Measuring Economic Activity

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Outline

- Gross domestic product (GDP)
- Elements of GDP
  - Different ways of measuring GDP
  - Real vs. Nominal GDP
  - Major components of GDP
    - Indian context
  - Different measures of national output
- General price level
- Inflation

The Economy's Income & Expenditure

- A measure of how well an economy is performing is the total income that everyone in the economy is earning.

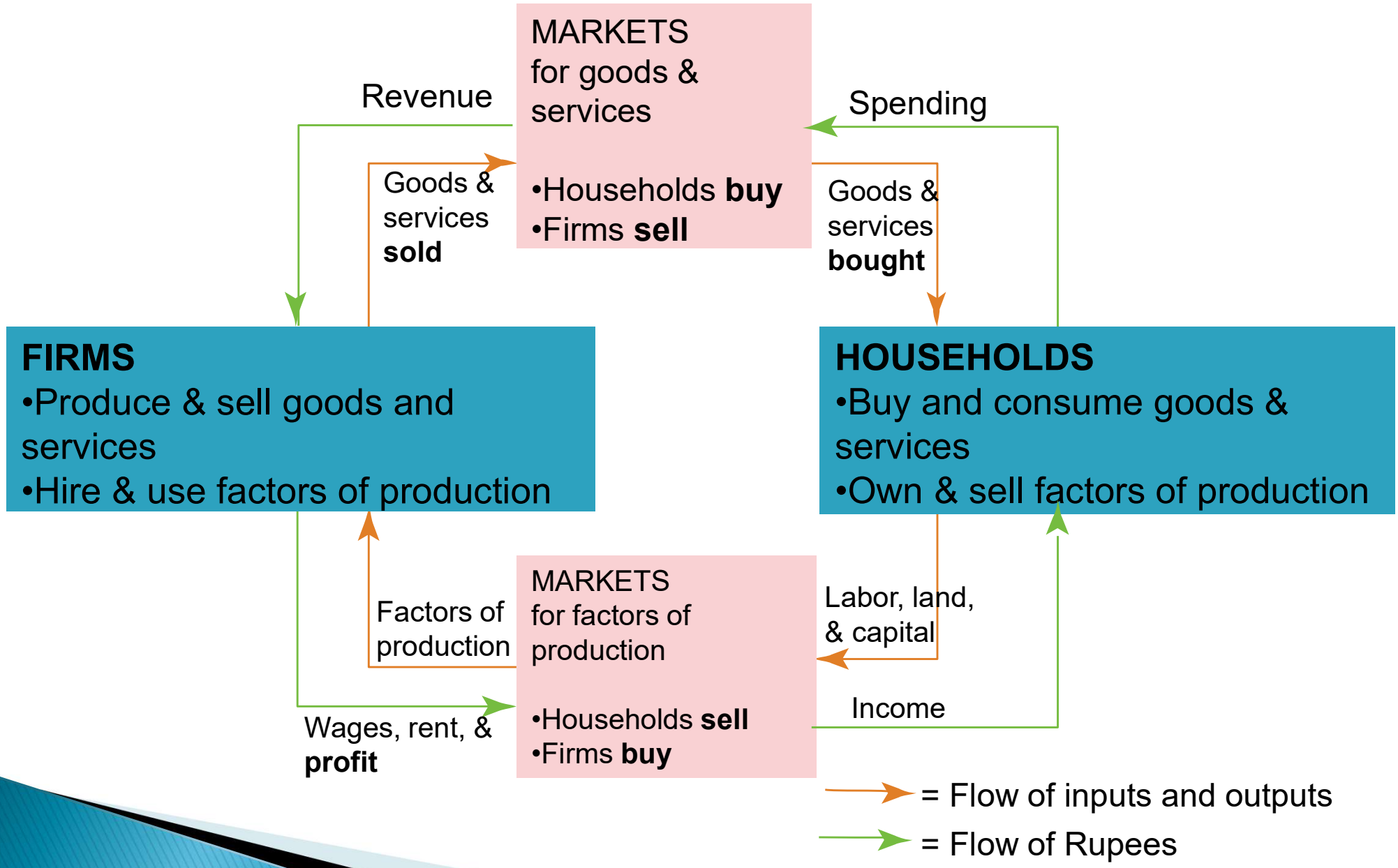
- For an economy as a whole, *income must equal expenditure* because:
  - Every transaction has a buyer and a seller.
  - Every Rupee of spending by some buyer is a Rupee of income for some seller.

