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RESEARCH ARTICLE

TIME SERIES ANALYSIS OF CASUAL RELATIONSHIP BETWEEN INFLATION AND UNEMPLOYMENT IN THE SAARC COUNTRIES

Surekha B. Munoli and *Shankrevva Gani

Department of Statistics, Karnatak University, Dharwad

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ABSTRACT

This paper investigates existence of a causality relationship between rates of inflation and unemployment for SAARC countries using time series data from 2003 to 2014. We use VAR (Vector Autoregressive) methodology and Granger casualty/block erogeneity Wald test statistics to emphasize the type of causality between rates of inflation and unemployment. The empirical result shows that a uni-directional causality relationship exists between rates of inflation and unemployment.

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INTRODUCTION

Despite an enormous literature on impact of inflation on welfare, employment, output, and economic growth (Driffill *et al.*, 1990 and McCallum, 1990), there are very few empirical studies that explore effect of inflation on income distribution in an international setting. Some of the empirical studies on effect of inflation on income and wealth distribution are Laidler and Parkin (1975), Fischer and Modigliani (1978) and Fischer (1981). An international perspective is: high and volatile inflation has occurred in Latin America, Africa, Eastern Europe, and in few Asian countries Hongyi Li and Heng-fuZou (2002). Among the multitude of economic problems, two macroeconomic variables inflation and unemployment are considered to be closest to people's soul, influencing directly or indirectly their lives and economy. In general a number of experts consider inflation to be a complicated multisided process which depends not only on economic but also on social and political reasons. One of the main aims of state governments and central banks of majority of world countries is to decrease inflation as it negatively affects the economic growth rate. On the other hand unemployment is a great social and economic problem, which also shakes the confidence of the people in the system.

Corresponding author: Shankrevva Gani,
Department of Statistics, Karnatak University, Dharwad

The basic principle for many of us is that all able bodied persons of certain age group (15-60 years) must work if they are not pursuing any other useful avocation like higher studies (or engaged in home making) and the system should permit them to work. Based on the above literature and discussions the main aim of this paper is to analyze the relationship between rates of inflation and unemployment for SAARC countries during 2003-2014 at country level. This study empirically investigates the causal relationship between rates of inflation and unemployment. The approach of this paper implies the following sequence: the presentation of several empirical evidences for rates of inflation and unemployment in SAARC countries and the presentation of certain methodological aspects regarding the causality analysis are considered in Section 2. The presentation of the results of the time series analysis by means of specific econometric methods are reported in Section 3.

MATERIALS AND METHODS

The country level annual data of Inflation rates (INFL) and Unemployment rates (UNEMP) used in this study are collected from www.worldbank website. SAARC countries were selected for the study. Annual data are used in this study to avoid the seasonal biases. The period for this study has been taken by availability of data at country level. Taking into

account this limitation and for the purpose of improving the result's quality, the study is conducted by means of the panel analysis method.

Inflation and Unemployment in the SAARC countries after 2003

Here we present in a descriptive manner some considerations on growth of rates of inflation and unemployment at country level for SAARC countries, after 2003.

Figure 1 shows the rate of inflation for SAARC countries from 2003-14. It is observed that for countries like Srilanka, Maldives, Nepal and Pakistan inflation rates are initially increasing and in the later period fluctuation is more. For India and Bhutan inflation rate is not much fluctuating throughout the period and inflation rate varies between 5-10. High rate of inflation and fluctuation is observed in Srilanka and Pakistan. As regards growth of unemployment rate by countries, we may notice that it has a constant trend for the study period, except for Sri Lanka, Pakistan, and in these two

