UNIT VI

GDP, Growth, and Instability: Measuring Domestic Output and National Income (9 Hours)

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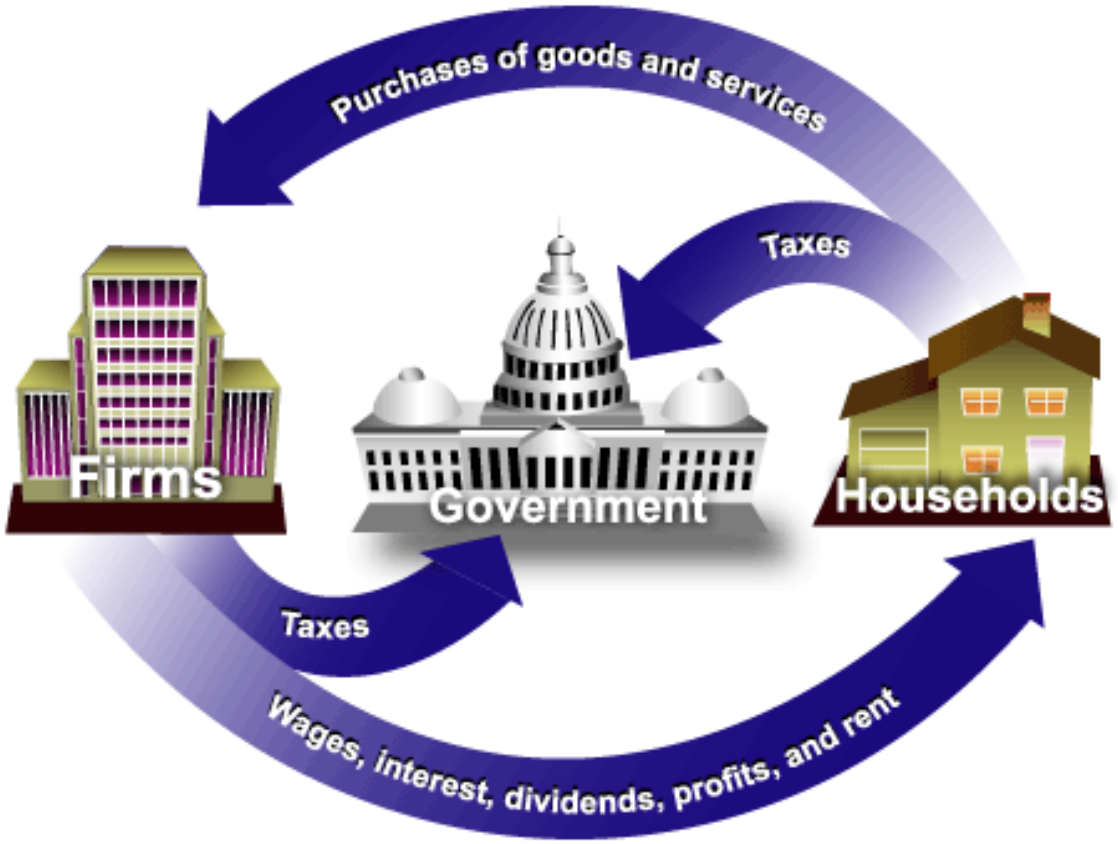
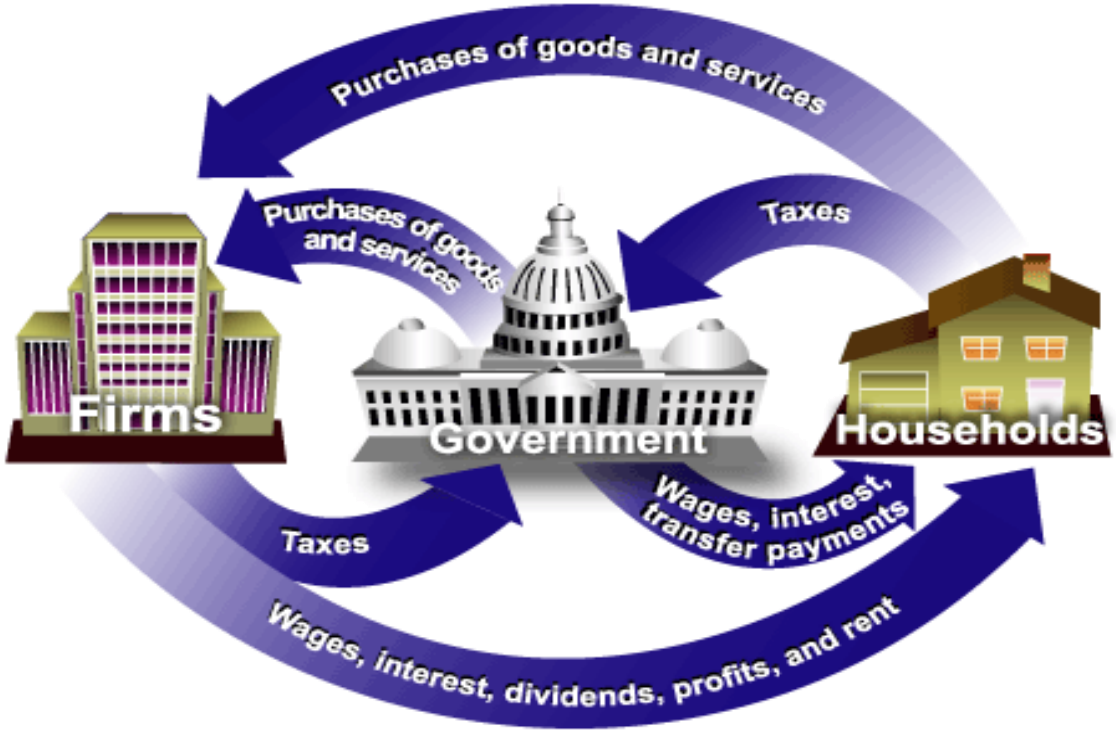
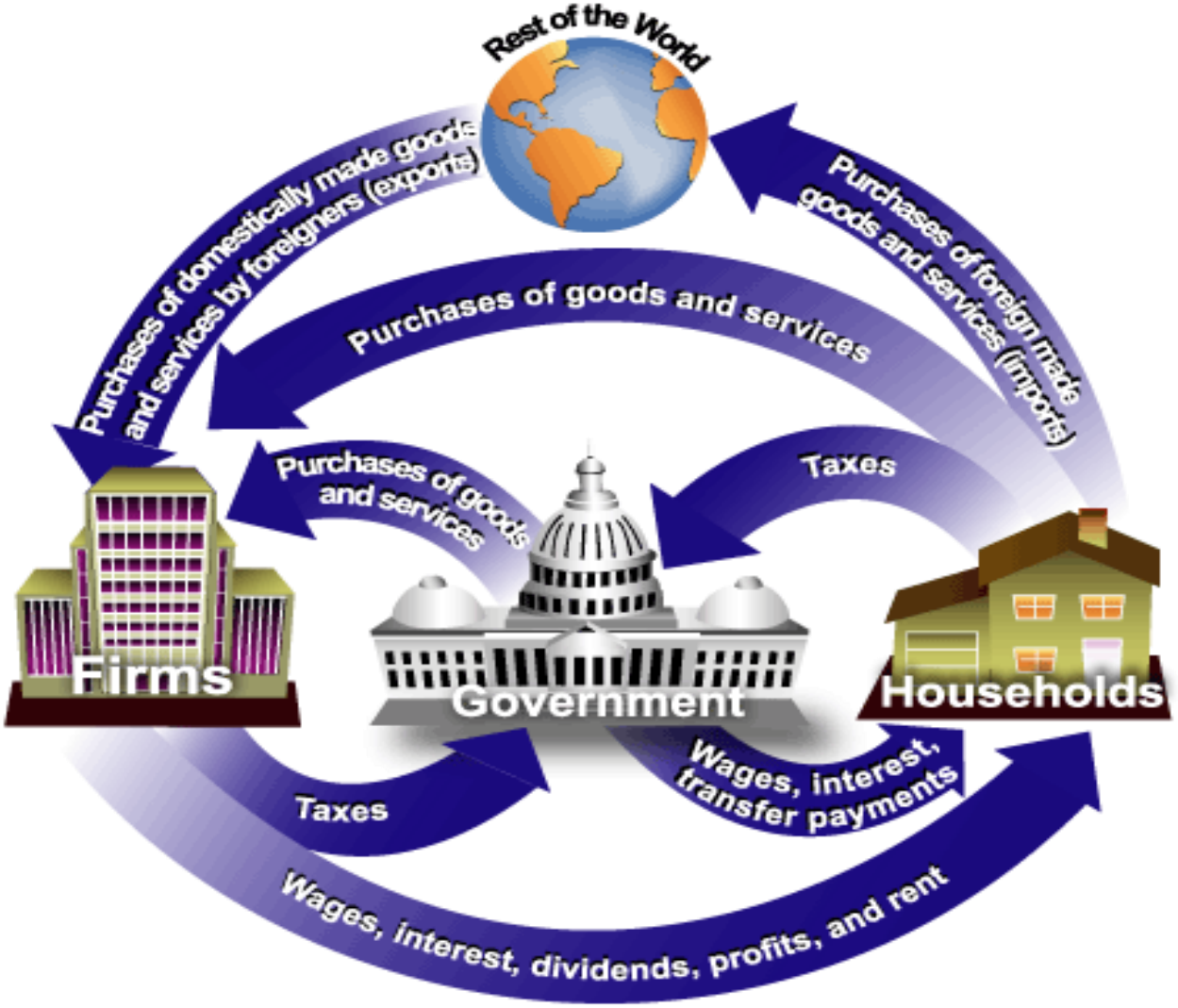
Classical or two Sector Economic Model



Keynesian or Three-Sector Economic Model



Four Sector Macroeconomic Model or Real Business Cycle Economic Model



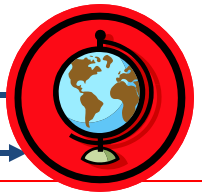
The Government and the Circular flow in Modern Economy

C+S= I

C+I+G

M

X



Rest of the World

G

C+S

S C

C+I+G+X-M

Government

Te

Firms

Households

B Td

Y(DI)

Y+B-Td

Y (Income)

THE GOVERNMENT …

Where;

G = Government

B = Transfer payment

Td = Direct tax

Te = Indirect tax

Y = Income

C = Consumption

S = Saving

I = Investment

DI = Disposable income

X-M = Net export

THE GOVERNMENT …

Household Activities

Δ income $\rightarrow$ Δ consumption + change in saving.

or;

$$\Delta Y = \Delta C + \Delta S$$

If there is an increase in income, an increase in consumption, and, an increase in saving, and vice versa

Thus,

$$Y = C + S \text{ and, } S = I$$

National Income

- National income (NI) is the aggregate value of goods and services produced annually in a country.
- National income includes payment made of all resources in wages, interest, rent, and profit.

