LONG RUN RELATIONSHIPS AND SHORT RUN DYNAMICS AMONG UNEMPLOYMENT AND DEMAND COMPONENTS: A STUDY ON SRI LANKA, INDIA AND BANGLADESH

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Abstract

Unemployment of an economy should have some associations with its aggregate demand components. With time series data for 1996-2015 on three aggregate demand components, namely, consumption expenditure (CON), capital formation (GCF) and public spending (GOV), we did econometric exercises such as cointegration, VECM and Wald test to test whether there are long run equilibrium relationships among unemployment (UN) and the three demand components and directions of their interplays in long run and short run frameworks. Doing appropriate diagnostic checking for the residuals of all the estimations, the results show that all the four series are cointegrated that justifies long run associationships among them. Further, the long run causality analysis through VECM reveals that UN, CON and GCF make a cause to GOV for Sri Lanka. For India, UN is caused by all three components of aggregate demand and its CON is caused by UN, GCF and GOV. Bangladesh does not produce any such long run causal relationships among the variables. Further for short run causality results, CON is caused by UN, GCF and GOV in Sri Lanka and India, and for Bangladesh and India, there are short run causalities running from CON, GCF and GOV to unemployment. This means, aggregate demand components in India and Bangladesh influence the unemployment rates of these two countries

Keywords: Unemployment, aggregate consumption, government expenses, gross capital formation, cointegration, VECM, Wald test

JEL classification: J64, E21, E22, E24, H5, C32

1. Introduction

Empirical works on long run relationships and short run dynamics among unemployment and demand components are hard to be obtainable from the existing literature; unemployment backed by consumption, government spending and investment or capital formation are to be underlined in the present context .It is non-deniable that all the variables might be hanging together; one causes other variable to move in positive direction whereas movement in negative direction caused by second one. Complexities are to be acknowledged as economy may moves as Non-Ricardian way when non-optimization of utility is often pronounced in real economy. Despite the above fact, we revisit how macroeconomic demand components do influence the frictions in the labour market so far as unemployment is concerned. As per Keynes, consumption rises as income increases; increase in consumption means reduction of investment because of fall in investment-consumption ratio (Solow 1991), tax revenue is likely to be reduced due to fall in output as investment falls as per historic theoretical framework and hence government revenue- expenditure ratio is likely to be reduced. On the other hand, multiplier effect becomes proactive because of rise in consumption. Although increasing consumption trend complements the robustness of government revenue in normal situation. Interplay among the variables over time matters much. Despite the above theoretical facts, in an economy with institutional or structural weaknesses, consolidation of creation of employment with applications of macroeconomic policies matters much. A variation of aggregate demand components to the desired directions is often observed in reality along with the applications of either monetary or fiscal policy or both; it might turn the existing employment level. It is evident that the unemployment is the cruelest tax to a part of

the citizens; loss of jobs reduces the wellbeing of the citizens and hence psychological distress is pronounced. Human unpleasantness due to unemployment and inflation often regarded as misery index and they are supposed to be the useful indices of the general health of the economy. President Ronald Reagan of USA propounded that inflation is supposed to be public enemy number one in 1980s, a high social cost to speak of. General health of an economy could be assessed by the combined effects of unemployment and inflation rates and these two are inversely related as per study report of Phillips (1958). There is a trade-off between them, but London School of Economics conducted a study for period 1861- 1957 revealing the fact mixed evidence about the shape of the Phillips curve from being horizontal to vertical as opined by Kumar (2012). Llaudes (2005) finds that unemployment duration matters for inflation dynamics, and that the long-term unemployment has a smaller effect on inflation. In some Western European countries in particular, the long-term unemployment have a negligible effect on changes in prices. Principal causes of unemployment in both developed and developing nations are to be identified separately, application of public policies in proper time to remove the evils are quite relevant. The topic, relationship between monetary policy and unemployment, is frequently discussed; the debate is subjected to various empirical studies. Empirical findings support that growth rate of employment is directly proportional to the growth rate of GDP; strong positive association between investment in fixed capital formation and employment is also another macroeconomic finding of the predecessors. Rise in aggregate demand plays crucial role to reduce the unemployment level; increase in real wage should be linked with the increase in productivity. In contrast, producers try to cut wage to enhance their profit. The rising trend of real wage along with the rising trend of productivity would generate sufficient aggregate demand which in turn may be reason of new employment generation. But often market behaves otherwise. Labor productivity growth is a necessary condition for advancing structural transformation and achieving higher standards of living (United Nations Conference on Trade and Development, 2012). Production and investment decisions were taken on the basis of domestic demand before globalization whereas today most of the developing nations adopt such decision with reference to the outlet of export demand. In the era of labor-saving technology, application of capital-intensive technology is inevitable to reduce the cost per unit of output or for decent work for mankind even in the labor-surplus economy, and it displaces labor at the cost of labor deployment. It signifies that real wage is supposed to be enhanced which in turn raises aggregate demand, productivity gains translate into higher demand for domestically produced goods and services.

What are the basic theoretical frameworks by which we could provide jobs to the job seekers when actual growth rate of unemployment exceeds the natural growth rate of unemployment in particular? We are assuming that workers may not be well competent with skills so that they could deploy themselves in the productive job as per their capacity. According to conventional neoclassical theory, flexibility of wage rates and adjustment mechanism of wage for clearing the labor market is pronounced. Capital-labor substitution in a wide range permits producers to pick out appropriate technique of production; while Keynes suggested otherwise - downward wage-rigidity is a limitation for the expansion of employment. Perhaps neither of these approaches favors employment expansion in most of the developing nations.