- The equality of income and expenditure is illustrated with the circular-flow diagram.

Circular flow of *macroeconomic* activity (Assumptions)

- Oversimplified world
- No government
- No foreign trade
- No investment
- Economy produces *only consumption goods* (i.e. goods purchased by households for personal consumption only)
- All goods and services are bought by households
- Households spend all their income
- **2 approaches** in terms of:
  - Flow of products
  - Earnings and income approach

Circular flow of macroeconomic activity



Equivalence of the 2 approaches

- *GDP **(flow of product approach)*** (upper loop)
  = total money value of the (*flow of*) final products produced by the economy ------ I

- *GDP **(flow of earnings/income approach)***(lower loop)
  = total factor earnings *or* cost of producing society's ***final*** products ----- II

- I = II
  - *Reason*: Profits (lower loop) are the residual amount from the sale of a product after other factor costs are paid out.
  - Wages + Rents + **Profits** = Income

Value-addition

- Flow of products approach includes **only final goods** (excludes intermediate goods)

- *Double counting* in *income* approach?
  - Only the *value-added amounts* of firms are added while calculating the GDP
  - Value-added approach => only value-added at each stage of production is included to calculate the GDP

Value added =

Value of the final goods (price of sales which includes the costs incurred owing to factors of production are included)

– Expenditure on purchase of intermediate goods used to produce the goods

Value- added approach

- *To avoid double counting, we take care to include only final goods in GDP and to exclude the intermediate goods that are used up in making the final goods.*

- *By measuring the value added at each stage, taking care to subtract expenditures on the intermediate goods bought from other firms, the lower-loop earnings approach properly avoids all double counting and records wages, interest, rents, and profits exactly one time.*

Gross Domestic Product

- *Gross domestic product* (GDP) is a measure of the income and expenditures of an economy.

GDP is the total market value of all final goods and services (products) produced within a country in a given period of time.

Defining the Gross Domestic Product

- **"GDP is the market value. . ."**
  - Output is valued at market prices (which reflect the *relative economic value of all the goods and services*).
- **". . . of all. . ."**
  - Includes all items produced in the economy and sold in markets
- **". . . final . . ."**
  - It records only the value of final goods, not *intermediate goods* (value of intermediate good is included in the *price* of the final good)
  - When are intermediate goods considered final goods?
- **". . . goods and services . . ."**
  - It includes tangible goods (food, clothing, cars) and intangible services (financial services, transport, health)

Defining the Gross Domestic Product

- **“. . . produced . . .”**
  - It includes goods and services currently produced, not transactions involving goods produced in the past.

- **“ . . . within a country . . .”**
  - It measures the value of production within the geographic confines of a country.

- “. . . **in a given period of time**.”
  - It measures the value of production that takes place within a specific interval of time, usually a year or a quarter (three months).

The Components of GDP

- GDP includes all items produced in the economy and sold legally in markets.

- What is **not counted** in GDP?

  - GDP excludes most items that are produced and consumed at home and that never enter the marketplace
  - It excludes items produced and sold illegally.

  - *Human development indicators:* pertaining to poverty, inequality, health and sanitation, etc. in an economy.