National Income

- It is the total of goods and services produced by a nation in a year and national income is the total monetary value of all final goods and services produced in an economy over some time usually a year.
- National income means the performance of the national economy, which is the total monetary value of the final product.

Definitions of National Income

- There are different approaches to the national income among them,
- Professor A. Marshall: British Economist
- Professor A.C. Pigou: English Economist
- Professor Fisher: Irving Fisher was an American Economist.
- Simon Kuznets: Simon Smith Kuznets was an American economist and statistician. (American, Russian)

Professor A. Marshall,

- Marshall’s definition is broad as it includes all types of goods and services that enter or do not enter the market transaction (including mother care).
- The important feature of Marshall’s definition is its emphasis on the need to deduct machines' depreciation from the value of output to get net value.
- Marshall points out that income from abroad should be added to the national income.

Professor A.C. Pigou

- National income is that part of the objective income of the community, including of course income derived from abroad which can be measured in money.
- This definition is better than the Marshallian definition.

Professor Fisher

- Fisher adopted ‘consumption’ as the criterion of national income whereas Marshall and Pigou regarded it to be production.
- According to Fisher, “The National dividend or income consists solely of services as received by ultimate consumers, whether from their material or from the human environments.
- Thus, a piano, or an overcoat made for me this year is not a part of this year’s income, but an addition to the capital.
- Only the services rendered to me during this year by these things are income.”

Simon Kuznets

- **Simon Kuznets** defines national income as “the net output of commodities and services flowing during the year from the country’s productive system in the hands of the ultimate consumers.”

Gross Domestic Product (GDP)

- GDP is the *total market value* of all *newly/currently produced* (not necessarily sold) *final* goods and services within the geographical boundary of a country during a fixed period of time, generally in one-year.
- A number of features of this definition require clarification.

Currently produced goods and services

- GDP excludes:
- (i) previously produced any items such as houses, cars, or factories as well as resold goods, and
- (ii) any transaction in which money is transferred without any direct exchange of goods or services
- These transactions do not directly involve the current production of goods or services and are therefore not included in GDP.
- GDP is a flow measure of output per period, for example per year, and includes goods and services produced during this interval.

GDP

- Suppose an economy produces $x_1, x_2, x_3, \ldots, x_n$ types of final goods and services within the economy in a year and let $p_1, p_2, p_3, \ldots, p_n$ be the corresponding prices of the products. Then:

$$GD_t = p_{1t}x_{1t} + p_{2t}x_{2t} + p_{3t}x_{3t} + \ldots + p_{nt}x_{nt}$$

$$\text{That is,} \quad \text{GDP}_t = \sum_{i=1}^{n} p_{it}x_{it}$$

- where 't' is a time index.

GDP

- GDP is the single most-used economic measure or the broadest quantitative measure of the aggregate economic activities that occur within a country.
- In the production of GDP, both domestic and foreign-owned factors of production make a contribution.

Assessing the Economy's Performance

- National Income Accounting measures the economy's overall performance
- Economic Analysis compiles National Income and Product Accounts
  - Assess the health of the economy
  - Track long run course
  - Formulate policy

GDP

- The measure of aggregate output
- Monetary measure
- Avoid multiple counting
  - Market value final goods
  - Ignore intermediate goods (**Products used to produce a final good**)
  - Count value added

GDP

- Exclude financial transactions
  - Public transfer payments
  - Private transfer payments
  - Stock (and bond) market transactions
- Exclude second hand sales
  - Sell used car to a friend

Income Relationships: Example

Gross Domestic Product (**GDP**)	**$ 14,256**
Less: Consumption of Fixed Capital	1864
Equals: Net Domestic Product (**NDP**)	**$ 12,392**
Less: Statistical Discrepancy	209
Plus: Net Foreign Factor Income	105
Equals: National Income (**NI**)	**$ 12,288**
Less: Taxes on Production and Imports	1090
Less: Social Security Contributions	967
Less: Corporate Income Taxes	315
Less: Undistributed Corporate Profits	418
Plus: Transfer Payments	2528
Equals: Personal Income (**PI**)	**$ 12,026**
Less: Personal Taxes	1102
Equals: Disposable Income (**DI**)	**$ 10,924**

Statistical Discrepancy is **the difference between net lending in financial accounts and non-financial national** accounts.

Methods of Measuring National Product and Income

- Expenditure Approach
- Income Approach
- Production/Value-Added Approach

Expenditures

- Personal consumption expenditures (C)
  - Durable consumer goods
  - Nondurable consumer goods
  - Consumer expenditures for services
  - Domestic plus foreign goods produced

Expenditures Approach

- Gross private domestic investment (I_g)
  - Machinery, equipment, and tools
  - All construction
  - Changes in inventories (**Inventory** is the raw materials used to produce goods as well as the goods that are available for sale.)
- Creation of new capital assets
- Noninvestment transactions excluded (**An expenditure for stocks, bonds, or secondhand capital goods**)

Expenditures Approach

- Government purchases (*G*)
  - Expenditures for goods and services
  - Expenditures for publicly owned capital
  - Excludes transfer payments
- Net exports (X_n)
  - Add exported goods
  - Subtract imported goods
  - X_n = exports – imports
- **GDP = $C + I_g + G + X_n$**

GDP and GNP by final demand/expenditure (current price in millions of NRs.)

Description	1999/00	2000/01	2001/02	2002/03	2003/04
1. Private Consumption, C	287947	309107	329199	355535	383978
2. Total Investment, I	92272	99301	102174	118020	130993
3. Public Consumption, G	33964	40150	42327	46362	50381
4.Exports of Goods and Net Factor Services, X	88360	91821	77068	77280	89543
5.Imports of Goods and Net Factor Services, M	123055	129104	127961	140522	158150
Equals Gross Domestic Product (at Producers' Price)	379488	411275	422807	456675	496745
6. Net Factor Income from Abroad, NFIA	13125	16172	18375	16194	11155
Gross National Product, GNP	392613	427447	441182	472869	509700

***Source**: Ministry of Finance, Government of Nepal. (2006).*

Income Approach

- This method measures GDP from a flow-of-cost approach. In other words, the factor income approach measures GDP by adding together all the incomes received by suppliers of resources of production over a fixed period of time, normally in one year.
- Factor inputs like labor, land, and physical and financial capital are used in the process of producing goods and services.

Income Approach

- Compensation of employees
- Rents
- Interest
- Proprietor's income
- Corporate profits
  - Corporate income taxes
  - Dividends
  - Undistributed corporate profits
- Taxes on production and imports

Income Approach

- From national income to GDP
  - Subtract net foreign factor income
  - Statistical discrepancy (the difference between demand and supply in national accounts.)
  - Consumption of fixed capital
- Other national accounts
  - Net domestic product (NDP)
  - National income (NI)
  - Personal income (PI)
  - Disposable income (DI)

National Income by Income Approach (billions of current US dollars)

S.N.	Descriptions	Amount
1	Compensation of employees	6,186
2	Proprietors' income	846
3	Rental income	164
4	Net interest	582
5	Corporate profits (with adjustments)	1,059
6	Depreciation	1,308
7	Production taxes	739
8	Statistical discrepancy and miscellaneous	100
	Gross domestic product	**10,984**

Production Method

- The National Income/Product of an economy can also be computed by adding up the production of goods and services of all industries operating in the economy.
- Different firms or industries of an economy get involved in the production of diverse goods and services.
- Some firms produce final goods while others produce intermediate goods. Intermediate goods are used in the production of other goods.

Production Method

- National income accounting should incorporate the output contribution of both final goods and intermediate goods-producing industries simultaneously.
- Under the production approach, national product and income can be measured either by the **Final Product** or **Value Added** method.
- Each of them is introduced in order.
- *Value added* means the addition to the value of raw materials and other inputs during the process of production.

Production Method

Final Product Method

(i) **Primary industrial sector:** The economic activities of the economy which concentrate on the production of agricultural products and the extraction of raw materials are put into the primary industrial sector.

Production Method

Final Product Method

(ii) **Secondary industrial sector:** This is the manufacturing portion of the economy, which uses raw materials and intermediate producer goods to produce final goods or other intermediate products.

Production Method

Final Product Method

(iii) **Tertiary industrial sector:** This sector is the services and commerce segment of an economy, that is, the tertiary industrial sector covers ***commercial*** and ***professional*** services.

Gross Value Added by Industrial Origin in Nepal (At Current Prices of millions of NRs.)