Policies often applied to achieve a required growth of fixed capital formation that provides the additional employment opportunities for absorbing surplus labor. Generation of mass income in a growing economy or inclusive growth pattern might optimize our employment target. Gain in productivity should be distributed in such a way that allows labour income to grow at the same pace as productivity. As demand grows, it would also be supplementary as an inducement to additional fixed investment, and as a stimulus for industrial growth and the creation of jobs to absorb the job seekers. The implementation of such policies in a market-based economy requires a robust institutional framework adapted to the economic structure and the historical specificities of each country. Fiscal policy is often applied by cutting tax rate which in turn raises aggregate demand. Here is a limitation too, it causes government-demand to move downward direction because of curtailment of tax-revenue and hence aggregate demand is likely to be affected to create new jobs. Policymakers often feel

uncomfortable as neither of the policies can achieve desired goals; additional policy measures like income policy, price control could be applied.

2. Review of Related Literature

We present a list of related research works available in the literature to justify our study. Volume of consumption in view of employment generations is not less important as it is assumed to be voluminous demand component. During worsening labour market, low consumption level directly affects fiscal policy since government revenue is adversely affected, transfer payment too. Karras (1993) justified that government spending on employment and output might rest on volume of government size and the stickability of spending; permanent and continuous changes in government consumption have a greater influence on output and employment than temporary or cyclical changes. The finding also showed that the output elasticity of government consumption was positive but declined with increases in government size. In another study, Gruber (1997) opined that consumption decisions of the households matter the ongoing unemployment level. It is noticed that households of Spain responded during increasing unemployment rate in the early stage of this millennium; Spanish updated their expectation of future income during the phase of massive unemployment, which forced to reduce consumption. But people's consumption does not respond in the short run. Adjustments measures to changes in expectations in future work strongly in view of reduction of consumption – a long run scenario.

In their study, Bnentolila and Ichino (2000) highlighted that there was serious relationship between unemployment and volume of consumption. Increase in duration of unemployment was associated with smaller consumption losses in Spain and Italy in particular as panel data of Spain, Italy, Germany and USA were taken into study.

Empirical evidence of Algan, Cahuc, Zylberberg (2002), based on sample of OECD countries in the 1960-2000 period, recommended that creation of 100 public jobs might be the elimination of jobs closed to 50 private sector jobs, labour market was being bogged down up to a certain extent. Further, crowding out effect of public jobs on private jobs was only significant in countries where public production was highly substitutable to private activities and the public sector offers more attractive wages compared to private labour market. In their study, Galí, López-Salido and Vallés (2004) pointed out that consumption demand increased when government spending went up and the outcome of the study could not be easily reconciled with existing optimizing business cycle models. The study of Stephens (2004) construing changes in subjective job-loss probabilities did not influence on consumption of employed workers whereas changes in expectations to future income affect consumption negatively. The shadow of unemployment affected future consumption primarily through expectations. Relation between government spending shocks and private consumption is revisited by Coenen and Straub (2005) with the econometric tools of DSGE models; non-Ricardian households were taken into account. It exhibited that government spending shocks was conducive for raising the level of consumption level. As per study of Karanassou, Sala and Salvador (2007), dynamicity of labour market establishes capital accumulation plays a basic role in shaping unemployment movements, indirect transmission channels of the capital stock effects by using variables like interest rates or investment ratios is taken into the study. Capital stock is a major determinant of unemployment in the Nordic countries; negative shocks to capital stock growth in Denmark and Sweden are pronounced. The study of Furceri and Zdzienicka (2010) revealed that social spending affected economic activity perceptibly; expansionary effects on GDP in OECD countries for the period 1980 to 2005 were pronounced. An increase in one per cent of social spending raises GDP by about 0.1 per cent point during downturns in particular. Unemployment and health benefits are the key points of their empirical findings. Spending also affects private consumption positively while has a negligible effect on investment. In another study, Fouladi (2010) confirmed that efficiency of government expenditure depended upon kind of expenditure if it was confined to agricultural, gas and oil, construction, industry and mineral and service. Government expenditure as investment had influences on economy in different ways while consumption expenditure caused reduction in production, employment and investment.

The effects of government expenditure shocks on the unemployment rate in the face of proactive holding of assets by the households with rule-of-thumb consumers has been studied by Mayer, Moyen and Stähler (2010). Their findings supported that thumb-rule consumers had a few incentives to work harder in order to consume more as the marginal utility of consumption deteriorates relative to the marginal disutility of work. In contrast, households' optimization behaviour would have a strong incentives to raise labor supply as crowding out in private consumption would raise the marginal utility, incentives to work more. Tayeh and Mustafa (2011) proved that government expenditure had a considerable impact on inflation rate and unemployment rate in Jordon during the period1979- 2000. Accordingly, policy of public spending would enhance job opportunities and assist in alleviating poverty. Ramey (2012) opines that private spending falls significantly in most cases when there is an increase in government spending, tax rates curb the spending multiplier. He also explores the effects of government spending on labor markets which suggests that increases in government spending lower unemployment.

The empirical study of Iacovoiu (2012) observed the relationship between the progression of net capital investment and unemployment dynamics in Romania in the period 2004 – 2012. As a result of the global economic crisis in 2009, a significant reduction in net FDI in 2009 was observed because of lower domestic and external demand that led to a rising unemployment.