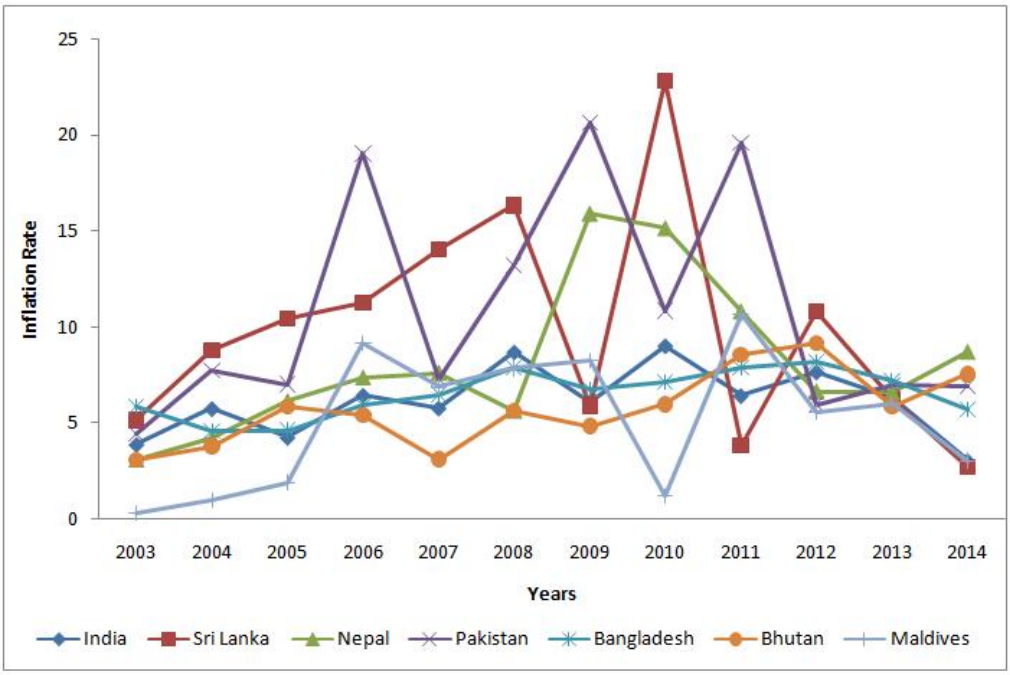

Figure 1. Trend of Inflation of SAARC countries after 2003

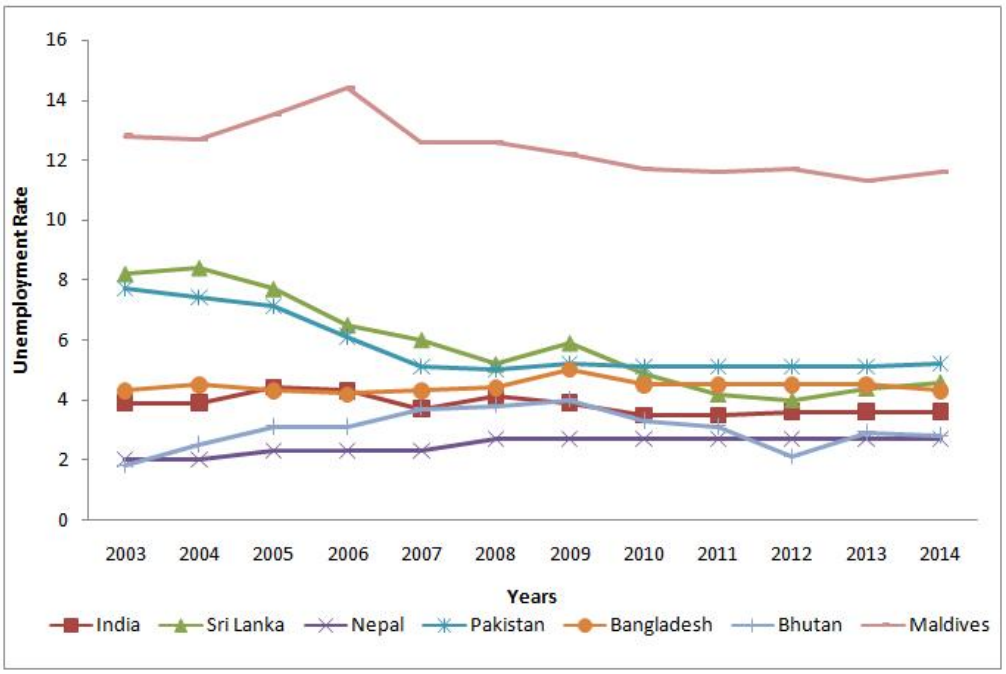

Figure 2. Trend of Unemployment rate of SAARC countries after 2003

countries we find a noticeable decreasing unemployment rate at the initial period and later it is stagnant. For Maldives the unemployment rate is high throughout the study period compared to other countries (Figure 2). In time series analysis, if the series are non-stationary (or I(1)) process, the regression results with variables at level will be spurious (Granger and Newbold, 1974; Phillips, 1986). In case of panel data, we use the Levin, Lin & Chu test. The correction of non-stationarity, if it is needed, can be performed by considering lagged variables. In the second stage, the analysis of causality between the two variables is performed by means of a VAR model where the optimal lag length is evaluated by means of Schwarz information criterion.

$$INFL_t = \alpha_0 + \alpha_1 INFL_{t-1} + \cdots + \alpha_m INFL_{t-m} + \beta_1 UNEMP_{t-1} + \cdots + \beta_m UNEMP_{t-m} + u_t \quad (1)$$

$$UNEMP_t = \gamma_0 + \gamma_1 UNEMP_{t-1} + \cdots + \gamma_m UNEMP_{t-m} + \delta_1 INFL_{t-1} + \cdots + \delta_m INFL_{t-m} + v_t \quad (2)$$

Where u_t and v_t are stochastic error terms called impulses or innovations shocks in the language of VAR. For this model, the direction of Granger Causality can be detected through VAR method. After testing, we can identify whether the level of inflation rate (equation (2)) has an impact on unemployment rate or if the inflation rate Granger causes unemployment rate and vice versa (equation (1)). For each of the two equations, a Chi-square (Wald) test is performed which evaluates whether the independent variables from each model are statistically significant. After testing the correlations if we ascertain that the variables in both equations