Industrial Sectors	1999/00	2000/01	2001/02	2002/03	2003/04
1.Agriculture,Fisheries and Forestry	145131	151059	160144	171104	183117
2.Mining and Quarrying	1815	1924	2056	2188	2377
3.Manufacturing	33550	35495	32805	34337	36634
4.Electricity ,Gas and Water	5942	7432	8635	10905	11355
5.Construction	37382	39584	42290	45068	49029
6.Trade, Restaurants , and Hotels	42895	44572	40772	43978	46718
7.Transport,Communication and Storages	29336	33297	34652	38286	43668
8.Financial and Real Estate	36919	41634	43882	47719	51940
9.Community and Social Services	33281	39055	40902	43961	47081
Total GDP at Factor Cost	366251	394052	406138	437546	474919
10. Less imputed value of banking services	10708	11912	12624	13911	15135
11. equals Total GDP at Factor Cost	355543	382140	393514	423635	459784
12.plus Net Indirect Taxes	23945	29135	29293	33040	36961
13.equals GDP at producers'/market price	379488	411275	422807	456675	496745

Value Added Method

- The value-added method estimates national income and product by considering the values of both intermediate and final output simultaneously.
- Output is the transformation of inputs from one form to another.
- Final output should pass through different stages of production before being transformed into ultimately consumable/usable form.
- At each stage of production, a particular *value* is *added* or *created* by the producer.

Value-Added Method in Output Measurement (Value in NRs.)

Producer	Production stage and product	Sales value of output (A)	Cost of intermediate goods (B)	Gross value added (A-B)
Farmer	Wheat	1,500	-	1500
Miller	Flour	2,800	1,500	1300
Baker	Bread/Bakery	4,000	2,800	1200
Total		**8,300**	**4,300**	**4000**

Nominal vs. Real GDP

- GDP is a dollar measure of production
- That requires adjustment when comparing the value of output in two countries using different currencies.
- The usual method is to convert each country's GDP value into U.S. dollars and then compare them.
- Conversion to dollars can be completed either using market exchange rates those that overcome in the foreign exchange market or purchasing power parity (PPP) exchange rates.
-

Nominal vs. Real GDP

- GDP is a dollar measure of production
- The PPP exchange rate is the rate at which one country's currency would have to be converted into that of another to purchase the same amount of goods and services in each country.
- There is a large gap between market and PPP-based exchange rates in emerging markets and developing countries.

Nominal vs. Real GDP

Using dollar values creates problems

- Is the US dollar too much of a good thing?
- Can its success in becoming the main currency of the world also make it a curse for global financial stability?
- These and other questions about the dollar's dominance are increasingly being considered by policymakers, academics, and journalists as the reach of the dollar continues to grow.

Nominal vs. Real GDP

- **Is the US dollar too much of a good thing?**
- In the 1970s, President Richard Nixon's Treasury secretary, John Connally, once told foreign finance ministers that the dollar is "our currency, but your problem" after they complained about its compulsory sway on their economies.

Nominal vs. Real GDP

- Nominal GDP
  - Use prevailing price
- Real GDP
  - Reflect changes in price
  - Use base year price

Nominal, Real, and Potential GDP

- Nominal GDP is a measure of the value of the output of goods and services in terms of current market prices.
- GDP calculated in terms of the normal market price is called nominal GDP.
- Any **change** in **nominal GDP** reflects the combined effects of **changes** in **quantities** and changes in **prices**.
- The current market price GDP is sensitive to changes in the average price level in the market.

Nominal, Real, and Potential GDP

- To correct the national income accountants calculate ***real GDP*** which is a measure of the value of the output of goods and services in terms of base year price (base year is the reference year of the index used).
- When the current price of GDP is adjusted for inflation, it is real GDP.
- Real GDP is also called constant price GDP.
- Constant prices are values taken at a base year to remove the effects of inflation.
- The measure of GDP over different periods by using a common set of base-period prices reflects only the changes in real output.

Nominal vs. Real GDP

- Nominal GDP and real GDP are linked by the following expression:

Real GDP (Constant price GDP) =

$$\frac{Current/MArketPriceGDP}{GDP\ Deflator} \times 100$$

A deflator is a statistical factor designed to remove the effect of inflation; inflation-adjusted variables are in constant price.

The GDP deflator

- The **GDP deflator** is a price index measuring changes in the overall prices of all newly produced final goods and services within the geographical territory of a country.
- It is the quantity by which nominal GDP must be divided, or "deflated" to obtain real GDP.
- GDP deflator is used as an indicator of average prices in the economy.
- The percentage change in the value of the GDP deflator is one of the measures of the rate of inflation in a country.

Nominal vs. Real GDP

- Current price or Nominal GDP is sometimes called "money GDP"
- Real GDP is termed "inflation-corrected GDP" or "GDP in base-year prices".
- Differences between nominal GDP and real GDP arise only because of changes in prices.
- A glimpse of the nominal and real GDP and the GDP deflator of Nepal for the period 1999/00 - 2003/04 is given in the next Table. The year 1994/95 is taken as the base year.

Current and Constant Price GDP of Nepal (NRs. in millions)

Year	Nominal GDP (at Factor Cost)	Real GDP	GDP Deflator	GDP Growth Rates	
				Nominal	Real
1999/00	366251	267096	137.1	11.0	6.1
2000/01	394052	280106	140.7	7.6	4.9
2001/02	406138	279169	145.5	3.1	-0.3
2002/03	437546	287689	152.1	7.7	3.1
2003/04	474949	298023	159.4	8.5	3.6

***Source**: Ministry of Finance, Government of Nepal, 2006*

Current and Constant Price GDP of Nepal

- For the base year current and constant price GDP figures will be the same because for that year GDP deflator will be 100.
- But for other years, there is a difference between nominal and real GDP figures due to changes in the overall price level.
- The growth rate of current price GDP is positive for the selected period but the growth rate of real GDP is negative in the year 2001/02.
- So, the year 2001/02 was a growth tragedy year for Nepal. The decline in GDP lowers people's per capita income and unemployment rises.

Potential GDP

- Potential output/GDP is the output that the economy would produce if all factors of production were fully employed.
- It is the full employment GDP.
- Potential output is not the maximum output the economy could produce, but the output that would be produced if all the markets (e.g., labor market, capital market, product market) were in equilibrium.
- When an economy is operating at its potential, there are high levels of utilization of the labor force and capital stock.
- Actual GDP equals potential GDP only if there is no unemployment or underemployment of resources.

Shortcomings of GDP

- Nonmarket activities (activities primarily undertaken for the purpose of self-consumption.)
- Leisure (GDP does not capture leisure, health, a cleaner environment, or the possibilities created by new technology)
- Improved product quality
- The underground economy
- GDP and the Environment
- Composition and distribution of the output
- Noneconomic sources of well-being (courtesy, crime reduction, etc., are not covered in GDP.)

Difficulties in the Measurement of National Income and Product

- **Nonmarket Transactions**: In GDP calculation only the goods and services evaluated at market prices are included and non-market production is left out. For example, the services of housewives (cooking, washing, child caring, etc.)
- **Underground Activities/Black Economy:** The underground economy refers to the market transactions which do not come into the net of legal registration.
- **Depreciation valuation:** Depreciation of physical capital goods is to be deducted to find the net national product (NNP).

Underground Economy (2022)

Country	% of GDP
USA	7.3
Switzerland	7.5
Japan	9.6
Singapore	10.4
China	12.7
Nepal	33.2
Afganisation	72
Zimbawa	64.1
Haiti	55.1
India	43.1
Bhutan	22.8
Pakistan	35.6
Sri Lanka	31.1
Bangladesh	30.2

Difficulties in the Measurement of National Income and Product

- **Value of public services:** Government provides public services like general administration, and defense (police, and army).
- **Government transfer payment:** Government pays a pension to retired civil servants, police, and army men; provides unemployment allowance and pays interest on public loans.
- **Data Deficiency:** In developing and least-developed countries like Nepal, the task of national income accounting is also affected by the lack of data.

Countries by Nominal GDP at Current U.S. Dollar Exchange Rates and Nepal

Country	Annual Growth (% 2022)	GDP Per Capita
Luxembourg	1.60%	$1,31,384
Switzerland	2.90%	$1,05,669
Singapore	7.40%	$88,447
United States	5.70%	$85,373
China	8.10%	$13,136
Bhutan	4.00%	$4014
Sri Lanka	6.60%	$3342
India	8.90%	$2731
Bangladesh	4.60%	$2646
Pakistan	7.00%	$1461
Nepal	4.25	$1397

List of Variables Rs. in million at current price

Variable Name	Variable Definition	Type
Government Finance Block		
GTE	Total Government Expenditure	Identity
GRE	Government Recurrent Expenditure	Endogenous
GCE	Government Capital Expenditure	Endogenous
GPE	Government Principle Payment (Government Amortization)	Endogenous
GTRV	Government Total Revenue	Identity
GTAX	Government Tax Revenue	Endogenous
GNTAX	Government Non Tax Revenue	Endogenous
GFG	Government Foreign Grants	Endogenous
GBB	Government Budget Balance	Identity
GFL	Government Foreign Loan	Identity
GDL	Government Domestic Loan including Overdraft	Endogenous
TDEBT	Total Outstanding Debt	Identity
DDEBT	Total Outstanding Domestic Debt	Identity
FDEBT	Total Outstanding Foreign Debt	Identity

Social Sector		
POVT	Number of people below poverty live	Endogenous
POVT_RATE	Poverty rate	Identity
POPULATION	Total population	Exogenous

Monetary Block		
MNFA	Net Foreign Assets	Identity
MNDA	Net Domestic Assets	Identity
MDC	Domestic Credit	Identity
MNG	Net Claim on Government	Endogenous
MGE	Claim on Government Enterprises	Endogenous
MPS	Claim on Private Sector	Endogenous
MNCO	Non monetary liabilities	Endogenous
MM2	Broad Money Supply (M2)	Identity

Price Block		
PDY	GDP Deflator	Endogenous
PAI	Lending Rate Agriculture	Endogenous
PII	Lending Rate – Industry	Endogenous
PCPI	Consumer price Index	Endogenous
PWPII	Wholesale Price Index of India	Exogenous
PEXR	Annual average buying rate of Nepalese currency vis-à-vis US$	Exogenous
PTB91	91 days Treasury Bill Rate	Endogenous
PLR	Indian Lending Rate of Commercial Banks	Endogenous