According to Sigurdsson (2013), numerical analysis reveals that an increase in growth of capital-production technology raises capital formation and employment in capital production; reducing unemployment in equilibrium. Model with macroeconomic data successfully shows the negative long-run relationship between investment and unemployment. According to Rodolfo and Reggio (2014), during the Great Recession a one percentage point increase in the unemployment rate was related to a reduction in household consumption of more than 0.7 per cent per equivalent adult in Spain. It is observed that the fall in consumption expenditure was due to a reduction in quantities purchased, not lower prices. Bande-Ramudo, Fernandez-Grela and Riveiro-Garcia (2014) examined empirically that consumption shocks on unemployment through changes in investment was evident in Spain; permanent shifts in the consumption-saving practice would have a permanent impact on investment , consequently unemployment rate too.

According to Qionga and Junhuaa (2015), defence-unemployment nexus in China is really a surprise to us so far as datasets on relevant variables for the period 1991 to 2013 are concerned; empirical result shows that the military expenditure pushes up the unemployment rate whereas the increase in its non-military counterpart presses down the rate. The study of Dikko (2016) shows the existence of a negative relationship between capital accumulation and unemployment in all the economies like Namibia, Nigeria, and South Africa. One per cent increase in the level of capital accumulation will reduce the unemployment rates of Namibia, Nigeria, and South Africa by 3.75, 13.07, and 1.59 per cent respectively. Holden and Sparrman (2016) estimated the effect of government purchases on unemployment in 20 OECD countries during the period 1980-2007. It is noticed that unemployment is reduced by about 0.3 percentage points in the same year as government purchases increase by one per cent of GDP; greater effect is also noticed in downswing stage compared to booms. Positive effect of increased government purchases on the employment to population rate is observed during unemployment. In the study with different flavour for the panel of Indonesian provinces Fleriyanto and Sriyana (2016) analyzed the impcts of minimum wage policy upon level of employment. It revealed that minimum wage policy across provinces had created unemployment trap and there was negative correlations between economic growth and employment rate in the provinces. Applying the trade-adjusted shift-share analysis upon the employment level in the post crisis periods in Greece Kallioras, Tsiapa and Zapantis (2016) observed negative national effect component as an outcome of the shocks and the upsets that the Greek economy had suffered.

Onodugo et.al (2017) studied the impact of government expenditure and private investment on unemployment rates during the period 198-2013 in Nigeria. It is observed that capital expenditure both in the short-run and long-run do influence the reduction of the unemployment; the public sector finances on infrastructure lead to an output growth and additional employment generation to speak of. Both short-run and long-run expenditure

induce the reduction of the unemployment rate; the impact of private investment to reduce unemployment in Nigeria cannot be denied. In their work Correia and Alves (2017) analyzed the specificities of employment in Portuguese regions at a disaggregated level of NUTS III, and the synchronisation of regional employment cycles over the 2000-2014. It revealed that Portugal is marked by substantial regional specificities. The analysis of the evolution of employment 'cycles highlight the considerable reduction in the employment rate since the beginning of the 2000s, with particular intensity in the phase of global financial crisis. The study of Yıldırım and Yıldırım (2017) established that show consumption shocks have a significant impact on both the unemployment rate and the investments in Turkey during 2005-2016, used structural VAR (SVAR) models. As per study, Investment shocks also have a similar effect on unemployment rates and positive investment shocks raised employment rates. Accelerator effect is found to be proactive to complement investment because of the increase in consumption. Jablanovic (2017) aimed to analyze a relatively simple chaotic unemployment rate growth model that is capable of generating stable equilibria, cycles, or chaos, and secondly, to to analyze the unemployment rate growth stability in the period 1991-2015 in the Euro Area and assured the prevalence of stable growth of the unemployment rate in the Euro Area in the study period.

In a recent study, Tripathy (2018) analyzes the employment situation in different class of cities in urban India for the period emphasizing upon the relevant city specific determinants of city-wise work-force participation rate. The results show that the indicators such as city-wise average land owned by a person, city-wise percentage of persons receiving any vocational training, percentage of persons currently registered with any placement agency, city size population and city output growth have explained declining work participation rates of the country.

2.1. Objective of the Study

Based on the survey of literature, the present study examines whether there are long run associationships and short run interplays among unemployment, consumption demand, investment demand and government expenditure for India, Sri Lanka and Bangladesh for the period 1996-2015.

2.2. Theoretical Model

As mentioned, unemployment level in an economy is dependent upon, besides other factors, different components of demand. The different components are consumption demand (C), investment demand (I = GCF) and government expenditure (G). Hence,

U = f(C, I, G, A)

where A is the club of all other factors influencing level of unemployment. Taking the the derivative with respect to time (t) and dividing both sides by U we get the relation among them as-

$$\frac{\dot{U}}{U} = \frac{\dot{C}}{C} + \frac{\dot{I}}{I} + \frac{\dot{G}}{G} + \dot{A}/A$$

Keeping all other factors A as fixed then the relation among unemployment and different demand components turned down to-

$$\frac{\dot{U}}{U} = \frac{\dot{C}}{C} + \frac{\dot{I}}{I} + \frac{\dot{G}}{G}$$

The expression shows that the time rate of growth of unemployment is the summation of the time rate of growth of consumption, investment and government demands.