The Components of GDP

Expenditure approach

GDP (Y) is the sum of the following:

- Consumption (*C*)
- Investment (*I*)
- Government Purchases (*G*)
- Net Exports (*NX*)

$$\mathbf{Y = C + I + G + NX \quad (Identity)}$$

The Components of GDP…

- *Consumption (C)*:
  - The spending by households on goods and services, with the exception of purchases of new housing. (Health, education, leisure, etc.?)

- *Investment (I)*:
  - The spending on goods (capital equipment, inventories, and structures), including new housing. It consists of additions to the economy's capital stock (in a year) which is used to produce more goods and services (*foregoing current consumption to increase future consumption*)

The Components of GDP…

- *Government Purchases (G)*:
  - The spending on goods and services by local, state, and central governments. [Expenditure made in exchange for a good or service]
  - It does ***not*** include ***transfer payments*** because they are not made in exchange for currently produced goods or services. Transfer payments alter a household's income but do not reflect an economy's production.
  - Interest paid by government on debt? **NO**

- *Net Exports (NX)* = [Exports – Imports]
  - Imports are subtracted
  - Net foreign investment (NFI) =X – IM (when X>IM)

Total Net National Investment (NFI + I)

Components of GDP in India (Expenditure approach)

- **(C)**: Private Final Consumption Expenditure (PFCE)

- **(G)**: Government final consumption expenditure (GFCE)

- **(I):** Investment = Gross capital formation (GCF)
  = [Gross fixed capital formation (GFCF) + Changes in Stock (CIS)] + Valuables

OR

(I): = Gross savings + Net capital inflow from abroad (*flow of funds approach*)

- **(X)**: Exports
- **(IM):** Imports

Components of GDP in India (Expenditure approach)

- **PFCE**: Expenditure by households and non-profit institutions on non-durable consumer goods and services, and all durable (more than one-year lifetime) goods *except* land and buildings. Also includes expenditure on rent and imputed rent of owner-occupied buildings/houses.

- **GFCE**: Purchase by central and state government of non-durable goods and services + expenditure on durable goods used for defence. Valuation of collective government services (health, defence, education, justice) : money spent by government to buy the services of the people employed.

Components of GDP in India (Expenditure approach)

- **GCF**: Consists of the acquisition of fixed assets (machinery, buildings, vehicles) and the accumulation of stocks (raw materials, fuel, finished goods, semi-finished goods). Part of country's total expenditure **NOT** consumed but added to economy's fixed (tangible & intangible) assets and stocks.
- Gross domestic investment by private and government sectors + acquisition of residential buildings by households.

- GCF = GFCF + CIS + Valuables (*commodity flow approach*) --------- (i)
- GCF = Gross savings + Net capital inflow from ROW (rest of world) (*flow of funds approach*) --------- (ii)

- (i) – (ii) = **Discrepancies**

Components of GDP in India (Expenditure approach)

- **G(Fixed)CF** = Total value of a producers' acquisitions
  - – disposals of fixed assets during the accounting period
  - + additions to value of non-produced assets realized by productive activity of institutional units

  Categories of assets included => dwellings, other buildings & structures; machinery & equipment; cultivated biological resources; and intellectual property products.
- **Changes in stocks (CIS)** => change in stock of inventories
- **Valuables**: Expenditure on acquisition of valuables including works of art, precious metals & stones, jewellery.

Indian GDP (at market prices) and its components for 2022-23 (Base: 2011-12 series)

Components of GDP (Expenditure approach)	Value in Rs crore (at constant prices) Provisional estimates	% share in GDP (%)
PFCE	87,03,540.5	58.3
GFCE	15,75,280.7	10.6
GFCF	48,78,773.2	32.7
CIS	1,24,162.2	0.8
Valuables	2,78,758.95	1.9
Exports of Goods and Services	33,05,833.4	22.1
Imports of Goods and Services	34,93,326.0	23.4
E & O (Discrepancies)	-4,47,182.5	-3.0
GDP	1,49,25,840.4	100

Source: National Account Statistics 2023, https://www.mospi.gov.in/publication/national-accounts-statistics-2023

