THE IMPACT OF UNEMPLOYMENT AND INTEREST RATE ON INFLATION IN SRI LANKA

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Abstract

Three major economic indicators such as Inflation, unemployment and interest rate have an important role in an economy in terms of sustainable development. The long-term progress of the Sri Lankan economy is destabilized. The linkage or the impact among these variables is very important for developing country such as Sri Lanka to overcome the destabilized hurdles. The study intends to investigate the impact of unemployment and interest rate on inflation in Sri Lanka. Also, this study was analyzed the short and long run relationship among the variables. Phillip's relationship between the variables inflation and unemployment also was discussed in details. Fifty-three years of annual data for period of 1953-2015 of the variables inflation, unemployment, interest rate, money supply (M2) and government expenditure used for the analysis. Parametric and non-parametric approaches have been employed in this study. The Autoregressive Distributed Lag (ARDL) model with co-integration technique has been employed to find the short and long run relationship of the variable. The statistical package EViews 9 and Microsoft excel were used for the analysis. The study reveals that unemployment is negatively impact on inflation in short and long run in Sri Lanka, which is statistically significance. Further, the study revealed that the Phillip's relationship between inflation and unemployment exist in Sri Lankan economy. The interest rate is also negatively impact on inflation in short run and positively impact in long run. Results are statistically significance at 5% confidence level and theoretically expected. This study recommends that the relationship between the variables should be noted and utilized the Engine of growth concept in order to achieve sustainable development of Sri Lanka. Job opportunities to be extended further more. Further, the study suggests that using quarterly data to analysis this kind of time series will reflect relationship accurate.

Keywords: Inflation, Unemployment, Interest rate, Money supply, Government Expenditure

Introduction

The unemployment, interest rate and inflation play a vital role in sustainable economic growth of any country. The most fundamental objective of macroeconomics is to sustain high economic growth through maintenance of low rate of unemployment and low rate of inflation (Adeyi Emmanuel ola, 2012). A country may fulfill this kind of situation where there is full employment of the labour force operates in an economy. Full employment means that, no or low unemployment rate in an economy creates enough supply of goods and services than

demand exists; which reduces the price level or inflation. The rising purchasing power of people (PPP) leads savings and investment which support the economy in an upward trend of growth rate. Sri Lanka has remained as a developing country since a long time and the life cycle of the economic development still at an early stage. The economies of countries like "04 tigers of Asia" such as Singapore, Taiwan, Hong Kong and South Korea are growing faster than Sri Lanka. These four countries positioned as "04 Tigers Asia", of emerging economies and challenging economies to the developed nations such as the United States of America

(USA) and United Kingdom (UK). In 1960, the Gross Domestic Product (GDP) of Sri Lanka and Singapore was United States Dollar (USD) 1.42 billion and USD 0.7 billion respectively. But, at present GDP of Sri Lanka and Singapore is USD 78.82 Billion and USD 307.97 Billion respectively Even though, this kind of as at 2014. backwardness is unbelievable, it is the real scenario in Sri Lanka. The Sri Lankan economy grows in addition term, while other countries grow in multiple terms. According to the Gross National Income (GNI) per capita of 2014, Singapore and Hong Kong ranked above the UK and USA (World Bank, 2015). Sri Lanka is far behind even though having almost all the resources, including natural and human capital than Singapore. The impact of 30 years of civil war, which resulted in high security expenses, also negatively affected the economy. But it is not only the reason for the failure of the economy. The relationship between inflation and unemployment related and policy implications also accountable for the failure of economy. Hence, finding the relationship among these variables in the short and long run is very important in order to understand the real economic scenario in Sri Lanka. Therefore, it is essential to find the relationship between inflation and unemployment in Sri Lanka whether the relationship explained by Phillips or Lucas is exist in Sri Lanka in order to make effective policy decisions. Hence, the study tries to understand the relationship between unemployment, interest rate on inflation in Sri Lanka.