Balance of Payments Block		
BGX	Export of Goods	Endogenous
BGM	Import of Goods	Endogenous
BGTB	Balance on Goods	Identity
BNS	Net Services Receipts	Identity
BSR	Services Receipts	Endogenous
BSP	Service Payment	Endogenous
BNI	Net Factor Income	Endogenous
BNTR	Net Current Transfer excluding Remittance	Endogenous
BREM	Remittance	Endogenous
BCAB	Current Account Balance	Identity
BCA	Capital Transfers	Endogenous
BNGL	Net Foreign Loan Drawings	Endogenous
BFEO	Financial Account Net, Miscellaneous, Error and Omission	Endogenous
BOP	Balance of Payments	Identity
BFR	Gross Foreign Exchange Reserve	Identity

National Account		
YA	Agriculture GDP	Endogenous
YI	Industrial GDP	Endogenous
YS	Service GDP	Endogenous
YF	GDP in Factor Cost	Identity
YAR	Agriculture GDP at constant price	Endogenous
YIR	Industrial GDP at constant price	Endogenous
YSR	Service GDP at constant price	Endogenous
YFR	GDP in Factor Cost at constant price	Identity
YFISMR	Financial Intermediary Service (Imputed Value of Banking Services) at constant price	Endogenous
YNITR	Net Indirect Tax at constant price	Endogenous
YP	GDP at Producer Price	Identity
YPR	Real GDP at Producer Price	Identity

National Account		
Y_C	Total Consumption	Identity
C_PUB	Public Consumption	Endogenous
C_PVT	Private Consumption	Endogenous
Y_Investment	Gross Fixed Capital Formation	Identity
I_PUB	Public Capital Formation	Endogenous
I_PVT	Private Capital Formation	Endogenous
YM	Import of Goods and NFs	Identity
YX	Export of Goods and NFs	Identity
YNFI	Net Factor Income	Endogenous
STOCK	Change in Stock	Identity

National Account

GDS	Gross Domestic Saving	Identity
YGNS	Gross National Saving	Identity
GNP	Gross National Product	Identity
YAE	Agriculture Employment	Exogenous
YIE	Industry Employment	Exogenous
YSE	Service Employment	Exogenous
YAI	Investment on Agricultural Sector	Endogenous
YII	Investment on Industrial Sector	Endogenous
YSI	Investment on Service Sector	Endogenous
YAGYFI	Land Productivity	Endogenous
LPAG	Labor Productivity	Endogenous
YA/YAE	Labor Productivity in Agriculture	Endogenous
YI/YIE	Labor Productivity in Industry	Endogenous
YS/YSE	Labor Productivity in Service	Endogenous

Other variables		
TOURIST	Number of Tourist Arrival	Exogenous
IND_GDP	Indian GDP at constant price	Exogenous
ME_GDP	Middle East GDP index	Exogenous
PLR	Indian Lending Rate	Exogenous

Dummy Variables		
DUMYP	GDP growth Dummy	Exogenous
DUMAGR	Monsoon Dummy	Exogenous
DUMBNTR	Net Service Transfer Dummy	Exogenous
DUMBREM	Remittance Dummy	Exogenous
DUMEXP	Export Dummy	Exogenous
DUMGCE	Government Capital Expenditure Dummy	Exogenous
DUMINV	Private Investment Dummy	Exogenous
DUMIPU	Public Investment Dummy	Exogenous
DUMSTOCK	Change in Stock Dummy	Exogenous

DATA

- Analysis Software
- Interpretation of Results

TOPIC: THE IMPACT OF MACROECONOMIC VARIABLES ON THE ECONOMIC GROWTH OF NEPAL

Introduction

- Economic growth is important for raising living standard of people or an increase in real GDP is required to upgrade the living standard of people.
- Both rich and poor people try to achieve the target of high GDP. Therefore it is important to know its various determinants.
- As Nepal's GDP rely on numerous macroeconomic determinants, however, this study just examine some major factors like physical capital (k), human capital (HC), government expenditure (GE), openness to foreign trade (TO) and foreign aid (AID).

Objectives

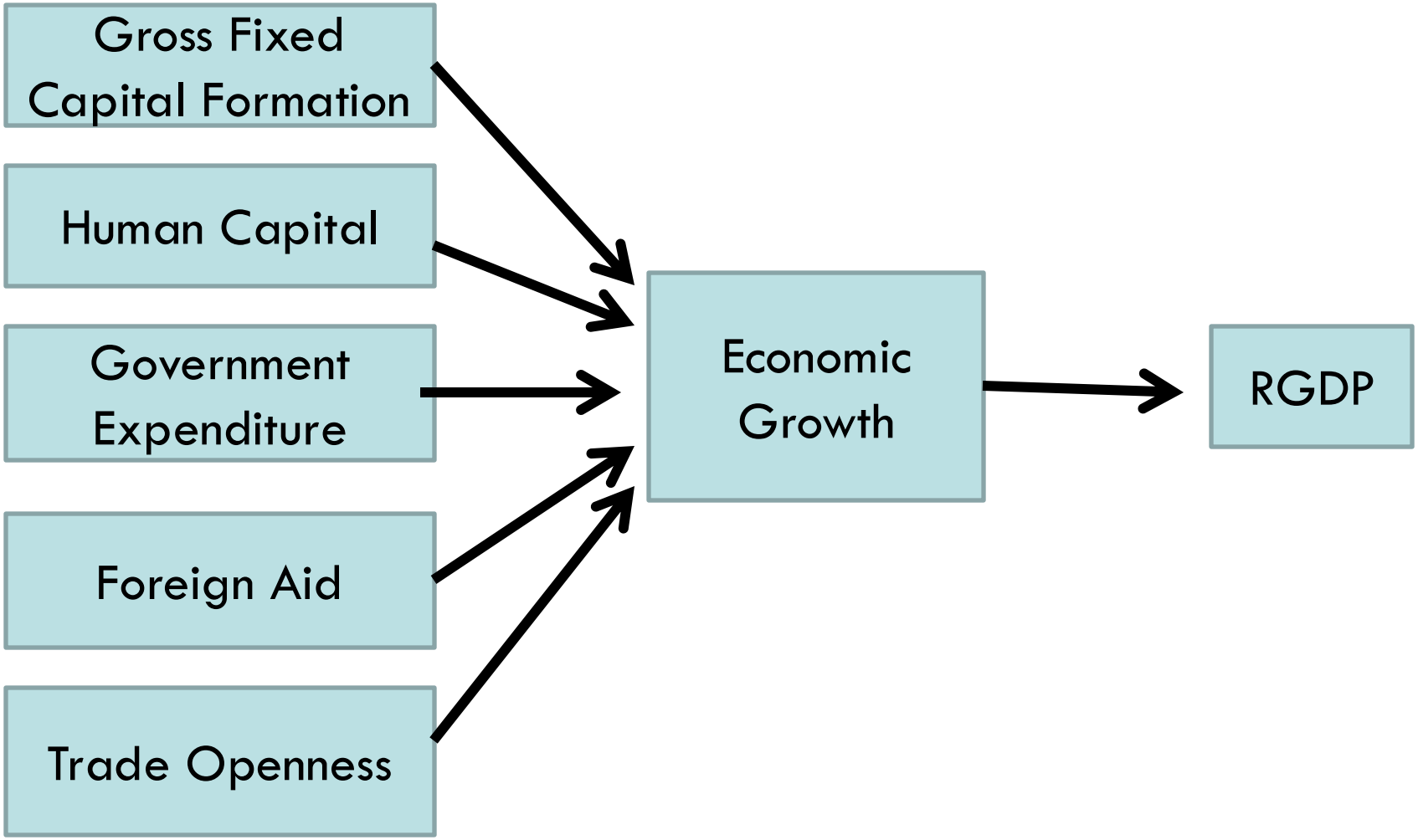
The specific objectives:

- To analyze the growth trends of real gross domestic product, physical capital, human capital, government expenditure, foreign aid and openness to foreign trade in Nepal over the period 1975-2016.
- To examine empirically the impact of physical capital, human capital, government expenditure, foreign aid and openness to foreign trade on economic growth of Nepal.

Theoretical Framework

- This research is directed to theory driven approach. Some theoretical consideration is presented here.
- Gross Fixed Capital Formation: New keynesian Economists (Harrod-Domar Model), Neo-classical economists (Solow model, Swan model)
- Human Capital: Endogenous growth models (Romer, Lucas)
- Government Expenditure: Keynesian hypothesis of expenditure multiplier and Endogenous growth theories (Romer , Barro)
- Foreign Aid: A three gap hypothesis (Bacha, 1990)
- Trade Openness: Endogenous growth models (International diffusion of advanced technologies).

Conceptual Framework



Data Sources

- time series data: 1975-2016
- RGDP, GFCF, GE, AID and TO -NRB
- labor force – CBS
- students enrollment and deflator –MOF

Methodology

- This study is the combination of descriptive and econometric analysis.
- Under descriptive analysis, the average growth rate trends of the employed macro variables are computed.
- Under econometric analysis, ARDL approach to cointegration is used which is a latest econometric method.

