

# A STRATEGIC ANALYSIS OF PATTERNS OF GROWTH IN ADVANCED COUNTRIES DURING 1870-2006

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## ABSTRACT

*The purpose of this study is to examine the impact of GDP per hour worked, total hours worked and labor force on GDP growth in advanced countries. The broad objective of the paper is to find out the relationship among variables. Gross Domestic Product (GDP) growth rate has been selected as dependent variable and GDP per hour worked, total hours worked and labor force is independent variables. We have collected our data for the period of 1870-2006. We used EViews 9 for data analysis. Different statistical tests were performed to fulfill the objectives of the paper. We used Augmented Dickey Fuller Test for testing unit root. For testing cointegration Johansen Test for Co-Integration has been used. We also used Error Correction Model (ECM), CUSUM and CUSUM square test for testing stability of the model. Paper shows that there has relationship between variables. GDP hour worked total hours worked are negatively correlated with GDP growth rate. Labor force is positively correlated with GDP growth rate.*

**Keywords:** Gross Domestic Product (GDP), Labor Force, Advanced, Augmented Dickey Fuller (ADF) Test and Error Correction Model (ECM).

## INTRODUCTION

When country's overall production of services and goods increase over a certain period that is called economic growth. To measure economic growth, country's total output or GNP (Gross National Product) or GDP (Gross Domestic Product) are considered. For a healthy economy economic growth is an important indicator. Economic growth has significant impact on overall economy and social sectors. Higher economic growth leads higher tax revenue for the Government expenditure. For centuries economic development and economic growth are debated issue. For meeting up the need of their population for economy it is very crucial paper of economic growth. It is very simple tendency that, country's economy can gain high growth rate because of macroeconomic factors. Macroeconomic factors of a country may change over the period due to the changes of the world economic condition. Advanced countries economy are playing vital role for world economic development.

## LITERATURE REVIEW

The information based economy was discovered most prevalent example of economic development, trailed by the trade based economy. Neither the reserve funds based nor the ethnic-

religiously influenced example was discovered huge in influencing financial development founded by Kim (2014). His study also revealed that the trade based and knowledge based economy has positive significance on economic development. Lin & Rosenblatt (2012) showed that for global economic development not only developing countries are playing significant role, but also middle income countries also playing crucial role for overall development. It's very important role for developing countries that they are contributing advance knowledge for practical and academic. Winters et al. (2008) tried to examine pattern of rural development for 15 developing countries. Their analysis shows that there is a strong positive significant relation between share of income and per capita income in rural non-agriculture activities. Their study also examined that the relation between agriculture production and per capita income is negative. Chen et al. (2014) examined the impact of urbanization of economic growth. They have selected 30 years panel data for finding out their study goal. Last there decade the level of urbanization have been changed dramatically. They have found that there is no significant correlation between the speed of urbanization and the growth of economic development at global level. Kim (2017) tried to examine the pattern of world economic development with consider of quality of life. Study reveals that there have several pattern of economic growth: trade based, knowledge based and savings based. Out of different types of economic growth, the most predominant pattern is knowledge- based economy. Fritz & Koch (2016) found that social connection can be set up under various institutional and economic conditions. Higher economic developments provide individual social prosperity, but it is matter of sad it can be destroy our environment for huge carbon emotion. Zahonogo (2017) tried to find out in developing countries how economic growth is affected by globalization by considering the period 1980-2012 in Sub-Saharan African (SSA) 42 counties. For SSA counties the relationship between economic growth and globalization is not linear.

## **OBJECTIVES**

The purpose of this study is to find out the macroeconomic variables influence on economic development of the advanced counties. The general objective of this paper is to find out the relationship between GDP, average growth rates, GDP per hour worked, total hours worked and labor force. This paper will empirically investigate on the determinants of GDP growth rate. Estimating how GDP growth rate response to change in the labor force and total work per hour. The specific object of this study is to find out the effect of GDP per hour, total hours worked and labor force on GDP growth rate in advanced countries with reference to 1870-2006.

## **METHODOLOGY**

This paper is based on secondary data. For collecting data we have used different types of sources like, the World Bank development Indicator, International Monetary Fund report and different journals. For collecting data we have consider period of 1870-2006. For analysis all those data EViews 9 software used. For conducting the study we used different types of statistical tools. Firstly we tried to show stationary of data by following Unit root test (Augmented Dikky Fuller Test). For testing cointegration Johansen Test for Co-Integration has been used. It also used Error Correction Model (ECM) test, CUSUM test and CUSUM square test. Here CUSUM test and CUSUM square test has been used for checking stability of the model.