Review of literature

Reviews the scholars' view on the particular field of study related to inflation. unemployment and interest rate. This field of study extensively researched all over the world. However, there are only a few scholars researched on this field in Sri Lanka. Here, some important findings reviewed as follows. The scholar Handapangoda (2005) examines the relationship between inflation

and unemployment in Sri Lankan context. The study concentrates on two different policy regimes such as inward looking in the period of 1970 to 1976 and outward looking for the period of 1977 to 2005. The study found that there is no any significant relationship between unemployment and inflation in Sri Lanka. That means the real relationship explained by Philip's does not exist in Sri Lanka. Lalani (2014) studied about the relationship of inflation and unemployment in Sri Lanka. The author analysed the data for the period of 1980-2013 by using Ordinary Leased Square (OLS) and concluded that there is a positive relationship between inflation and unemployment in Sri Lanka. Niranjala (2014) studied the nature of the relationship between unemployment and inflation in Sri Lanka. A sample of 35 years for the rate of inflation and unemployment has been taken from the year 1977 to 2012. The ADF test was used for finding the unit root or stationary and the Granger causality test and OLS was employed to find the relationship between the inflation and unemployment in Sri Lanka. The results of the statistical analysis show that there is no trade-off between inflation and unemployment in Sri Lanka. Ewing and Seyfried (2004) examined the Phillips curve by using the price adjustment mechanism and the conditional variance of inflation also included rather than the traditional model, they suggested that the adding variability of inflation gives more weight to the model than traditional one.

Chaido, and Melina (2012) studied inflation, unemployment and the NAIRU in Greece. This paper examines the Phillips Curve approach in Greece using annual data from 1980 - 2010. The results show that there is a long run and a causal relationship between inflation and unemployment for the period. Hussein Ali Al-Zeaud, (2014) investigated the existence of a trade-off relationship between unemployment and inflation in the Jordanian economy between 1984 - 2011. Alfred & King (2012) examined the relationship between inflation and unemployment in the long run, using

quarterly US data from 1952 - 2010. According to the band-pass filter approach, the study found strong evidence that a positive relationship exists in short and long run. Gulistan, et.al. (2015) studied the relationship between unemployment and inflation in Turkey. This study period is the years between 1988 - 2002. Vector Autoregressive Model (VAR) and impulseresponse analysis are used in the study to explain the relationship. This result is a supportive of Philips curve. Also, suggest that the inflation reduces the purchasing power of the consumers and increase the social issues and creates the social unrest in the country. Hence. maintaining inflation and unemployment at optimum level is better to politics. the economical Anthony, et.al.(2015) examined the inflation and unemployment nexus in Nigeria by testing if the original Phillips curve proposition holds for Nigeria. The study adapted a distributed lag model with data covering the period 1970-2011. Blanchflower, et al. (2014) studied on happiness tradeoff between the unemployment and inflation. This paper makes use of a large European dataset, covering the period 1975 to 2013, to estimate happiness equations in which an individual subjective measure of life satisfaction is unemployment regressed against and inflation rate. Touny (2013) set the main objective of his study was to investigate the long run trade-off between unemployment and inflation in Egypt through the period (1974-2011). The study revealed a positive relationship between changes in inflation rate and unemployment gap in the long run. Van Bon Nguyen (2015) studied about effects of fiscal and money supply (M₂) on inflation: Evidence from selected economies of Asia and found that money supply (M₂) has significantly positive relationship with inflation Mohseni and Jouzaryan (2016) studied on the subject of examining the effects of inflation and unemployment on economic growth in Iran for the period of 1996-2012 using the ARDL model and revealed that significant and negative effect of inflation and unemployment on economic

growth in long term. Based on the, review of literature a research question was developed in this study. That is; What kind of short and long run relationship exist among the variables unemployment, interest rate and inflation in Sri Lanka?

Objective of the study

The primary objective of this study is to investigate the impact of unemployment and interest rate on inflation in Sri Lanka. Other sub objectives include;

- i. To examine the Phillip's relationship of variables, inflation and unemployment.
- ii. To test the stationary properties of the time series data.
- iii. To examine the long run relationship among the variables, inflation, unemployment and interest rate in Sri Lankan economy.
- iv. To examine the short run relationship among the variables, inflation, unemployment and interest rate in Sri Lankan economy.