Model Specification

ARDL Model:

$$\Delta \text{lnRGDP} = \mu + \sum_{i=0}^{m} \eta_i \Delta \text{lnRGDP}_{t-i} + \sum_{i=0}^{n} \omega_i \Delta \text{ln GFCF}_{t-i} + \sum_{i=0}^{p} \varphi_i \Delta \text{lnHC}_{t-i} + \sum_{i=0}^{q} \pi_i \Delta \text{lnGE}_{t-i} + \sum_{i=0}^{r} \lambda_i \Delta \text{lnAID}_{t-i} + \sum_{i=0}^{s} \psi_i \Delta \text{lnTO}_{t-i} + \theta_1 \text{lnRGDP}_{t-1} + \theta_2 \text{lnGFCF}_{t-1} + \theta_3 \text{lnH}_{t-1} + \theta_4 \text{lnGE}_{t-1} + \theta_5 \text{lnFA}_{t-1} + \theta_6 \text{lnTO}_{t-1} + \varepsilon_t$$

ARDL Approach to Cointegration

Under ARDL approach following steps are proceed:

- Lag length selection
- F-Bound test
- Long run test (Level Relationship)
- Short run test (Error Correction Mechanism)

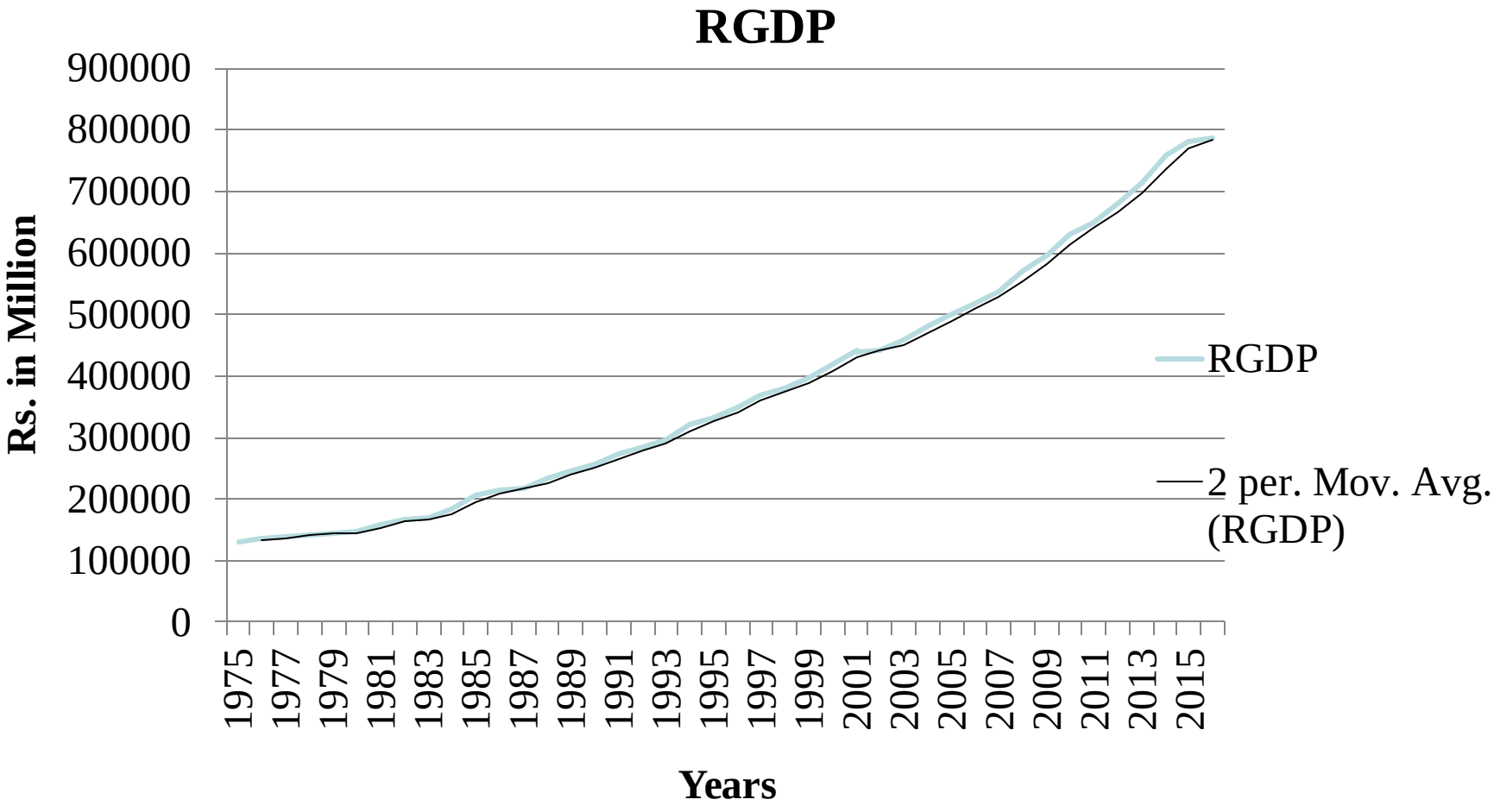
Data Presentation and Analysis

- The growth trends of real gross domestic product, physical capital, human capital, government expenditure, foreign aid and openness to foreign trade is computed over the period 1975-2016.
- ARDL approach to cointegration is applied to know the short run and long run relationship of the variables.

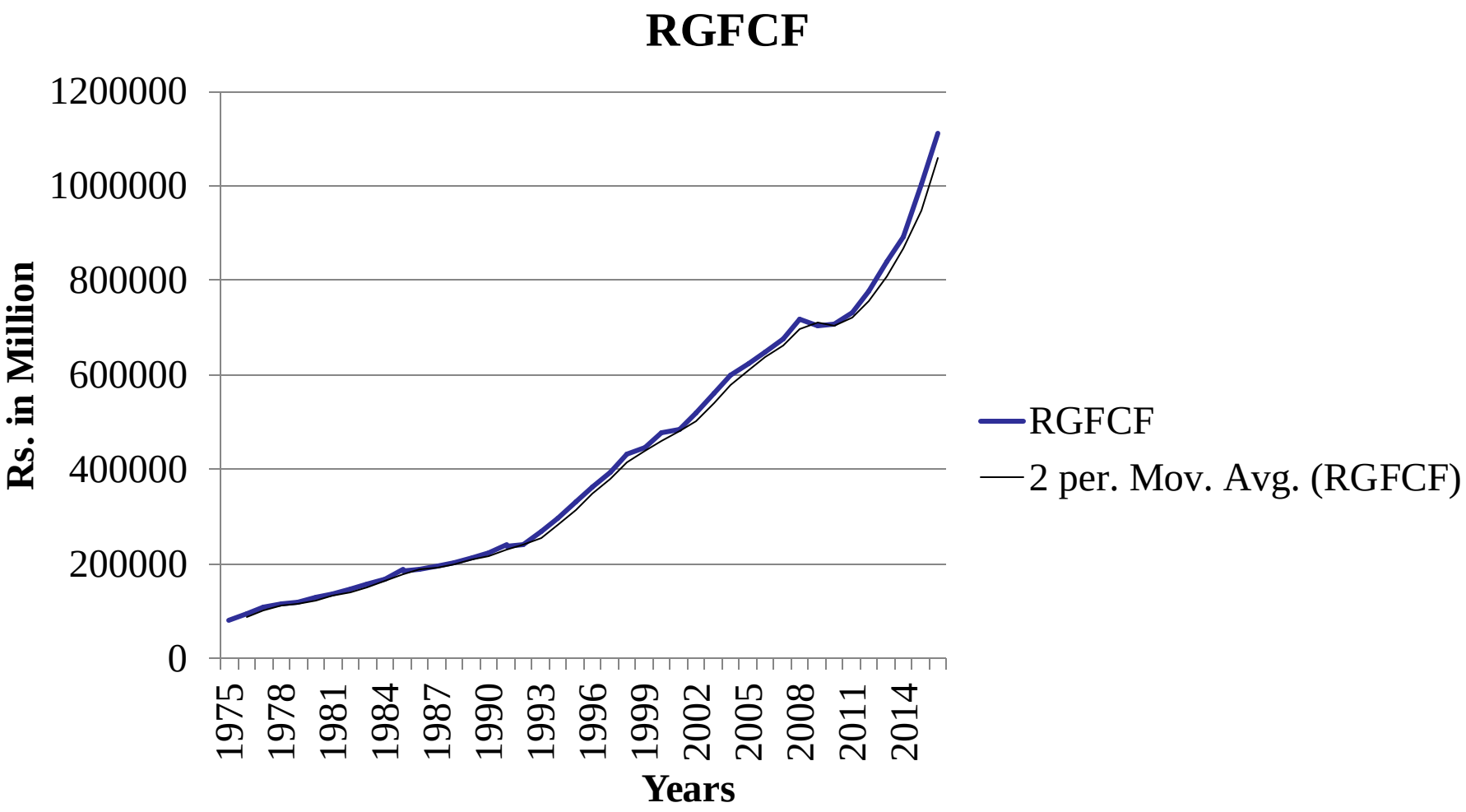
Summary of Growth Trend Analysis

Year	RGDP	Per Worker RGDP	GFCF	HC	AID	GE	TO
1975-1979	2.5437	-0.0549	9.9782	19.1029	21.2577	13.842	3.825
1980-1984	4.7367	5.1203	7.3312	9.1335	13.1994	12.138	2.364
1985-1989	6.1495	3.9662	5.0413	5.5722	12.0277	7.5312	1.9432
1990-1994	4.6733	0.2576	6.8643	0.0870	1.11	1.9832	9.395
1994-1999	4.2838	1.5455	8.4643	1.4780	0.6115	5.055	0.4558
2000-2004	4.0039	4.8677	6.0998	5.5513	-0.888	3.1519	0.1764
2004-2009	4.3558	2.9658	3.3214	2.427	5.7738	10.687	0.1337
2010-2014	4.9248	3.1466	4.9454	-2.9912	2.2942	4.9224	3.0401
2015-2016	1.841	0.4838	11.610	-2.1575	5.6713	11.984	-4.326

