sample specified. If a threshold exists for the sample, it would imply a non-linear relationship between inflation and economic growth which would be different above and below the threshold of inflation.

3.1 Model Specifications

As mentioned before, the model used in this study is built on the basic national income identity which is:

$$\mathbf{Y}_{it} = \boldsymbol{\alpha} + \boldsymbol{\beta_1}\, X_{1it} + \boldsymbol{\beta_2}\, X_{2it} + \boldsymbol{\beta_3}\, X_{3it} + \boldsymbol{\beta_4}\, X_{4it + \varepsilon_{it}} \tag{1}$$

where, the dependent variable Y is GDP and the independent variables X_1, X_2, X_3 and X_4 are consumption, investment, government expenditures and net exports respectively.

However, previous empirical works have incorporated inflation and inflation-squared as independent variables in order to estimate the presence of a non-linear relationship between inflation and growth (Pollin & Zhu, 2006; Das & Loxley, 2015). Inspired by the approach, the equation of the model incorporates inflation and inflation-squared into equation (1). Hence the final model is a second degree polynomial regression as follows:

$$GDP_{it} = \alpha + \beta_1\, INF_{it} + \beta_2\, INF_{it}^2 + \beta_3\, \delta CONS_{it} + \beta_4\, \delta GCF_{it} + \beta_5\, GOV_{it} + \beta_6\, NX_{it} + \varepsilon_{it} \quad (2)$$

Here, GDP is our dependent variable, and the independent variables are, inflation, inflation squared, consumption, gross capital formation (as investment), government expenditures and net exports respectively. The variables consumption and gross capital formation were not stationary at level and so they had to be differenced in order to make them stationary (Table 2 in Chapter 5), and so are denoted as $\delta CONS_{it}$ and δGCF_{it} respectively.

In order to detect non-stationary behavior, the variables were tested using the Levin-Lin-Chu (LLC) unit root test. This test was done in line with previous works (Khan & Khan, 2018) because macroeconomic variables often show non-stationary behavior and presence of unit root or non-stationary behavior in variables can lead to spurious regressions. The LLC Unit Root Test for panels is a specific test used to detect non stationary behavior or presence of unit roots in panel data. The LLC Unit Root test uses an Augmented Dickey-Fuller (ADF) regression for each panel. The test has the null hypothesis that the variable is non-stationary across all cross and the alternative hypothesis that the variable is stationary across at least one cross section. Non-stationary variables can be differenced in order to make them stationary. The test result is detected by checking the p-value whereby we can reject the null hypothesis at 1%, 5% or 10% significance levels.

Next, using equation (2), the variables were first regressed under the panel fixed and random effects models and then, the Hausman test was used to distinguish between the two. The Hausman is a determinant test in order to choose between the fixed and random effects. It has the null hypothesis that the preferred model is random effects. The results from the Hausman test suggested that the fixed effect model was more fitted to the sample. The fixed effects model controls for all unobserved individual-specific time invariant characteristics.

This study also attempted to distinguish the individual or country specific effects of inflation on economic growth. The country specific effects were identified using the regular OLS model based on equation (2). But since the model was estimated individually for each country, the regressions were for time series data. Equation (2) is used to dissipate the country specific effects because the equation allows to check for the presence of non-linearity in each country.

In some of the previous studies that estimated inflation thresholds, studies have used conditional least squares to find a threshold of inflation (Khan & Senhadji, 2001). Others have defined an inflation threshold to be a turning point (Pollin & Zhu, 2006; Das & Loxley, 2015).