Methodology

This study purely depends on the secondary data. In an attempt to explore empirically the relationship between inflation. unemployment and interest rate in Sri Lanka, a multiple regression model such as ARDL was employed. According to the literature, model includes inflation this (INF), unemployment (UR), interest rate (IR), Money Supply (M_2) and government expenditure (GE) as variables; where the inflation rate is dependent variable and others are explanatory repressors. Logarithmically transforming variables in a regression model is a very common way to handle situations where a non-linear relationship exists between the independent and dependent variables. Using the logarithm of one or more variables instead of the un-logged form makes the effective relationship, while preserving the linear model. Necessary secondary data collected from published and unpublished data sources, such as books, journals, proceedings, newspaper articles, statistics, database and handbook, various

reports of central bank, world bank and IMF, university research pool, web browsers and other bibliographies related to the content.

The data and information collected from secondary sources analysed using various analysis methods. The statistical tools like average, percentage, and parametric and nonparametric tests used where necessary. First of all, non-parametric approach or graphical explanation such as Kernel Fit with Confidence ellipse curve was derived among the variables and shown the relationship. The non parametric relationship was validated using parametric approaches such as cointegration technique. The co-integration technique was employed to establish relationships between variables in short run and long run as well. The direct effects of these inflation, interest rate and unemployment could be identified easily rather than the indirect effects or relationship. To identify the time series properties of the variables, Dickey-Fuller (DF) test with break unit root technique was employed. According to the DF test of stationary, the ARDL model was selected and analysed to determine the relationship between the variables in Sri Lanka. Co-integration technique was used to examine the short and the long run relationship between the variables. Short run and long run relationship as well as the long run equilibrium of the model were estimated by using the ARDL co-integration model. The trend of variables such as inflation, interest rate and unemployment explains by using the tables and graphs. The software EViews version 9. and Microsoft Excel used for this purpose. Data is displayed in time series graph at various time-points. This is another type of graph used for this kind of specific data that come in pairs. The vertical axis is for data values while the horizontal axis shows time. This kind of graph used for showing trends passing through a time period. The following analytical function given below is used to test the data on the contribution of the performance of unemployment and interest rate on inflation

in Sri Lanka. The basic model constructed was

$$INF_t = \beta_o + \beta_1 UEt + \beta_2 IR_t + \beta_3 M2 + \beta_4 GE_t + \varepsilon_t \dots (1)$$

The log- log model was constructed by considering data type and trend. Using log transformation, the model is specified as follows:

Here, the model re-organized and named as follows for the analysis purpose

Where INF, UE, IR, GE and M₂ are denoted as inflation rate, unemployment rate, interest rate, Government Expenditure and Money supply (M₂) error respectively, the ε is term and $\beta_0, \beta_1, \beta_2, \beta_3 and \beta_4$ are parameters. The log denoted by ln or LN in the analysis. The best model for analysis this time series data is selected by using the result obtained from unit root test. The figure 1 below clearly explains the situation of data stationary and appropriate models to be selected.



Figure 1. Model selection Source: Muhammad Saheed Aas khan Meo, 2016

Result and Discussions

The trend of variables such as inflation, unemployment, interest rate, money supply (M_2) and government expenditure for the sample period, figured out in following graphs.



Figure 6. Trend of government expenditure in Sri Lanka, 1963-2015



Figure 7. Visual inspection of the relationship between inflation & unemployment

The Kernel Fit with Confidence ellipse graph 7 above shows the relationship between the inflation and unemployment rate in Sri Lanka. It fluctuates over the samle period of time and shows an up and down movement. Between the point a-b and c-d show a positive trend and b-c and d-e show a negative trend between the variable. The graph 7 is not showing a relationship among the variables clearly, but it shows a relatively negative trend.

To meet one of the objectives of the study and find impact of unemployment and interest rate on inflation, the DF break unit root test was employed. Unit root test is essential to find out proper estimation model. The nonparametric or graphical approach shows that the variables are fluctuated and break. Hence, the break points unit root test employed in order to find the real impact of variables.