2.3. Data Sources

We have taken only three countries like Sri Lanka, India and Bangladesh for our present study. Time series datasets on percentage change in unemployment, annual growth rates of consumption, government expenses and gross capital formation are taken for the period 1996 to 2015 from World Bank.

2.4. Empirical Methodology

Since we have 20 data points which may have stochastic trends, we need to test for stationarity or unit roots of the four series for all the selected countries. We have tested for unit roots by Augmented Dickey-Fuller (ADF) (1979). The ADF test is based on the assumptions that the error term is serially independent and has a constant variance. For a data set of variable, y (y_t, t = 1, 2, ...,T), where t denotes time, let us consider the following linear regression set up for unit root test for two versions of the ADF(p) regression–viz.,

$$\Delta y_t = \alpha + \beta y_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta y_{t-j} + u_t \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

for the without time trend case and

$$\Delta y_t = \alpha + \delta t + \beta y_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta y_{t-j} + u_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

for the with time trend case.

If β = 0 is rejected by the ADF statistic then we say that the series is stationary. If this property holds for all the series of unemployment, consumption expenditure, GCF and government's expenditure, then we can run regression without the chances of getting spurious results. If not, we need to test whether the series are integrated of order one (I(1)) or first difference stationary. If we get the result that all the series are I(1) (that is integrated of same order), or non stationary at level values, then we can test for cointegration between the series to establish long run relations. Since we have four endogenous variables we can run vector auto regression (VAR) model and if we find cointegration among them then we apply vector error correction model (VECM). If VECM provides usual signs and statistically significant results then we can say that there are long run causalities running from any three independent variables to any one dependent variable. If we do not find significant VECM results then we say there are no long run associationships among all the four variables. In that case we test for short run causality in line with Wald test. If we get significant causality results then we test for the fitness of the model. We test for residuals to justify whether there is any serial correlation exists among the error terms (by LM test), whether there is the presence of heteroskedasticity (by Breusche-Pagan test) and whether the residuals are normally distributed (by JB test).

Let us structure a VAR model for four endogenous variables such as unemployment rate (UN), growth of consumption expenditure (CON), growth of gross fixed capital formation (GCF) and growth of government expenditure (GOV).

$$UN_t = \alpha_1 + \sum_{j=1}^{n} \beta_{1j} UN_{t-j} + \sum_{j=1}^{n} \gamma_{1j} CON_{t-j} + \sum_{j=1}^{n} \delta_{1j} GCF_{t-j} + \sum_{j=1}^{n} \theta_{1j} GOV_{t-j} + u_{1t} \quad \ldots (3)$$

$$CON_t = \alpha_2 + \sum_{j=1}^{n} \beta_{2j} UN_{t-j} + \sum_{j=1}^{n} \gamma_{2j} CON_{t-j} + \sum_{j=1}^{n} \delta_{2j} GCF_{t-j} + \sum_{j=1}^{n} \theta_{2j} GOV_{t-j} + u_{2t} \quad (4)$$

$$GCF_t = \alpha_3 + \sum_{j=1}^{n} \beta_{3j} UN_{t-j} + \sum_{j=1}^{n} \gamma_{3j} CON_{t-j} + \sum_{j=1}^{n} \delta_{3j} GCF_{t-j} + \sum_{j=1}^{n} \theta_{3j} GOV_{t-j} + u_{3t} \quad (5)$$

$$GOV_t = \alpha_4 + \sum_{j=1}^{n} \beta_{4j} UN_{t-j} + \sum_{j=1}^{n} \gamma_{4j} CON_{t-j} + \sum_{j=1}^{n} \delta_{4j} GCF_{t-j} + \sum_{j=1}^{n} \theta_{4j} GOV_{t-j} + u_{4t} \quad (6)$$

where α_1, β_{1j}, γ_{1j}, δ_{1j}, θ_{1j} stand for the intercept and slope coefficients when UN is the dependent variable. The notations with numbers will change accordingly from 2 to 4 for CON, GCF and GOV as the dependent variables. Once the optimum lag is selected then the VAR model will have to be modified. Suppose optimum lag is 2 then the values of j will be 1 and 2.

Once it is tested that the series are cointegrated in line with Johansen technique, we will go for modeling the VECM. VECM is a restricted VAR model and it has cointegrating relation built into the specification so that it restricts the long run behaviours of the endogenous

variables to converge to their long run equilibrium relations while allowing for the short run dynamics. The cointegrating term is known as the error correction (EC) term since the deviation from the long run equilibrium is corrected gradually through a series of short run dynamic adjustments. Here the primary objective is to add estimated error terms with lagged values as the error correction terms. The VECM is given by the following set of equations-

$$\Delta UN_t = \alpha_1 + \sum_{j=1}^{n}\beta_{1j}\Delta UN_{t-j} + \sum_{j=1}^{n}\gamma_{1j}\Delta CON_{t-j} + \sum_{j=1}^{n}\delta_{1j}\Delta GCF_{t-j} + \sum_{j=1}^{n}\theta_{1j}\Delta GOV_{t-j} + \sum_{i=1}^{m}\eta_{1i}\hat{e}_{1,t-i} + \varepsilon_{1t} \quad (7)$$

$$\Delta CON_t = \alpha_2 + \sum_{j=1}^{n}\beta_{2j}\Delta UN_{t-j} + \sum_{j=1}^{n}\gamma_{2j}\Delta CON_{t-j} + \sum_{j=1}^{n}\delta_{2j}\Delta GCF_{t-j} + \sum_{j=1}^{n}\theta_{2j}\Delta GOV_{t-j} + \sum_{i=1}^{m}\eta_{2i}\hat{e}_{2,t-i} + \varepsilon_{2t} \quad (8)$$