The turning point of inflation had been estimated using the following formula where the Threshold Inflation Rate (TIR) is:

$$TIR = \frac{INF}{2 \times INF^2}$$
(3)

However, this formula is not used in this study; rather, a more robust model is used for threshold estimation. To estimate the threshold of inflation, the Dynamic Panel Threshold Model was used. Although this model was used previously (Vinayagathasan, 2013), the sample was for the time period 1980-2009. This study uses the model on a more recent dataset i.e. for 2000-2019. The dynamic panel threshold model allows for fixed effects and endogeneity. The threshold model is used for dynamic panels and by default, it changes the dependent variable to its lagged value and uses the independent variables as instruments. In this model, GDP Growth is the dependent variable, inflation is the threshold variable and all other independent variables are defined as additional instruments. The threshold model not only defines a threshold value for the variable but also shows show the relationship between the dependent variable and the threshold variable changes above and below the threshold.

The next section describes the dataset and the descriptive statistics show the trends in the variables. The results of the empirical analysis are discussed in chapter 5.

CHAPTER 4

4.1 Data

The dataset used in the study is a balanced panel for six South Asian countries, namely Bangladesh, India, Bhutan, Nepal, Sri Lanka and Pakistan for the time period 2000 to 2019. Data on the sample is collected for GDP growth rate (annual percentage), Final Household Consumption Expenditure (as a percentage of GDP), Gross Capital Formation (as a percentage of GDP), General Government Expenditures (as a percentage of GDP), Net Exports[2] (as a percentage of GDP), and Inflation (in percentage, Consumer Prices) from World Bank, (World Development Indicators).

The variables chosen for the sample follow the national income identity having GDP as a function of consumption, government expenditures, investment and net exports. Previous

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[2] Net Exports are not directly available in the World Bank Database and so, it was separately calculated as the difference between exports and imports.

empirical works used openness or terms of trade and in their models (Iqbal & Nawaz, 2009; Khan & Senhadji, 2001; Sarel, 1996). In this model, net exports has been used as openness or terms of trade, gross capital formation has been used as investment[3] and inflation is added as the key independent variable for the research question.

The variables and their descriptions are discussed in detail in Section A of Appendix.

4.2 Descriptive Statistics

The table below summarizes the data for inflation and GDP for all six countries in the sample over the time period 2000-2019.

Country	GDP Growth Rate (%)			Inflation, Consumer Prices (annual %)		
	Min	Mean	Max	Min	Mean	Max
Bangladesh	3.8331	6.1554	8.1527	2.0072	6.3428	11.3952
India	3.0867	6.4730	8.4976	3.3282	6.2016	11.9894
Bhutan	2.1200	7.0949	18.3609	-18.1086	4.0887	10.9197
Nepal	0.1202	4.5260	8.9773	2.2692	6.45539	11.0948
Pakistan	1.1447	4.2579	7.5469	2.5293	7.7884	20.2861
Sri Lanka	-1.5454	5.1261	9.1446	2.13504	7.9484	22.5645

Table 1: Summary of Inflation and GDP for the sample

Source: Author generated

From the table we can see that Bhutan had the highest mean GDP among all countries, but the lowest inflation. The variations in GDP and inflation are the highest for Bhutan. The lowest average GDP was for Nepal and the highest average inflation was in Sri Lanka. In terms of absolute values also, the highest GDP was in Bhutan while the maximum inflation was in Sri Lanka.

The graphs[4] below show the inflation and GDP trends for each country over the time period 2000-2019.

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[3] Gross Capital Formation was previously termed gross domestic investment and includes public and private investment, net acquisition of valuables and change in inventories. Hence it is the investment component that is part of the expenditure side of GDP (Meta Data Glossary, World Bank).
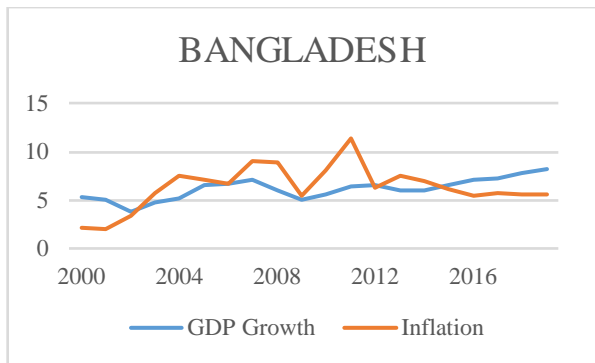[4] All figures have been generated using MS Excel.