are significant until the optimum number of lags set in the previous stage, then we have bidirectional causality between rate of unemployment and inflation (Jemna, 2015). Finally, the VAR methodology assists an analysis impulse response that evaluates the manner in which each independent variable from each equation responds to the shocks that are evaluated through the residual variables. These shocks spread from one variable to the other through the dynamic structure of the VAR model.

RESULTS

This section, represent the results of empirical analysis on the relationship between rates of inflation and unemployment in SAARC countries using VAR methodology this analysis is done by using Econometric software Eviews. The results are given as follows: stationarity tests, estimated VAR model, causality analysis and impulse response analysis.

Stationarity test

The time series properties of the series are examined through Levin, Lin & Chu test. The results of the stationarity tests are presented in Table 1, confirming that the variables used in the study are stationary (rejecting the unit root assumption), because the calculated probabilities are less than 0.05.

Estimated VAR model

The relationship between rates of inflation and unemployment of SAARC countries is estimated by means of VAR model. In this regard, initially we estimate the optimal lag length using Schwarz information criterion, which showed that lag length is equal to 1. The estimated models for rates of inflation and unemployment are presented below.

The Inflation equation:

$$INFL_t = \underset{[4.65]}{6.129} + \underset{[2.15]}{0.238} INFL_{t-1} - \underset{[-0.17]}{0.025} UNEMP_{t-1} \quad (3)$$

The value of t ratio (the respective Student test statistic) is presented below each coefficient. For this model, the value of the determination coefficient (R^2) and F-statistic are respectively obtained as 0.06 and 2.39.