Table 1. Result of break unit root test

	DF at level		DF at 1 st 1	Difference
Variable	Intercept	Intercept & trend	Intercept	Intercept & trend
LINF	-2.039679	-2.633900	-7.464779 ^a	-7.637685 ^a
LUE	-4.206792°	-4.396421	-8.575309ª	-8.142210 ^a
LIR	-4.346063°	-3.951242	-9.711126ª	-9.719216 ^a

LGE	-3.551842	-8.444567 ^a	-12.98718 ^a	-12.61293 ^a
LM_2	-1.485458	-4.720611	-9.740912ª	-9.870845ª
Source: Estimated 2017 (a - 1% significance b - 5%				

Source: Estimated, 2017 (a - 1% significance, b -, 5% - & c - 10%)

The Dickey-Fuller (DF) unit root tests with break unit root technique is performed on both levels and the first differences with intercept or intercept and trend for all the variables. The result of the unit root test (Dickey Fuller) for the variables are presented in the table 1 above. The Dickey Fuller Test results confirm that the time series data of some variables in the model are nonstationary in their levels. However, these variables are stationary in their first difference. Which means, some variables are integrated I (0) series and some variables are integrated I (1) series. But, all the variables are stationary at I (1) which means all the variables are integrated at 1st difference with intercept. According to the model selection ARDL (Auto criteria the Regressive Distributed Lag) model is most suitable for this kind of time series data. Hence, the rest of the analysis carried out by using the ARDL model.

Bound test: Bound test is performed in order to find the long run relationship of the variables. If the F statistic is greater than the critical Value of particular confidence level, it means that the null hypothesis stated 'No long run relationship exit' is rejected which means there is a long run relationship between the variable is exist. According to the statistic mentioned in the table 2 below, the F statistic is 8.395 and upper bound of critical value for 1% confidence level is 4.37. The result clearly shows that, even at 1% of critical level of upper bound is exceeded. Hence, the model is suitable for the cointegration test. According to the residual diagnostic tests mentioned above the model is fitted and specified correctly. Consequently, the short run and long run relationship of the independent variables with inflation could be established.

Table 2. Test statistic of bound te	st
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Test	Statistic	Probability	
Bound Test	8.395	0.971	
Critical value			
	0 Bound	1 Bound	
a. Significance at 1%	3.29	4.37	
b. Significance at 5%	2.56	3.49	
c. Significance at 10%	2.2	3.09	
Legend: a: Significant at 1%, b: Significant at 5%, c: Significant at 10%			

Tests of model stability :The graph and the ARDL regression result show there is an impact of unemployment on inflation in Sri Lanka. Though the statistical result confirms the phillip's relationship among the variables, it should be re-checked whether the selected model is fulfilling the criteria of model stability tests in order to further discussion.



According to the Schwarz criteria, 2500 models evaluated and selected the ARDL (1, 4, 1, 2,4) is the best model for the data set. The graph 7 above shows the top twenty best models and explained that the ARDL (1, 4, 1, 2,4) is carrying a minimum Schwarz criterion (SIC) which the best one.

CUSUM test : The CUSUM test (Brown, Durbin, and Evans, 1975) is based on the cumulative sum of the recursive residuals. This option plots the cumulative sum together with the 5% critical lines.



The test parameter finds instability if the cumulative sum goes outside the area between the two critical lines. The graphs 9 & 10 above clearly show that the model fitted within the confident level line. Hence, the model used for the analysis is best based on the CUSUM test graph.

Ramsey RESET test: There are many statistical techniques to test the model specification. The Ramsey Regression Equation Specification Error Test (RESET) is tested the specification of independent variables. This omitted variable test, namely Ramsey RESET test was employed for the understanding of whether there are any more variables to be added to the betterment of analysis or the included variables to be specified as square or cube format. The hypothesis of the Ramsey RESET test is as follows, $H_{0:}$ The model is correctly specified, H_1 : The model is not correctly specified.

Omitted Variables: Powers of fitted values from 2 to 5			
	Value	df	Probability
F-statistic	1.407571	(4, 27)	0.2582
F-test summary:			
			Mean
	Sum of Sq.	df	Squares
Test SSR	0.842210	4	0.210553
Restricted SSR	4.881026	31	0.157452
Unrestricted SSR	4.038815	27	0.149586

Table 3. Result of Ramsey RESET test

The F statistic of the Ramsey RESET test is 1.407 with a probability of 0.2582 which means that the null hypothesis of RESET test specified above cannot be rejected at 5% confidence level. Hence, the model developed in this study is correctly specified and there is no more square or cube form of independent variables to be added.