Figure 1: GDP Growth and Inflation Trend for Bangladesh
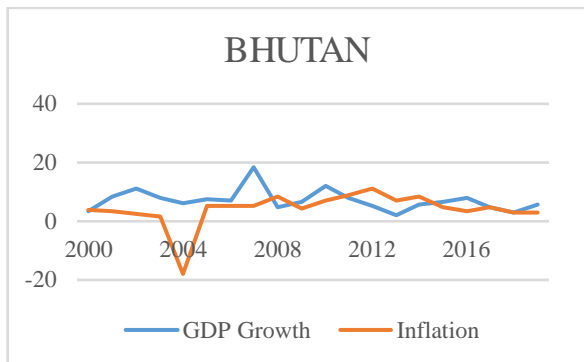

Figure 2: GDP Growth and Inflation Trend for India
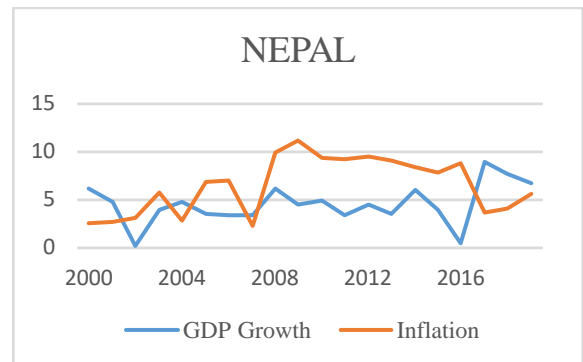

Figure 3: GDP Growth and Inflation Trend for Bhutan

Figure 4: GDP Growth and Inflation Trend for Nepal
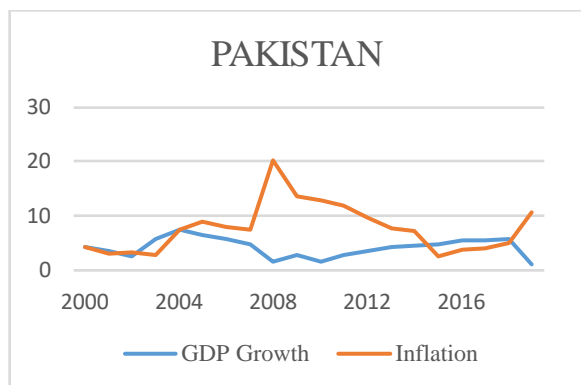
Figure 5: GDP Growth and Inflation Trend for Pakistan
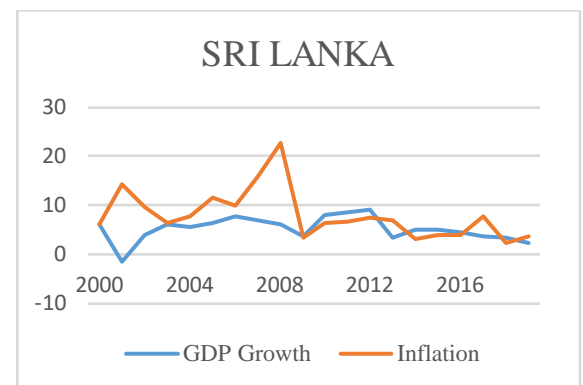
Figure 6: GDP Growth and Inflation Trend for Sri Lanka

Source: Author generated

The figures show that the countries experienced some turmoil in growth rates of both GDP and inflation. For example, Bhutan experienced negative inflation around 2004 and a peak in GDP in 2007. Similarly, sharp peaks in GDP are also present for Bangladesh and Pakistan, while for India and Nepal and Sri Lanka, there are peaks that show sharp declines in GDP.

However, it is difficult to dissipate the relationship between inflation and economic growth by analysis of these trends alone and so the next portion of the study presents results from the econometric analysis.