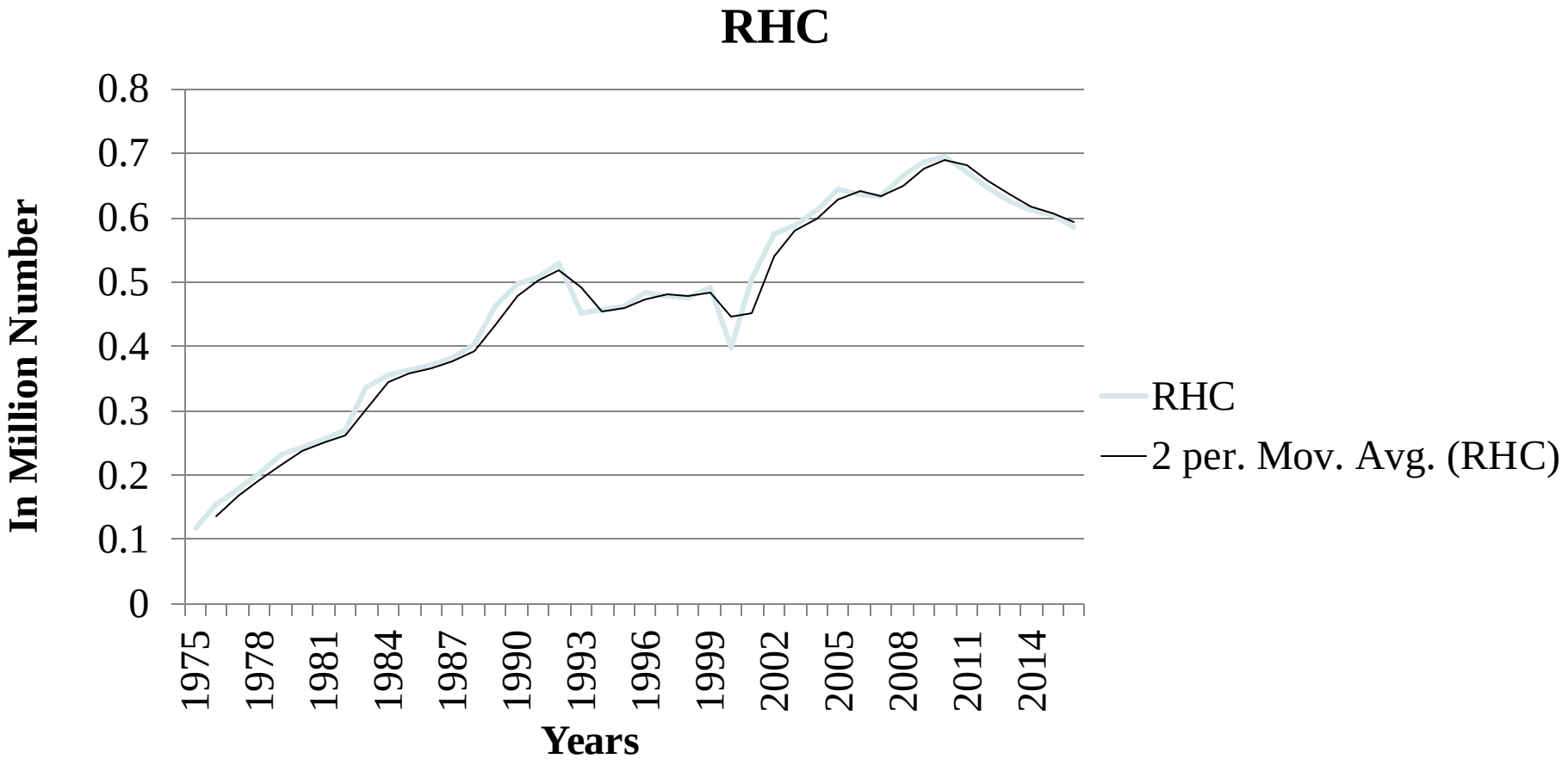
Real Gross Domestic



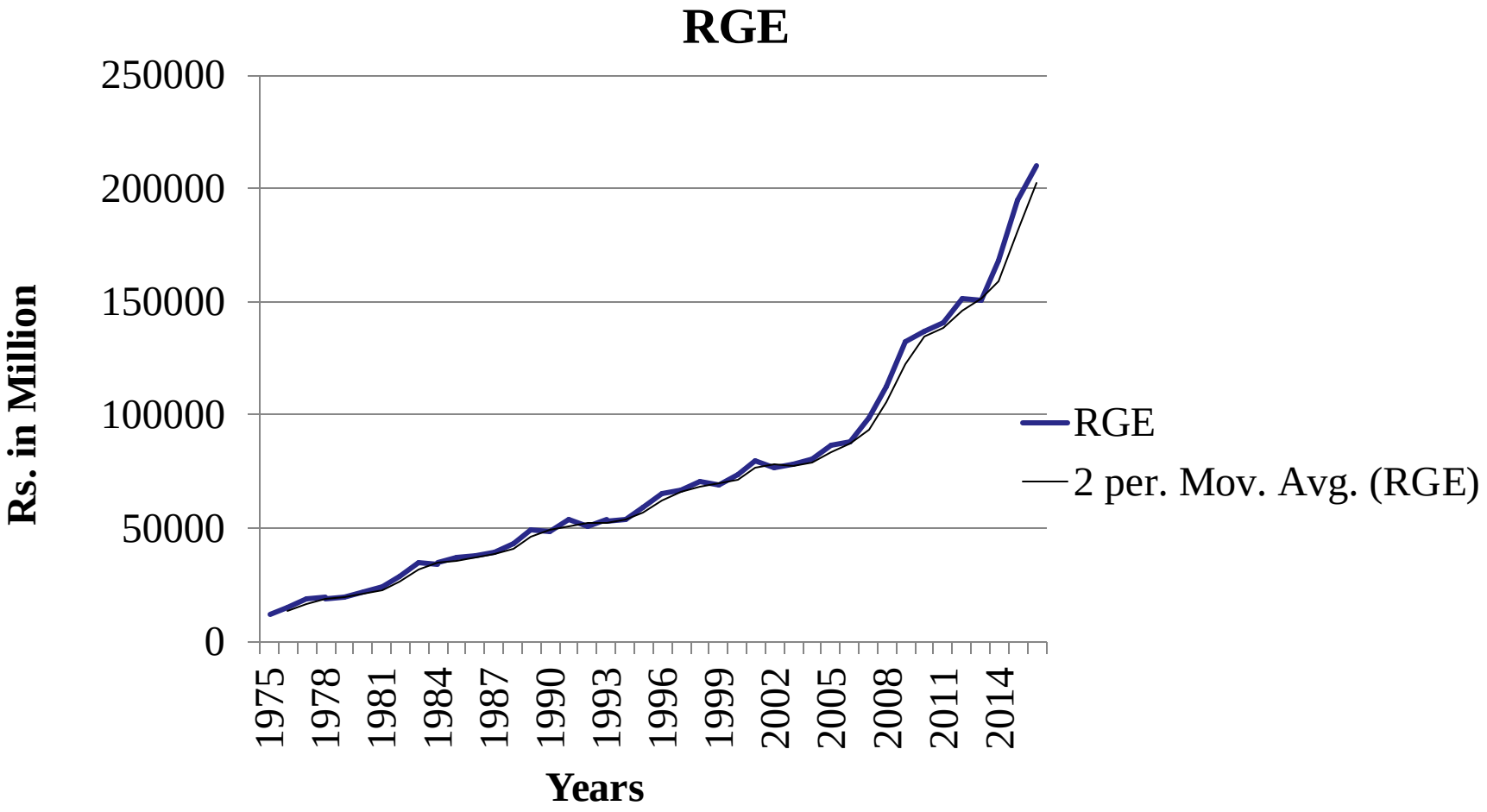
Gross Fixed Capital Formation



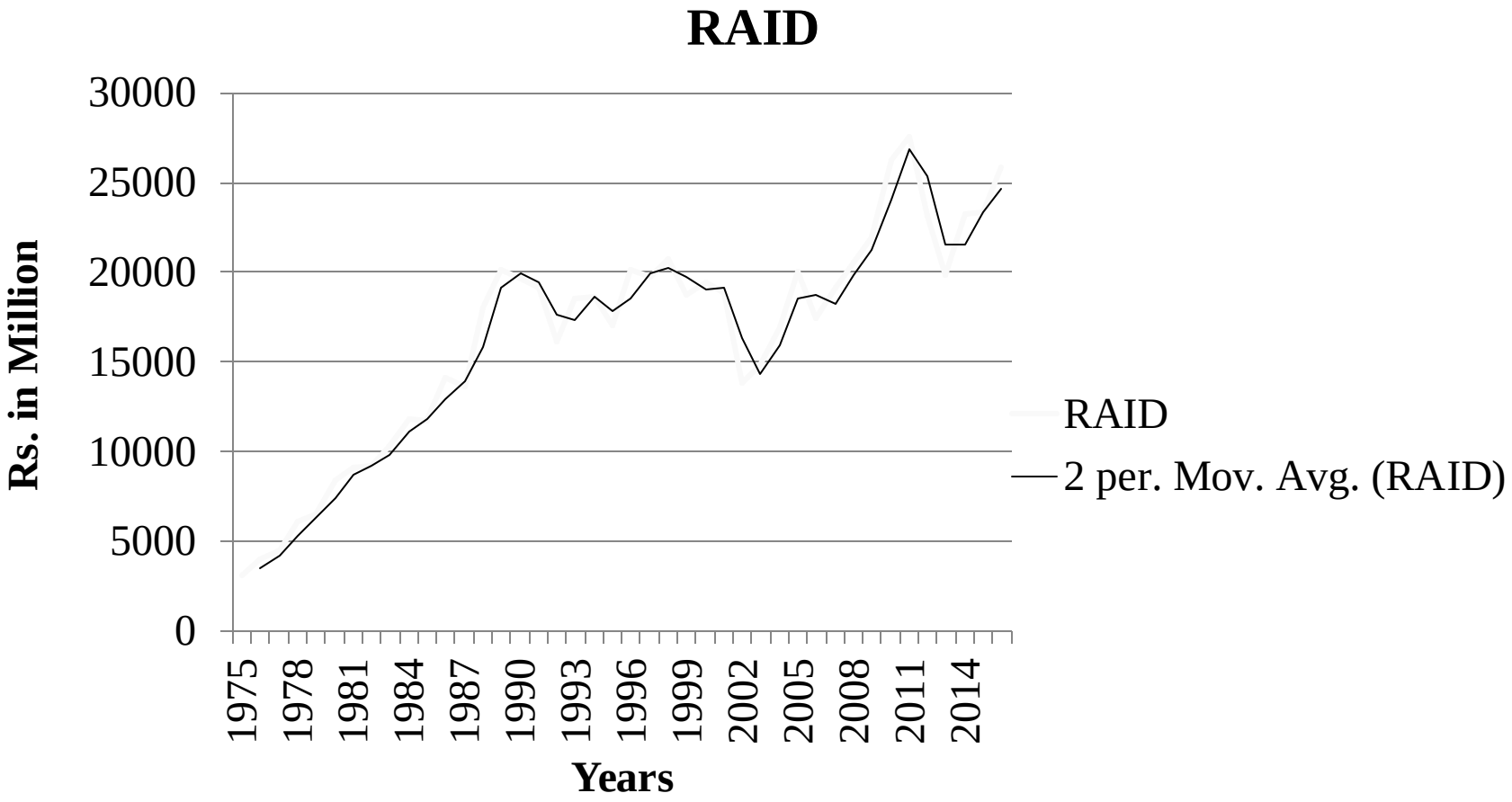
Trend of Human Capital



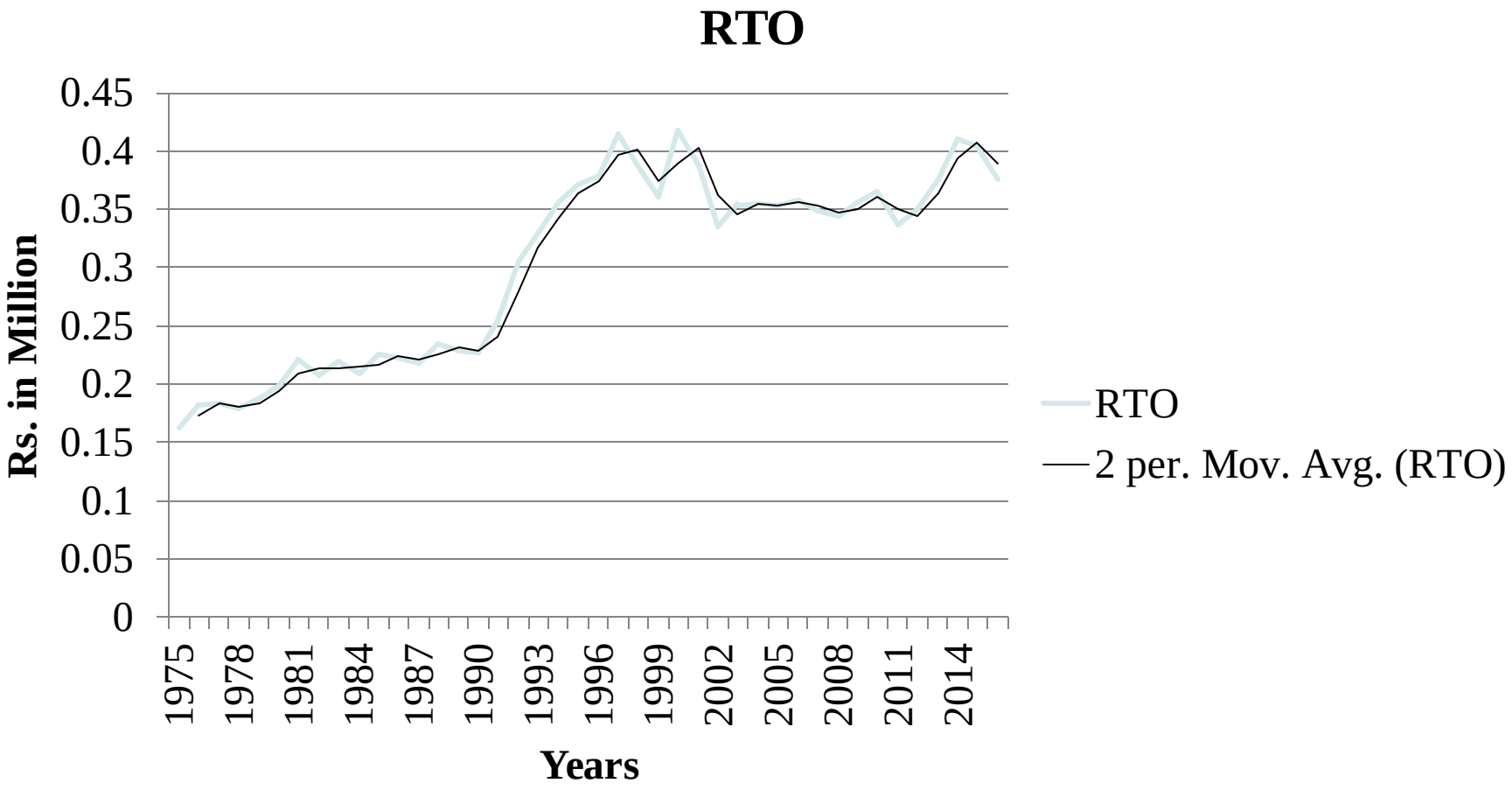
Trend of Government Expenditure



Trend of Foreign Aid



Trend of Trade Openness



Summary of Descriptive Statistics

	lnRGDP	lnGFCF	lnHC	lnGE	LnAID	lnTO
Mean	10.557	10.561	-0.843	8.834	7.468	-1.236
Median	10.539	10.521	-0.731	8.843	7.565	-1.076
Maximum	11.108	11.446	-0.365	9.781	7.981	-0.874
Minimum	10.022	9.564	-2.151	7.651	6.287	-1.814
Std. Dev.	0.335	0.507	0.438	0.502	0.364	0.293
Skewness	-0.043	-0.124	-1.219	-0.290	-1.532	-0.467
Kurtosis	1.979	1.962	3.830	2.808	5.289	1.649
Jarque- Bera	1.836	1.993	11.604	0.655	25.607	4.7196
Probability	0.399	0.369	0.0030	0.721	0.0000	0.095
Sum	443.421	443.571	-35.444	371.066	313.696	-51.929
Sum Sq. Dev.	4.626	10.550	7.868	10.336	5.439	3.525
Observations	42	42	42	42	42	42

ADF Unit Root Test Results

Variables	ADF test statistics	P- value	Critical Values			Remarks
			At 1%	At 5%	At 10%	
lnRGDP	-2.095	0.523	-4.198	-3.523	-3.192	
ΔlnRGDP	-5.914	0.0001	-4.205	-3.526	-3.194	I(1)
lnGFCF	-2.875	0.1806	-4.198	-3.523	-3.192	
ΔlnGFCF	-5.318	0.0005	-4.205	-3.526	-3.194	I(1)
lnHC	-3.379	0.0682	-4.198	-3.523	-3.192	
ΔlnHC	-6.606	0.0000	-4.205	-3.526	-3.194	I(1)
lnGE	-2.555	0.3014	-4.198	-3.523	-3.192	
ΔlnGE	-4.896	0.0016	-4.205	-3.526	-3.194	I(1)
lnAID	-4.017	0.0033	-4.198	-3.523	-3.192	I(0)
ΔlnAID	-6.161	0.0000	-4.205	-3.526	-3.194	