### THEORY AND MODEL

In this model  $rt$  is representing the average gross domestic product growth rate,  $gdppht$  is the average gdp per hour worked,  $thwt$  is the total hours worked and  $lft$  is labor force. For examining the short run dynamic in relationship among GDP average growth rates, GDP per hour worked, total hours worked and labor force, an ECM model has been developed.

$$Gdp_t = \alpha + \beta_0 + \beta_1gdpph_t + \beta_2thw_t + \beta_3lf_t + \epsilon_t \tag{1}$$

$$\Delta lngdp = \alpha_0 + \alpha_1 \Delta lngdpph_t - i + \alpha_2 \ln thw_t - i + \ln lf_t - i + \Delta lngdp_t - i + \alpha_3 U_t - i + \epsilon_t$$

$$U_t - I = lngdp_{2,t} - \beta_0 - \beta_1 lngdpph_t - \beta_2 thw_t - \beta_3 lf_t \tag{2}$$

Where,  $\alpha_4 U_t - i$  expresses the error correction term, it is the residual from the co integrating equation,  $\alpha_3$  indicated the error correction coefficient and  $\alpha_i$  are the estimated short term coefficients (Jammeh, 2012).

### RESULTS AND DISCUSSION

From Augmented Dickey Fuller (ADF) unit root test (Table 1), it can be said that all these variables are stationary at 1<sup>st</sup> difference. By testing Johansen Test (Table 2) for Con-integrating it has been estimated that at least there has 1 co integrating equation in this model, Trace statistic and Max-Eigen Statistics also support this co-integrating equation Zahonogo (2017).

Variable	C (constant) and T (trend) in the equation	ADF statistics	Optimum lag
GDP	C and T	-11.555	0
GDPPH	C and T	-11.664	0
THW	C and T	-11.678	0
LF	C and T	15.3952	0

Sources: Estimated GDP=Gross Domestic Product, GDPPH=Gross Domestic Product per Hour Worked. THW=Total Hours Worked and LF=Labor Force.

Hypothesized No. of CE(s)	Trace statistic	0.05 Critical Value	Eigen value	Hypothesized No. of CE(s)	Max-Eigen Statistics	0.05 Critical Value
None *	66.30455	47.85613	0.302073	None*	47.47262	27.58434
At most 1	18.83194	29.79707	0.076916	At most 1	10.5646	21.13162
At most 2	8.267342	15.49471	0.036678	At most 2	4.932581	14.2646
At most 3	3.334761	3.841466	0.024947	At most 3	3.334761	3.841466

Sources: Estimated (\*denoted significance level), (GDP=Gross Domestic Product, GDPPH=Gross Domestic Product per Hour Worked, THW=Total hours worked and LF=Labor Force).

From the Table 3 it can be said that there exist both positive and negative relationship among gross domestic product growth rate, gross domestic product per hour worked, total hours

worked and labor force. Gross domestic product per hour worked and total hours worked are negatively correlated with GDP average growth rate. Here just labor force is positively correlated with GDP. Here is the retrieved co-integration equation.

$$gdp_t = 1.00 - 0.998948 gdp_{ph,t} - 1.006273thw_t + 0.002512lf_t - 2.534566 \epsilon_t \quad (3)$$

Variable	$\beta$ coefficients	A Coefficients	Standard error	t-value
GDP	1.000000	-	-	-
GDPPH	-0.9989	0.99946	0.003	333.479
THW	-1.0063	1.00366	0.02841	35.3325
LF	0.002512	-0.0016	0.05482	-0.0284
Constant	-2.5346	1.27456	0.00039	0.03288

Sources: Estimated (GDP=Gross Domestic Product, GDPPH=Gross Domestic Product per Hour Worked, THW=Total hours worked and LF=Labor Force).

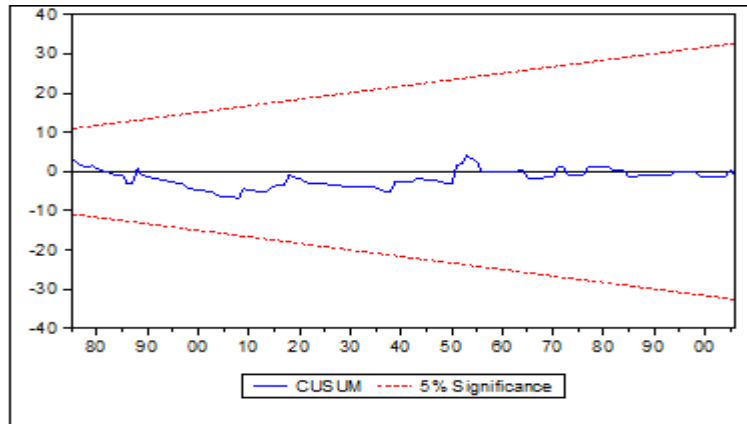
From Table 4, it is very clear that the relationship among all those variables were stable during 1870-2006. From R-squared value it is worth of saying that the data sets is relatively good for this work. Here GDP growth rate can be explained properly because F-Statistic is robust enough at 5% significant level.