CHAPTER 5

Results and Discussion

5.1 Panel Unit Root Test

Since most macroeconomic variables show non-stationary behavior, the variables in the panel were tested under the Levin–Lin–Chu (LLC) test for unit root. The variables consumption and gross capital formation were found to be non-stationary at level. So, their first differences were taken in order to make them stationary. The first differenced variables are denoted by δ. The table below shows the results[5] of the LLC Unit Root test.

Variables	Unadjusted T-statistic	Adjusted T-statistic	P-value	Result
GDP	-6.2069	-2.7481	0.0030***	Stationary
Inflation	-5.2081	-1.7082	0.0438**	Stationary
Consumption	-3.6766	-0.8955	0.1853	Non-Stationary
δConsumption	-9.0012	-4.4874	0.0000***	Stationary
Gross Capital Formation	-0.6495	-2.8723	0.9979	Non-Stationary
δGross Capital Formation	-8.0475	-4.2095	0.0000***	Stationary
Government Expenditures	-3.8620	-1.2758	0.1010*	Stationary
Net Exports	-3.6180	-1.5776	0.0573*	Stationary

Table 2: Results of LLC Panel Unit Root Test

H_0: $Panel\ contains\ unit\ root$
*p< 0.10 **p< 0.05 ***p<0.01*

Source: Author generated

5.2 Regression Results

The table below summarizes the regression results for the overall sample. The sample was regressed under the fixed effects and random effect models. The Hausman test confirmed that the fixed effect model was more fitted to the sample. In the fixed effects model, the positive coefficient of the inflation variable implies a positive relationship between inflation and economic growth. However, this value is very small and the p-value also suggests that this

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[5] All Statistical tests and regressions were computed using Stata 14.

coefficient is insignificant. The coefficient on inflation-squared is negative and significant at 90% confidence interval, implying that the relationship between inflation and economic growth is significantly non-linear. The R-squared values show that the model captures a higher variation in GDP between the countries than within them. All other variables have a positive correlation with GDP, as expected, except for Net Exports.

Dependent Variable: GDP Growth			
Variable		**Fixed Effect**	**Random Effect**
Inflation		**0.0222**	-0.0032
		(0.0632)	(0.0656)
Inflation-squared		**-0.0060**	-0.0063
		(0.0038)*	(0.0038)*
δ Consumption		**0.0440**	0.0404
		(0.0651)	(0.0672)
δ Gross Capital Formation		**0.0782**	0.0867
		(0.0704)	(0.0714)
Government Expenditures		**0.1524**	0.1472
		(0.1359)	(0.0536)***
Net Exports		**-0.0217**	0.0229
		(0.0167)	(0.0287)
Constant		**3.957**	11.6254
		(1.5466)***	(3.2860)***
R-squared	Within	0.0419	0.0335
	Between	0.2634	0.4223
	Overall	0.0805	0.0994
Countries		6	
Observations		120	
Hausman test (p-value)		**0.0121**	

Table 3: Regression Results for the Overall Sample

The standard errors for each variable are quoted in parenthesis
$p< 0.10$ **$p< 0.05$ ***$p<0.01$
H_0: The preferred model is random effects.

Source: Author generated

The other variables in the fixed effect model have a positive relationship with GDP growth, except for net exports which is negative. The highest contribution to GDP growth in terms of

the regression results is seen to come from government expenditures, followed by gross capital formation (investment) and consumption.

The overall positive relationship among inflation and economic growth for the sample is consistent with previous literature where a positive relationship between growth and inflation was found for South Asia (Behera, 2014; Das & Loxley, 2015). The significant negative, non-linear relationship is also coherent with those found in previous studies (Pollin & Zhu, 2006, Eggoh & Khan, 2014).

The OLS regressions with the country specific effects is summarized in the table below. Although the model was run separately for each country, only the results of the inflation and inflation-squared coefficients are reported in the table.