$$\Delta GCF_t = \alpha_3 + \sum_{j=1}^{n}\beta_{3j}\Delta UN_{t-j} + \sum_{j=1}^{n}\gamma_{3j}\Delta CON_{t-j} + \sum_{j=1}^{n}\delta_{3j}\Delta GCF_{t-j} + \sum_{j=1}^{n}\theta_{3j}\Delta GOV_{t-j} + \sum_{i=1}^{m}\eta_{3i}\hat{e}_{3,t-i} + \varepsilon_{3t} \quad (9)$$

$$\Delta GOV_t = \alpha_4 + \sum_{j=1}^{n}\beta_{4j}\Delta UN_{t-j} + \sum_{j=1}^{n}\gamma_{4j}\Delta CON_{t-j} + \sum_{j=1}^{n}\delta_{4j}\Delta GCF_{t-j} + \sum_{j=1}^{n}\theta_{4j}\Delta GOV_{t-j} + \sum_{i=1}^{m}\eta_{4i}\hat{e}_{4,t-i} + \varepsilon_{4t} \quad (10)$$

where $\hat{e}_{t-i}$ is the lagged value of the estimated residuals and $\eta\hat{e}_{t-i}$ is the error correction term. 'η' indicates coefficient of EC, it is desirable to be negative and statistically significant to establish the long run associationships among the variables. Further, a negative and significant 'η' signifies long run causality from any three endogenous variables to the rest of the endogenous variable. For example, if $\eta_1<0$ and significant then we say that there are long run causality from CON, GCF and GOV to UN. In addition, 'i' indicates number of cointegrating equations.

Short run causality, say in equation (7), from CON, GCF and GOV to UN can be examined on the basis of null hypothesis, H_0: $\gamma_{1j} = \delta_{1j} = \theta_{1j} = 0$. If the null hypothesis is accepted with probability values less than 0.05 then there is no causality running from CON, GCF and GOV to UN. Wald test ensures the results.

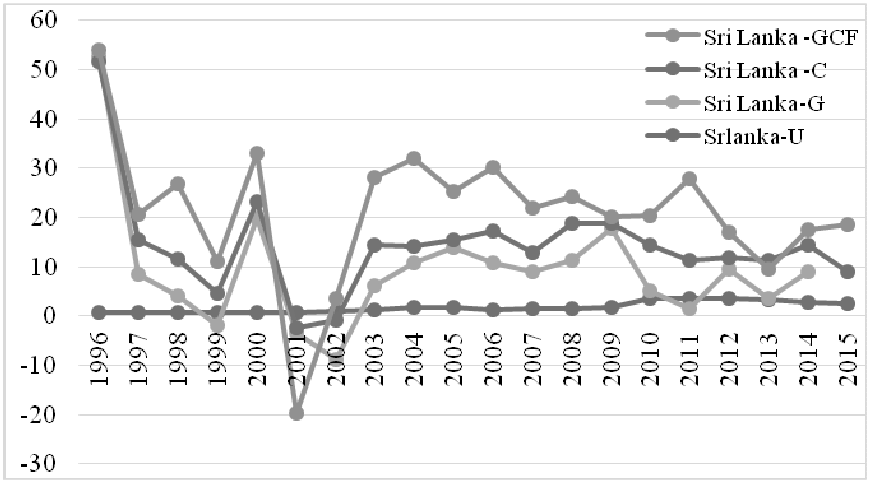
Finally we examine whether the residuals of the models (combinations of dependent and independent endogenous variables) pass the diagnostic checking to ensure the model as good fit. Three diagnostic checking are necessary to test- i) whether residuals are serially correlated, ii) whether residuals are heteroskedastic and iii) whether residuals are normally distributed. The null hypothesis for (i) is 'the errors are not serially correlated', for (ii) is 'the errors are heteroskedastic' and for (iii) is 'the errors are normally distributed'. The test statistics for (i) is Breusch-Godfrey, for (ii) Breusch-Pagan-Godfrey and for (iii) it is Jarque-Bera. A high value of probability in each of the test statistics indicates that the null hypothesis is accepted and so the errors qualify all the diagnostic checking.

2.5. Empirical Investigation

2.5.1. Graphical view

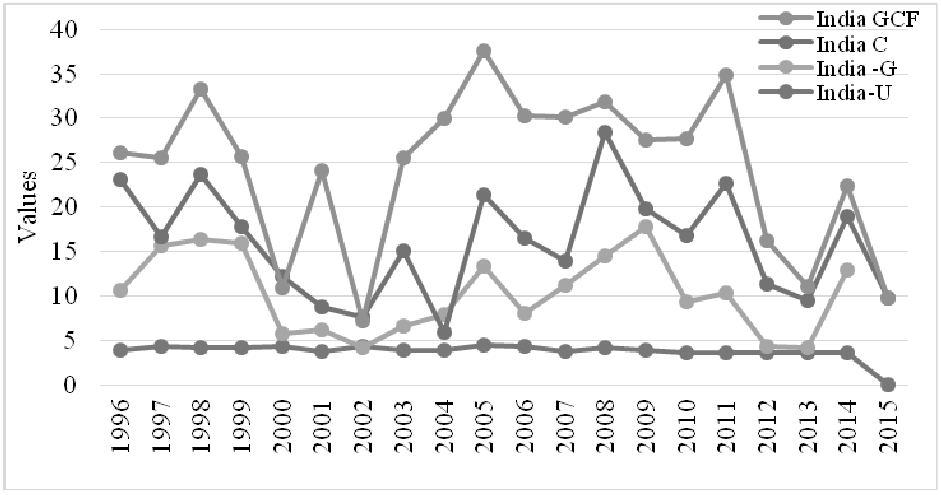
A graphical presentation provides a brief scenario of the selected indicators and it is helpful to read the movements of the indicators over time. Figure 1, Figure 2 and Figure 3 respectively represent the trends of the indicators for Sri Lanka, India and Bangladesh. We see that the magnitudes of the growth rates of GFCF for all the countries are higher compared to that of consumption demand and public demand. Consumption expenditure grows at higher rates compared to the government expenditure for all the countries.