Variables	Coefficient	Standard Error		t-value
Constant	-4.7311	0.00028		-0.0167
D(GDP(-1))	2.543462	1.83649		1.38496
D(GDP(-2))	2.426269	1.24962		1.9416
D(GDPPH(-1))	-2.546229	1.82807		-1.39285
D(GDPPH(-2))	-2.397099	1.23837		-1.93569
D(THW(-1))	-2.56768	1.90382		-1.3487
D(THW(-2))	-2.398471	1.33778		-1.79288
D(LF(-1))	0.034704	0.71138		0.04878
D(LF(-2))	0.027139	0.70724		0.03837
Variables	D(GDP)	D(GDPPH)	D(THW)	D(LF)
R-squared	0.033174	0.046938	0.003971	0.202815
Adj. R-squared	-0.036999	-0.022236	-0.068321	0.144954
Sum sq. resids	0.001326	0.001228	7.00E-05	3.82E-05
S.E. equation	0.00327	0.003147	0.000751	0.000555
F-statistic	0.472745	0.678555	0.054933	3.505249
Log likelihood	581.9475	587.0616	779.0297	819.5275
Akaike AIC	-8.53653	-8.612859	-11.47805	-12.0825
Schwarz SC	-8.320273	-8.396602	-11.2618	-11.86624
Mean dependent	2.99E-06	3.96E-05	-3.81E-05	-8.21E-06
S.D. dependent	0.003211	0.003113	0.000727	0.000601

Sources: Estimated (GDP=Gross Domestic Product, GDPPH=Gross Domestic Product per Hour Worked, THW=Total Hours Worked and LF=Labor Force).

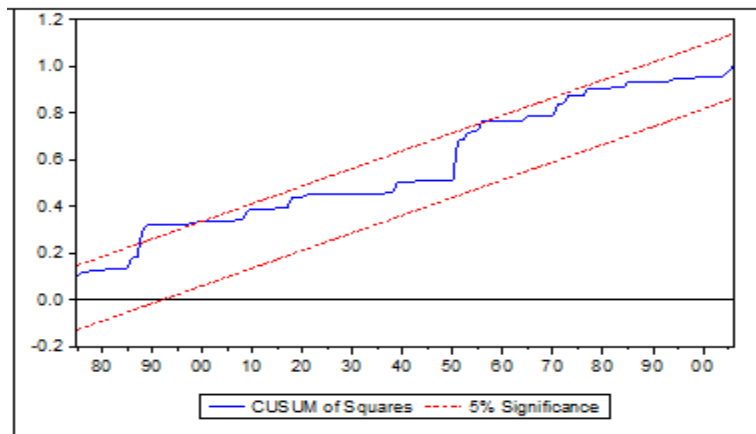
Figures 1 and 2 showing CUSUM and CUSUM square statistics. Basically graph showing that most of the time green line is within red line so we can say that our model is stable

Kim (2017). After lots of analysis and study, paper shows that for advanced countries (1870-2006) the pattern of economic growth is really amazing. Our study found that GDP affected by GDP/PH, total hours worked and total labor force. There have strong relationship between all those variables. The findings of analysis show that the relationship between GDP growth and labor force is positive. But GDP per hour worked and total hours worked are negatively correlated with GDP growth. Our CUSUM and CUSUM square test suggest that our model is stable over the year 1870-2006.



Source: Estimated.

**FIGURE 1  
CUSUM STATISTICS**



**FIGURE 2  
CUSUM SQUARE STATISTICS**

**CONCLUSIONS AND RECOMMENDATIONS**

Advanced countries economic condition is more stable than underdevelopment economy or developing economy Fritz & Koch (2016). Every economy is affected by lots of internal and external factors. For smooth economic development government is more concern for their macroeconomic factor improvement. Our paper findings suggest that for advance countries policy maker and government should highly concentrate to improvement of economic development Fritz & Koch (2016). Country’s economy policy maker should focus on Gross Domestic Product (GDP) per hour worked and total hours worked for good production.

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