Dependent Variable: GDP Growth		
Country	**Inflation**	**Inflation - Squared**
Bangladesh	**0.1375** (0.2650)	**-0.0013** (0.0203)
India	**-1.3242** (1.1644)	**0.0999** (0.0743)
Bhutan	**-0.0053** (0.2022)	**-0.0054** (0.0159)
Nepal	**-0.0146** (0.9885)	**-0.0052** (0.0788)
Pakistan	**0.2692** (0.2610)	**-0.0178** (0.0122)
Sri Lanka	**0.0622** (0.2708)	**-0.0070** (0.0118)

Table 4: The Country-Specific Effects of Inflation on Economic Growth

*The standard errors for each variable are quoted in parenthesis
Source: Author generated

In this model, the coefficient for inflation is positive for Bangladesh, Sri Lanka and Pakistan, and negative for India, Bhutan and Nepal. The positive relationship between inflation and

economic growth in Bangladesh, Sri Lanka and Pakistan is coherent with that found in previous literature (Majumder, 2016; Behera, 2014; Afzal et al., 2013). The negative relationship found for India, Bhutan and Nepal is also consistent with previous results (Mohaddes & Raissi, 2014; Tenzin, 2019; Nyugen, 2018). The coefficients for inflation-squared shows that the relationship between inflation and economic growth is negatively non-linear for all countries in the sample, except India.

5.3 Threshold Estimation

The table below summarizes the results from the threshold model.

Dependent Variable: **GDP Growth**	
Threshold Variable: **Inflation**	
Threshold	**5.8029**
Above	**-2.6107**
Under	**2.0261**
No. of Panels	6
Time periods	20
Bootstrap p-value for linearity test	0

Table 5: Dynamic Panel Threshold Model

H_0: The relationship is linear

Source: Author generated

The results show that in the panel, the threshold of inflation is 5.80%. The effect of inflation on economic growth is positive below this threshold and it becomes negative above the threshold. The bootstrap p-value for linearity further confirms the presence of a non-linear relationship between the dependent variable, economic growth and the threshold variable, inflation. The threshold found in this study matches well with previous literature, which found the threshold in South Asia to be around 5% (Behera & Mishra, 2017; Vinayagathasan, 2013).

The results of the entire quantitative analysis imply that there is an overall positive inflation-growth relationship for the countries in the sample. However, the relationship between inflation and economic growth is significantly non-linear, such that inflation levels below 5.80% can have positive effects on growth while higher levels can have negative impacts. The country specific effects show a positive inflation-growth relationship in Bangladesh, Sri Lanka and Pakistan and a negative relationship in India, Nepal and Bhutan. All countries except India have a negative, non-linear relationship between inflation and economic growth. The threshold

of inflation implies that in order to avoid negative impacts on economic growth, the countries in the sample should keep their inflation levels below the threshold, that is, below 5.80%.

CHAPTER 6

Conclusion

This study attempted to find the relationship between inflation and economic growth for five countries in South Asia. The results show an overall positive, but insignificant effect of inflation on economic growth for the entire sample. The effect of inflation on each country was also tested and a positive relationship was found for Bangladesh, Sri Lanka and Pakistan; while for India, Bhutan and Nepal, the relationship was found to be negative. The fixed effect model and the threshold model confirmed the presence of an overall non-linear relationship between inflation and economic growth. A negative non-linear relationship was also found for each country in the sample, except India. The threshold for the sample was found to be at 5.80%, below which the relationship is positive, and above it, the relationship becomes negative.

This study contributes to literature by confirming a non-linear relationship between inflation and economic growth for six countries in South Asia using recent data. It further contributes by specifying a threshold level of inflation found for South Asia which is at 5.80%. It also finds that there is a negative non-linear relationship between inflation and economic growth for Bangladesh, Bhutan, Sri Lanka, Nepal and Pakistan.