Figure 1. Indicators for Sri Lanka



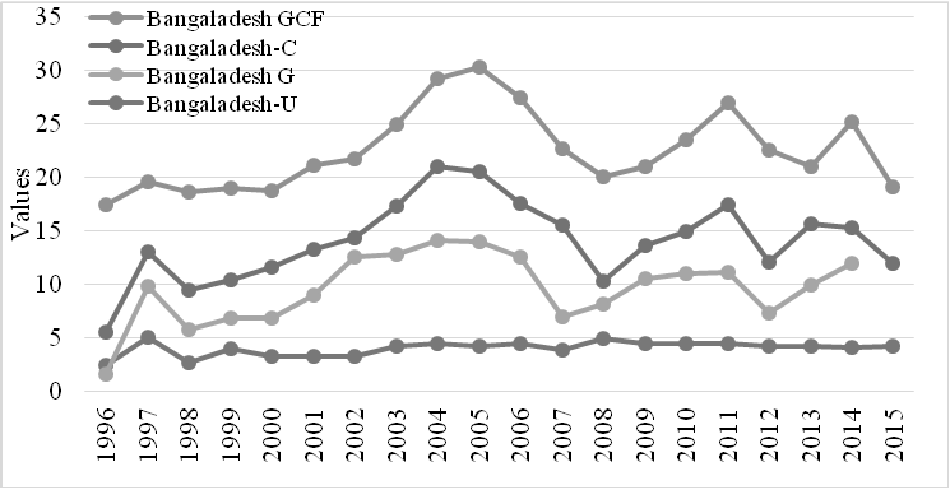
It is to further note that the overall growth rate of GFCF of India hovers around 25 per cent, for Bangladesh it is around 22 per cent but for Sri Lanka, it around 20 per cent. Similarly, the overall growth rate of consumption expenditure is larger for India followed by Bangladesh and Sri Lanka. The public sectors of all the countries contribute almost at the same rates. Hence, not only the volume of aggregate demand is large in India, its growth rate also out steps the neighboring countries.

Figure 2. Indicators for India



The percentage changes of unemployment rates for all the countries lie below the other three indicators. The unemployment scenarios for Sri Lanka and Bangladesh have been worsening over time but India has been improving in absorbing their total labour force into their economic activities. But the major difference is that Sri Lanka maintains unemployment rates below 3 per cent over the entire period of study unlike the other two countries.

Figure 3. Indicators for Bangladesh



2.5.2. Unit roots test results

Since we have 20 year points and the diagrams of all the indicators showing fluctuations, we need to test whether there are stochastic properties in the indicators to avoid spurious statistical results. The stochastic properties or the existence of unit roots have been tested in line with the ADF technique and estimated by equation 1 and 2. The results (refer to Table1**)** show that all the series are free from unit roots problem and so they are stationary at their first differences for all the countries. The series for all the indicators are thus integrated of order one (I(1)). The series for GOV in India is slightly weak; albeit we have considered it to be first difference stationary.

Table 1. Unit roots test results of all the indicators

Country	Indicators (in first differences)	ADF	Prob.	Remarks
Sri Lanka	Unemployment	-3.62	0.05	Stationary
	Consumption	-5.52	0.00	Stationary
	GFCF	-3.76	0.05	Stationary
	Govt. Expd.	-4.44	0.00	Stationary
India	Unemployment	-6.61	0.00	Stationary
	Consumption	-7.57	0.00	Stationary
	GFCF	-4.76	0.00	Stationary
	Govt. Expd.	-2.86	0.07	Stationary
Bangladesh	Unemployment	-3.60	0.05	Stationary
	Consumption	-3.99	0.01	Stationary
	GFCF	-5.67	0.00	Stationary
	Govt. Expd.	-3.07	0.05	Stationary

Note: All the results are derived at the lag of one year.

2.5.3. Johansen Cointegration test results

As the number of endogenous variables is more than two we use VAR model to identify optimum lags and cointegration among the four variables. The optimum lag is selected by looking at the minimum values most of the testing criterions such as LR, Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SIC), Hannan-Quinn information criterion (HQIC) take. In all the cases with each of the four indicators playing the nature of dependent variable interchangeably, the optimum lags are observed to be 2 or 3. But we have 20 time points and after differencing the series turns to 17 (=20-3lags) and with one constant term, the time points ultimately reduced to 16 (=20-3-1). Under this restricted condition with low degrees of freedom, the cointegration test cannot be done. Hence, we have taken only 1 lag to study for cointegration among the variables. Johansen cointegration test technique has been applied and the results have been presented in Table 2.