Jarque-Bera (Normality test): This below graph 10 and table 4 below clearly display a histogram and descriptive statistics of the residuals, including the Jarque-Bera statistic for testing normality. If the residuals are normally distributed, the histogram should be bell-shaped and the Jarque-Bera statistic should not be significant for a discussion of the Jarque-Bera test The graph 10 shows as bell-shaped and the Jarque-Bera statistic is not significant at 5% confidence level (JB is 0.059 and p is 0.971). Hence, the used model is specified correctly as per the Jarque-Bera test statistic.

According to the results shown in graph 10 above and table 4 above, the error term of the model in this study normally distributed and it is statistically not significance too. This study concludes that the specified model has no autocorrelation, no heteroskedasticity, well specified functional form and the regressions is stable. Therefore, it can be concluded that the model applied in this study is robust and the specification of the model is adequate. Hence, rest of this study analysed model specified ARDL using with cointegration technique in short run and long run relationship of variables in Sri Lanka.



Figure 11. Result of Jarque-Bera normality test

Test	Statistic	Probability	Decision
Jarque-Bera (Normality test)	0.0586	0.971	Error Normally distributed
Heteroskedasticity Test 1. Breusch-Pagan-Godfrey	1.184	0.332	No heterokedasticity
2. ARCH Test	0.588	0.447	No heterokedasticity
Breusch-Godfrey Serial Correlation LM Test:	1.096946	0.3781	No serial Correlation
Legend: a: Significance at 1%, b: Significant at 5%, c: Significant at 10%			

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Short run relationship: The short run relationship of the variables were analysed using co-integration technique. The following co-integration regression result reveals that the relationship between inflation and respective explanatory variables. Some variables show the negative relationship and the rest show a positive relationship with inflation in the short run.

Short run co-integrating equation is as follows:

 $INF = -2.124 - 0.147UE - 1.844IR - 4.138M_2 + 0.846GE.$ -0.709 (0.000)

Table 5. A	RDL Co-integration	regression results
	for the model	

Variable	Coefficient & Prob.	
Unemployment	-0.147 ^b	
	(0.037)	
Interest rate	-1.844 ^a	
	(0.009)	
Money Supply (M ₂)	-4.138ª	
	(0.003)	
Govt. Expenditure	0.846	
	(0.223)	
Legend: a: Significant at 1%, b: Significant at 5%,		
c: Significant at 10%		

The table 5 above shows estimated result of short run co-integration regression, which reveals that when other variables are constant a unit increase in the unemployment rate will decrease the inflation by 0.147 times. Unemployment is negatively correlated with inflation at 5% confidence level. Interest rate and money supply (M2) are negatively correlated with inflation. A unit change in the interest rate and money supply (M₂) will negatively change the inflation by 1.844 and 4.138 times respectively with statistical significant at 5% confidence level. Government is expenditure positively correlated with inflation and a unit increase in the government expenditure will increase the inflation by 0.846 times. But the government expenditure is not statistically significant at 5% confidence level. According to the short Co-integration regression run output presented in the above table 5.8 shows that, out of four independent variables, three variables and its lag values are statistically significant even at 5% confidence level. The critical value and p value of the model is -0.709 and 0.000 respectively. The model is overall significant even at 1% confidence level. Hence, as per the short run analysis described above, this concludes that the unemployment and interest rate negatively correlated with inflation for the sample period in Sri Lanka.

Long run relationship: The long run cointegration test estimated and the following calculated long run co-integrating equation is derived to meet the purpose of this study.

$$\begin{split} \text{INF} = -2.114 & -0.384 \text{ UE} + 0.420 \text{ IR} + 0.045 \text{ MS}(\text{M}_2 \text{ }) + 1.248 \text{ GE} \\ (0.0262) & (0.0142) & (0.8462) & (0.3091) \end{split}$$

estimated coefficient Further. the of unemployment indicates that, when other variables are constant a unit increase in unemployment rate will reduce 0.3845 times of inflation. The long run relationship between inflation and unemployment is negative and statistically significant at 5% confidence level. The result clearly indicates with statistical witness that the Phillip's relationship of variables exist in short run and long run in Sri Lanka. The result confirmed the finding of Balamurali and Sivarajasingam (2013) in Sri Lanka. The estimated coefficient of interest rate indicates that, a unit increase will increase the inflation at a rate of 0.42 times. The long run relationship between inflation and interest rate is positive and statistically significant at 5% confidence level. Also, the money supply (M_2) and government expenditure are positively correlated with inflation and a unit increase of monev supply (M_2) and Government Expenditure will increase the inflation at a rate of 0.545 & 1.248 times respectively. Here, money supply and government expenditure are statistically not significant at 5% confidence level.