lnTO	-1.498	0.8143	-4.198	-3.523	-3.192	
ΔlnTO	-6.240	0.0000	-4.205	-3.526	-3.194	I(1)

Optimal Lag Length

The optimal lag length used in this study is two (2) which is based on Akaike Information Criteria.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	77.92276	NA	0.001468	-3.688347	-3.432414	-3.596520
1	91.30930	21.96766*	0.000779	-4.323554	-4.024966*	-4.216423
2	92.71674	2.237467	0.000764*	-4.344448*	-4.003205	-4.222013*
3	92.72892	0.018728	0.000806	-4.293791	-3.909892	-4.156051

Bound Test Results

Existence of long run relationship.

Null Hypothesis: No long-run relationship exist		
Test statistic	Value	K (Explanatory Variables)
F- statistic	5.691	5
Critical Value Bounds		
Significance	I(0) Bound	I(1) Bound
10%	2.26	3.35
5%	2.62	3.79

Run Relationship Test Results

ARDL (1,0,1,0,1,1) Selected Based on AIC				
Long Run Coefficients				
Variables	Coefficient	Std. Error	t-Statistic	Prob
lnGFCF	0.623	0.144	4.338	0.0001
LnHC	-0.025	0.109	-0.231	0.818
LnGE	0.177	0.101	1.766	0.087
LnAID	0.068	0.086	0.791	0.435
LnTO	-0.129	0.063	-2.024	0.500
C	1.719	1.486	1.156	0.256

Short Run Test Result (ECM)

ARDL (1,0,1,0,1,1) Model Based on AIC				
Variables	Coefficient	Std. Error	t- Statistic	Prob.
ΔlnGFCF	0.292	0.065	4.454	0.0001
ΔlnHC	0.224	0.056	3.990	0.0004
ΔlnGE	0.083	0.050	1.644	0.1102
ΔlnAID	-0.024	0.037	-0.647	0.5218
ΔlnTO	0.202	0.058	3.429	0.0017
ECT(-1)	-0.468	0.059	-7.864	0.0000
R-Squared: 0.77		Adjusted R-Squared: 0.75		DW Stat: 2.10

RESET Test Results

There is a correct functional form of the model.