Although this study dissipated the country-specific effects on inflation, it could not find individual thresholds for each country in the sample. Hence, this is a question that is open for further investigation. Also, constrained by the availability of data and the requirements of the threshold model, the study could not attempt to seek the specified relationship for countries beyond the sample. Hence this is also a scope of further research.

However, since the overall relationship between inflation and GDP is negative above the threshold of 5.80%, the aforementioned South Asian countries should aim to keep inflation levels below the threshold in order to avoid any negative impacts on economic growth.

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Appendix

A. Variable Descriptions

The variables chosen for this study is mostly analogous to previous models. However, in order to see the effect of inflation on economic growth, the models used in the study involves GDP Growth Rate as the independent variable. The key independent variables are inflation and inflation squared.

A brief description of all the variables (according to the data sources) is included below:

1. **GDP Growth Rate (annual percentage):** this is the yearly rate of GDP growth in the countries. This is the dependent variable in the study and is a measure of the economic growth.
2. **Inflation (CPI):** this reflects the change (in annual percentage) in the cost an average consumer would face to acquire a basket of goods and services that may be fixed or changed at specified intervals of time, such as yearly.
3. **Final Consumption Expenditure (as a percentage of GDP):** is the sum of general government final consumption expenditure (general government consumption) and household final consumption expenditure (private consumption).
4. **General Government Final Consumption Expenditure (as a percentage of GDP):** this includes all current government expenditures for the purchase of goods and services. It also includes employee compensations and expenditures on national security and defense.
5. **Gross Capital Formation (as a percentage of GDP):** this was previously termed gross domestic investment and includes public and private investment, net acquisition of valuables and change in inventories.
6. **Exports of Goods and Services (as a percentage of GDP):** this is the monetary value of the goods and services exported from the country to the rest of the world.

7. **Imports of Goods and Services (as a percentage of GDP):** this represents the monetary value of all goods and other market services received by the country from the rest of the world.

B. Summary of Literature Review

The table below shows a tabular form of the relevant literature reviewed and the methods used in the studies.

Author(s)	Sample & Time Period	Methodology	Results
Mohsin S. Khan and Abdelhak S. Ssnhadji (2001)	140 developing and industrial countries [1960-1998]	OLS, NLSS fixed effects and RSS to find threshold	Thresholds: 1-3% for industrial countries and 11-13% for developing countries, with negative effects beyond the threshold.
Robert Pollin and Andong Zhu (2006)	80 countries [1961-2000]	Pooled OLS, between, fixed and random effects, and turning point to find a threshold	Positive effects of high inflation on growth up to 15-18%, and negative effects above it.
Thanabalasingam Vinayagathasan (2013)	32 Asian Countries [1980-2009]	Dynamic Panel Threshold Model	Threshold of inflation of 5.43% with higher levels having negative impacts but lower levels have no significant impact.
Jaganath Behera (2014)	Bangladesh, India, Bhutan, Maldives, Nepal, Sri Lanka [1980-2012]	ADF and Phillis-Perron (PP) unit root tests, Error Correction & Granger causality test, unidirectional VAR analysis	High positive correlation between inflation and economic growth and a unidirectional causality from GDP to CPI for Bangladesh, Bhutan, Nepal and India.
Anupam Das and John Loxley (2015)	54 developing countries [1971-2010]	Pooled OLS, Fixed and Random effects, turning point to estimate threshold	Positive relationship between inflation and economic growth up to a threshold: 11% for Asia, 23.5% for Latin America and the Caribbean, 23.6% for Sub Saharan Africa
Muhammad Azam Khan, Saleem Khan (2018)	Bangladesh, Iran, Indonesia, Malaysia and Pakistan [1973-2016]	Levin, Lin and Chu (LLC) and Im, Pesaran and Shin (IPS) Panel Root tests, OLS Regression, Fixed and Random effects	Significant negative relationship between inflation and growth.

Table 6: Summary of Literature Review

Source: Author generated