Conclusion

The impact of unemployment and interest rate on inflation in Sri Lanka was analysed and discussed. The results were found presented in this chapter. The parametric and non-parametric approaches were employed in order to find the trend and the relationship of the variables. The kernel fit and confident ellipse curve showed a negative relationship among variables inflation the and unemployment. The unit root test of DF was employed to identify the stationary property of the variables and decided to run the ARDL model since the unit root test fulfilled the properties of ARDL. The ARDL (1.4,1,2,4) model comprised with inflation as dependent and unemployment rate, interest rate, money supply (M_2) and government expenditure are as independent variables and evaluated by using graphs and statistics to conclude the scenario. The graphical approach shows relatively negative trend between inflation and unemployment but it is not clear. Then, the statistical approach namly ARDL cointegration technique used and evaluated the log-log ARDL model with the lag values of the variable. Finally, the long run relationship evaluated and found that the impact of unemployment on inflation is negative in the short run & long run as well. Also, the impact of interest rate on inflation is negative in short run and positive in the long run.

Recommendations

- The optimum trade-off between inflation and unemployment has to be maintained. These two variables have an important role in the socio- economic development. A certain level of inflation also needed to encourage the investors to supply more products to the market. But, it should be under controlled observation because these variables show a negative relationship in Sri Lanka.
- relationship between variables The interest rate and inflation is negative in short run and positive in the long run. Policy makers have to utilize this relationship in order to control the inflationary situation. Once the inflation, increasing continuously, policy decisions could be taken to increase a certain level of interest rate in order to reduce the inflation. But, this is not a long term policy instrument for the inflationary situation in Sri Lanka because the positive relationship among the variable found in the long run.
- The fiscal consolidation and reform in public enterprises by reducing considerable wasteful public expenditure are to be needed in order to maintain a sustainable development. According to the finding, the government expenditure has a positive relationship with inflation in Sri Lanka. Therefore, the national policies on economy and development have to be implemented with optimum benefits.
- The export sector initiatives of Sri Lanka have to be strengthened and exporter to be motivated to have a better balance of payment. Attractive tax reliefs to be introduced for new start-up businesses and rural based export initiatives to be encouraged. The government of Sri Lanka has to promote policies that inspire investor with confidence by ensuring law order. Then only, the and job opportunities in the private sector rise in

- order to create a job market for unemployed.
- The government investment has to be pumped more and more on the public and private enterprises to create the job opportunities. The government initiatives on job creating activities should be strengthened. Most of the unemployed are expecting job in the public sector (Paulina Mary & et al, 2014) and the government also formulate the policies, not to create the job opportunities in the private sector and providing jobs in the public sector by expecting votes in election. This trend should be evaluated and the innovative policies on iob creation to be implemented. Also, the expectations of job seekers in Sri Lanka have to be corrected in positive way through the education policies of Sri Lanka.
- The Sri Lankan economy structurally changed from agriculture to service since the independent.But, the industrial sector is still in their early life cycle and it should be developed in order to create more job opportunities in the private sector. Also, the industrial development has to be extended out of Colombo in order to equalize the development phase throughout the country. Environmental concern is to be top of the mind when industrial development taking place.
- In Sri Lanka, there are no more five or ten years long term economic plans implemented continuously. The government of Sri Lanka implemented its own economic policies time to time. Suppose the government changes, the implemented economic policy will also change according to the decision of ruling political party. But, this is the time to rethink about the long term economic policies and create an administrative division called an engine of economic growth which should carry out the task continuously to implement the economic policies throughout the period with the adaptation of innovative ideas. Even though, the government changes the

permanent long term economic policies should not be changed. As like in India, China and Malaysia, continous five year plans have to be implemented.

 The free flow of information between employers and employees should be enhanced. Training and educational programmes should be increased and geared towards innovations and productivity in order to reduce the rate of unemployment in the economy.

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