Omitted Variables: Squares of fitted values

	Value	Df	Probability
t-statistic	1.631027	30	0.1133
F-statistic	2.660248	(1, 30)	0.1133

Correlation Test Results

The residuals are not serially correlated.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.336578	Prob. F(2,29)	0.7170
Obs*R-squared	0.930114	Prob. Chi-Square(2)	0.6281

Heteroscedasticity Test Results

Residuals have a constant variance i.e Homoscedasticity.

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.515195	Prob. F(9,31)	0.8522
Obs*R-squared	5.334574	Prob. Chi-Square(9)	0.8042
Scaled explained SS	2.673851	Prob. Chi-Square(9)	0.9758

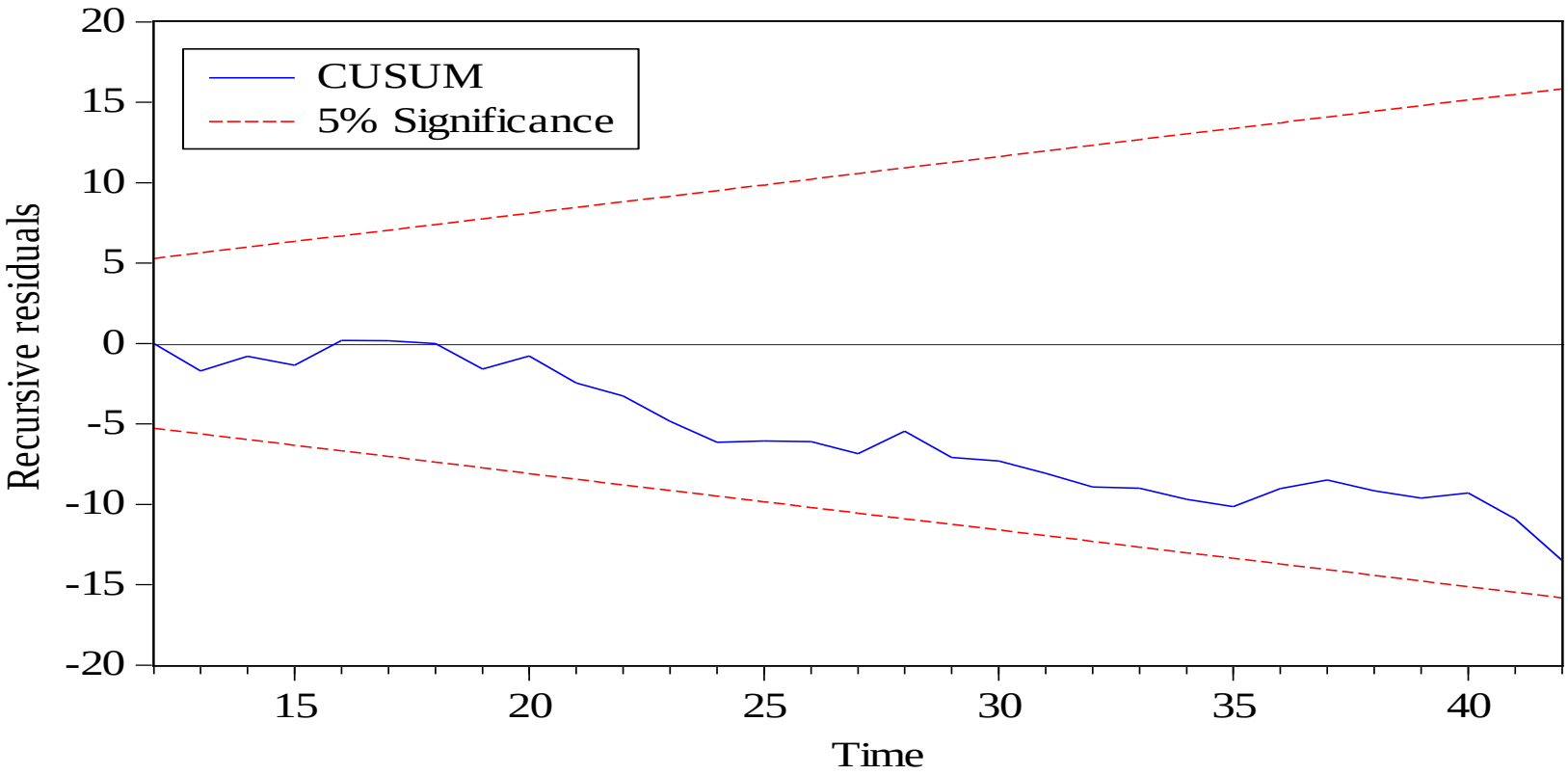
Normality Test Results

Residuals are normally distributed.

Statistical Tools	Statistical Value
Mean	-2.35e-16
Median	0.00019
Maximum	0.0408
Minimum	-0.0417
Std. Dev	0.0194
Skewness	-0.0684
Kurtosis	2.7535
Jarque-Bera	0.1357
Probability	0.9343

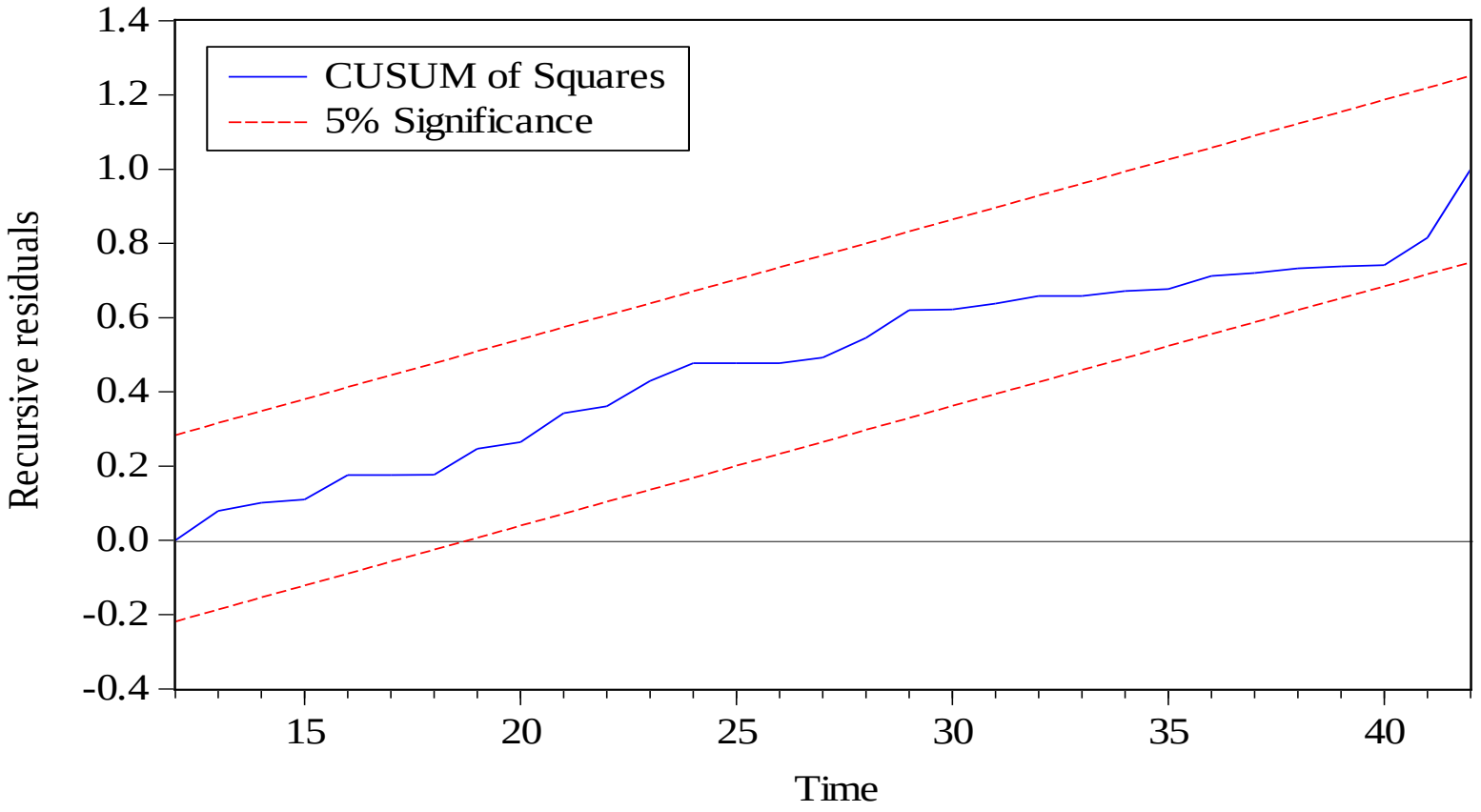
CUSUM Test Results

The model is stable.



CUSUMQ Test Results

The model is stable .



Conclusions

- GFCF and GE have significant positive impact on economic growth which justify the growth theory of Harrod-Domar model and Keynesian expenditure multiplier hypothesis.
- Human capital has positive but insignificant impact on economic growth of Nepal this insignificant result is may be due to the poor institutional management and accountability, lack of resource materials and poor quality of teachers.
- Foreign aid has positive but insignificant impact on economic growth, this may be due to the its unproductive utilization.
- Trade openness has significant negative impact on economic growth, Though we have adopted open market policies and endure trade openness, there is a lack of significant increase in exports and control of imports of luxurious goods.

Policy Implications

- It is suggested that investment should increase on GFCF including plants, machinery, technology etc.
- Government should increase its expenditure on infrastructure and research and development.
- There should be a deep cut in imports of consumer goods and encourage exports to boost domestic production.
- Structural changes should be made in school institutions with the provision of providing quality education with cognitive skills and added resources through quality and skilled teachers.
- Foreign aid should be effectively, optimally and productively utilize in order to get the better results of development.

THANK YOU!

NEXT CHAPTER V