Table 2. Johansen Cointegration test results

Country	Hypothesized No. of CE(s)	Trace Statistics (Prob)	Max. Eigen Statistics (Prob)	Remarks
Sri Lanka	None *	182.635(0.00)	119.948(0.00)	The variables are cointegrated and there are 2 cointegrating equations at 0.05 level
	At most 1 *	62.687(0.00)	48.239(0.00)	
	At most 2	14.447(0.12)	11.939(0.20)	
	At most 3	2.508(0.18)	2.508(0.14)	
India	None *	128.655(0.00)	86.505(0.00)	The variables are cointegrated and there are 2 cointegrating equations at 0.05 level
	At most 1 *	42.149(0.00)	32.176(0.00)	
	At most 2	9.973 (0.28)	9.47(0.24)	
	At most 3	0.501(0.47)	0.501(0.47)	
Bangladesh	None *	94.765(0.00)	50.223(0.00)	The variables are cointegrated and there are 3 cointegrating equations at 0.05 level
	At most 1 *	44.542(0.00)	26.572(0.00)	
	At most 2 *	17.97(0.02)	16.092(0.02)	
	At most 3	1.877(0.17)	1.877(0.17)	

Note: * mark denotes rejection of the 'no cointegration' hypothesis at the 0.05 level.

It is observed from the table that the Trace Statistics and Maximum Eigen Value Statistics are showing cointegration results among the variables in all the countries at 0.05 levels of significance. This means, the variables are cointegrated and there are long run associationships among them. There are two cointegrating equations for Sri Lanka and India and three for Bangladesh.

Now we test for long run (LR) dynamics among the four variables around the equilibrium relations by VECM. VECM is a restricted VAR model. If we find the error correction coefficients for all the four dependent endogenous variables as negative in sign and statistically significant (with $p<0.05$) then we say that the errors are corrected and there are LR causality running from the rest of the three endogenous independent variables to the endogenous dependent variable. If not there is cointegration but no long run causal relations from three to one. The results of VECM have been presented in Table 3 in summary form.

Table 3. Long run causality test results through VECM

Country	Dependent Variables	Independent Variables	EC term(η)	Prob.	Remarks
Sri Lanka	Unemployment	CON, GCF, GOV	0.025	0.337	No LR causality
	Consumption	UN, GCF, GOV	0.499	0.00	No LR causality
	GFCF	UN, CON, GOV	0.322	0.495	No LR causality
	Govt. Expd.	UN, CON,GCF	-1.285	0.008	UN, CON, GCF→GOV
India	Unemployment	CON, GCF, GOV	-0.436	0.012	CON, GCF, GOV→UN
	Consumption	UN, GCF, GOV	-11.39	0.000	UN, GCF, GOV→CON
	GFCF	UN, CON, GOV	6.863	0.242	No LR causality
	Govt. Expd.	UN, CON,GCF	-0.826	0.832	No LR causality
Bangladesh	Unemployment	CON, GCF, GOV	0.0153	0.003	No LR causality
	Consumption	UN, GCF, GOV	0.385	0.178	No LR causality
	GFCF	UN, CON, GOV	0.145	0.404	No LR causality
	Govt. Expd.	UN, CON,GCF	0.312	0.344	No LR causality

As we have already mentioned in the methodology section that a negative and significant error correction term in a VEC model ensures long run causality, hence, no endogenous variable gets caused by other three endogenous variables in case of Bangladesh. For Sri Lanka, we see that the EC term is negative and significant for GOV as the endogenous dependent variable. Thus, there is long run causality running from UN, CON and GCF to GOV. Although the case for CON as the endogenous variable for Sri Lanka is statistically significant (since $p<0.05$) but its sign is not negative, rather positive which establishes the divergence tendency from the long run relation. The results for India are more conclusive. It is revealed that UN is caused by CON, GCF and GOV and CON is caused by UN, GCF and GOV. In other way to say that unemployment in India is affected by aggregate demand

components that was a prime agenda of our study. Again, although the EC term is negative for GOV as the dependent endogenous variable in India, it is not statistically significant.

2.5.4. Short run causality test

We test for short run causality among the variables by Wald Test. The results have been given in Table 4. The decision rule is through the values of Chi Square test statistics with probabilities less than 0.05. It is observed that in no country GOV is caused by UN, CON and GCF. That means, household and industrial demands and unemployment situation of these three countries do not influence their governments to take spending decisions. That means, private demand does not influence public demands. In case of Sri Lanka and India, CON is caused by UN, GCF and GOV and in case of Bangladesh and India, there are short run causality running from CON, GCF and GOV to UN. This means, aggregate demand components in India and Bangladesh influence the unemployment rates of these two countries. In addition, GCF is motivated by UN, CON and GOV in Bangladesh. There are three cases of causality failure in case of Sri Lanka.