Table 1. Levin, Lin & Chu test results for the unit root hypothesis

Inflation			Cross-	
Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.71431	0.0432	7	63
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.93870	0.0263	7	63
ADF - Fisher Chi-square	28.0443	0.0140	7	63
PP - Fisher Chi-square	83.4428	0.0000	7	70
Unemployment			Cross-	
Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.59036	0.0000	7	63
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.29788	0.0108	7	63
ADF - Fisher Chi-square	28.9246	0.0107	7	63
PP - Fisher Chi-square	48.8587	0.0000	7	70

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

The Unemployment equation:

$$UNEMP_t = \underset{[2.58]}{0.372} + \underset{[59.22]}{0.9606} UNEMP_{t-1} - \underset{[-2.53]}{0.0307} INFL_{t-1} \quad (4)$$

For this model, the value of the determination coefficient (R^2) and F-statistic are respectively obtained as 0.98 and 1791.22. The critical value at 5 percent of level of significance for F test is 1 which is less than 2.39 as well as 1791.22. Hence, we conclude that, the two equations are statistically significant, while the independent variables explain the dependent variables for the maximum number of lags identified.

Granger Causality Test

If we consider two variables say $Y_t$and X_t, for which we can build variables with a certain lag (Y_{t-1}, X_{t-1}etc.), according to Granger [1981] we say that X_tGranger causes $Y_t$if and only if the past values of $X_t$are necessary for the prediction of Y_t. Apart from testing the presence of cointegration, the next stage of this paper is to ascertain the direction of causality. Using Pairwise Granger Causality Test, we obtain the results presented in Table 2

According to the result of the pairwise Granger causality tests it is clear that Unemployment does not cause inflation supporting the null hypothesis. But second causality tests doesnot support the null hypothesis.

Table 2. Results of Pairwise Granger Causality test

VAR Granger Causality/Block Exogeneity Wald Tests			
Sample: 2003 2014			
Included observations: 77			
Dependent variable: INFL			
Excluded	Chi-sq	Df	Prob.
UNEMP	0.030597	1	0.8611
All	0.030597	1	0.8611
Dependent variable: UNEMP			
Excluded	Chi-sq	Df	Prob.
INFL	6.415819	1	0.0113
All	6.415819	1	0.0113

Impulse responses

In Figure 3, we may observe how the two variables rates of inflation and unemployment will be reacting in future when 1SD positive shock is given to other variable. Further, in first graph response of rate of unemployment to inflation, it can be observed that innovations are negative for a 10 year of period without diminishing in time. Finally, in second graph response of rate of inflation on unemployment, it can be noticed that initially first two years the invocations are negative latter period it is stagnant at zero.

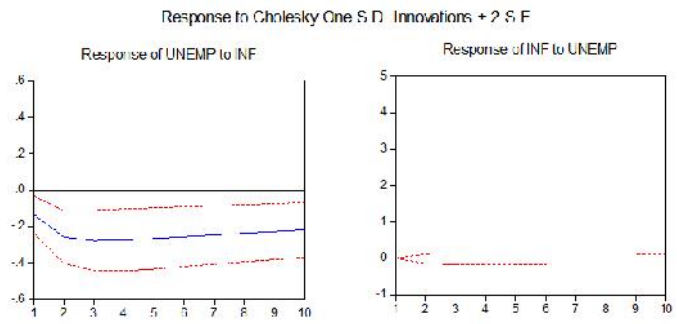

Figure 3. Impulse response analysis for inflation and unemployment

Conclusion

The approach of this paper aims to emphasize the causality relationships between rates of inflation and unemployment in SAARC countries after 2003. The short length of time series as well as the lack of data leads us to use panel data at country level. The results obtained highlight the existence of a unidirectional causality relationship between inflation and unemployment (Granger test inflation cause unemployment). n one hand, taking into account the variation in time as well as that among countries, the result is that unemployment is negatively influenced by inflation. At country level this outcome is very important for the decision-makers for explanation of policies focusing on inflation.

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