Table 4. Short run causality test results (Wald test)

Country	Dependent Variables	Independent Variables	Chi Square Value	Prob.	Remarks
Sri Lanka	Unemployment	CON, GCF, GOV	2.468	0.480	No SR causality
	Consumption	UN, GCF, GOV	7.768	0.051	UN, GCF, GOV→CON
	GFCF	UN, CON, GOV	3.722	0.293	No SR causality
	Govt. Expd.	UN, CON,GCF	4.035	0.257	No SR causality
India	Unemployment	CON, GCF, GOV	8.105	0.043	CON, GCF, GOV→UN
	Consumption	UN, GCF, GOV	19.18	0.000	UN, GCF, GOV→CON
	GFCF	UN, CON, GOV	0.841	0.839	No SR causality
	Govt. Expd.	UN, CON,GCF	0.070	0.995	No SR causality
Bangladesh	Unemployment	CON, GCF, GOV	15.032	0.001	CON, GCF, GOV→UN
	Consumption	UN, GCF, GOV	5.645	0.131	No SR causality
	GFCF	UN, CON, GOV	11.455	0.009	UN, CON, GOV→GFCF
	Govt. Expd.	UN, CON,GCF	0.696	0.874	No SR causality

Comparing the long run and short run causality results in reference to Table 3 and 4 we see that India is the only country where the case for unemployment produces similar causality results. No other countries' results produce any such similar results in long run and short run causality.

Examining long run and short run associationships among the four endogenous variables for the selected countries should be supplemented by diagnostic checking regarding the residuals or error terms to guarantee the model as good fit. Three different forms of diagnostic checking have been carried out and the results have been depicted in Table 5.

Table 5. Residuals' diagnostic checking

Country	Dependent Variables	Independent Variables	Breusch-Godfrey Serial Correlation LM Test(Prob.-F stat)	Breusch-Pagan-Godfrey Heterosked asticity Test(Prob.-Chi Square)	Histogram-Normality Test (Jarque-Bera, Prob.)	Remarks
Sri Lanka	UN	CON, GCF, GOV	0.998	0.409	0.396*	Model is partially good fit as the errors do not satisfy the normality property
	CON	UN, GCF, GOV	0.353	0.734	0.456*	Model is partially good fit as the errors do not satisfy the normality property
	GCF	UN, CON, GOV	0.999	0.216	0.931	Model is good fit as the errors satisfy all the diagnostic checking

Country	Dependent Variables	Independent Variables	Breusch-Godfrey Serial Correlation LM Test(Prob.-F stat)	Breusch-Pagan-Godfrey Heteroskedasticity Test(Prob.-Chi Square)	Histogram-Normality Test (Jarque-Bera, Prob.)	Remarks
	GOV	UN, CON,GCF	0.964	0.125	0.972	Model is good fit as the errors satisfy all the diagnostic checking
India	UN	CON, GCF, GOV	0.110	0.284	0.617	Model is good fit as the errors satisfy all the diagnostic checking
	CON	UN, GCF, GOV	0.748	0.644	0.740	Model is good fit as the errors satisfy all the diagnostic checking
	GCF	UN, CON, GOV	0.920	0.374	0.637	Model is good fit as the errors satisfy all the diagnostic checking
	GOV	UN, CON,GCF	0.999	0.905	0.845	Model is good fit as the errors satisfy all the diagnostic checking
Bangladesh	UN	CON, GCF, GOV	0.891	0.258	0.570	Model is good fit as the errors satisfy all the diagnostic checking
	CON	UN, GCF, GOV	0.659	0.509	0.869	Model is good fit as the errors satisfy all the diagnostic checking
	GCF	UN, CON, GOV	0.925	0.089	0.920	Model is good fit as the errors satisfy all the diagnostic checking
	GOV	UN, CON,GCF	0.964	0.494	0.398*	Model is partially good fit as the errors do not satisfy the normality property

We see that for all the dependent endogenous variables cases, the residuals are not serially correlated and non heteroskedastic as the probability values of the two test statistics (column 4 and 5) are greater than 0.05 which accept the null hypothesis of no serial correlation and homoskedasticity. Again, all the endogenous dependent variables' residuals are normally distributed (column 6) as the probability values are greater than 50 per cent as per Jarque-Bera method except three regressions. They are two for Sri Lanka with unemployment and consumption as the dependent variable and one for Bangladesh where government expenditure has worked as dependent endogenous variable. We have marked these three results as partially good fit as the other two diagnostic checking have worked in favour. Hence, the results of the overall diagnostic checking show that the estimated models are good fit and so the conclusion we have arrived at have legitimacy.

3. Conclusion

Unemployment of an economy should have some associations with its aggregate demand components and that has been specified to be examined as the major agenda of the present study. With time series data on three aggregate demand components, namely, consumption expenditure, capital formation (or investment expenditure) and public spending, we did the desirable econometric exercises such as cointegration, VECM and Wald test to test whether there are long run equilibrium relationships among unemployment, consumption expenditure, capital formation and public spending and directions of their interplays in long run and short

run frameworks. Doing appropriate diagnostic checking for the residuals of all the estimations, the results show that all the four series are cointegrated justifying long run associationships among them. Further, the long run causality analysis through VECM reveals that unemployment, consumption demand and investment demand make a cause to public demand for Sri Lanka. The results for India are more conclusive. It is revealed that unemployment is caused by all three components of aggregate demand of the economy and its aggregate consumption demand is caused by unemployment, investment demand and public spending. Bangladesh does not produce any such long run causal relationships among the four variables.

Further for short run causality results, the study observed that, in case of Sri Lanka and India, consumption is caused by unemployment, capital formation and government expenditure and in case of Bangladesh and India, there are short run causalities running from consumption, capital formation and government expenditure to unemployment. This means, aggregate demand components in India and Bangladesh influence the unemployment rates of these two countries. In addition, capital formation is motivated by unemployment, consumption and government expenditure in Bangladesh.

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