The Components of GDP

Income approach

GDP is the sum of the following:

- Wages, salaries, other labour income
- Interest payments, rent, other property income
- Profits
- Net taxes (Taxes – Subsidies)
- *Depreciation:* amount of capital used in a year irrespective of whether it replaced old capital or added to the existing stockpile (depicts wear and tear of existing capital)

Components of GDP in India (Income approach)

- **GDP** = *Income generated due to the production activity* distributed across 2 factors of production (labour and capital) and the payouts received in terms of salaries and the operating surplus

GDP = GVA @ basic prices + Product taxes – Product subsidies

where

GVA @ basic prices = Compensation of employees (CE) + Gross operating surplus (OS/MI) + (Production taxes – Production subsidies + Consumption of fixed capital (CFC)

- **GVA:** Total value added in terms of the goods and services produced within the economy after accounting for net production taxes and subsidies

Components of GDP

Production approach

- GDP is calculated based on the income from *different economic activities and capital formation in the economy.*
- GDP = Total output in the economy i.e. measured as the sum of value-added by all economic activities within the country

Indian context

- GDP = GVA at basic prices + *Product* or Indirect taxes – *Product* subsidies

Where

GVA @ basic prices = Output (i.e. sum of the value *added by all economic activities*) – Intermediate consumption

- **GVA:** Total value of output (contribution of labour and capital to production) after discounting intermediate production.
- **Intermediate consumption**: Intermediate consumption consists of the value of the goods and services consumed as inputs by a process of production, **excluding** fixed assets whose consumption is recorded as consumption of fixed capital (CFC)

Economic activities included to measure GDP

1. Agriculture, forestry and fishing
2. Mining & quarrying
3. Manufacturing
4. Electricity, gas, water supply & other utility services
5. Construction
6. Services
   - Trade, repair, hotels and restaurants
   - Transport, storage, communication & services related to broadcasting
   - Financial services
   - Real estate, ownership of dwelling and
   - professional services
   - Public administration and defence
   - Other services

Different measures of national output

- Net Domestic Product (NDP)

  NDP = GDP – Depreciation

- Gross National Product (GNP)

  GNP = GDP + Income earned by Indians abroad

  – Income earned by foreigners in India

- Net national Product (NNP)

  NNP = GNP - Depreciation

Different measures of national output

- National Income (NI): Total income received by the factors of production (labour, capital and land) called factor incomes. Payments for which no goods or services are received in return are termed transfer payments. Other incomes such as pensions, education grants, unemployment benefits, etc. are paid out of factor incomes and are called transfer incomes.

  NI = GDP – Depreciation – Indirect taxes

- Personal Disposable Income (DI): It is a measure of amount of the money in the hands of the individuals and available for their *consumption or savings*.

DI = NI – direct taxes – (profits – dividends) + transfer payments

= NI – direct taxes – (Net business savings) + transfer payments

Real vs. Nominal GDP

- *Nominal GDP* values the production of goods and services at *current prices* or actual market prices.
  - Current prices change over time
  - **Inflation**: Rate of growth of the price level from one year or month to the next.
  - Deflation vs. disinflation
  - **Issue:** Measuring GDP using changing prices
  - If GDP changes from T_1 to T_2, it could be due to:
    - Larger volume of goods & services produced

      OR
    - Higher prices of goods and services

Real vs. Nominal GDP

- Need for a price-invariant measure of total quantity of goods and services.

- *Real GDP* values the production of goods and services at *constant prices*.

  - Measures value of goods & services produced in the economy at prices prevailing in the past.

  - Reflects *changes in quantities* being produced (after accounting for price changes), and the economy's ability to supply people's needs.

GDP Deflator

- Difference between nominal GDP and real GDP (or the price of GDP)
- Measure of overall price levels in the economy
- The price index that measures the average price of the components in GDP relative to a base year
- Measures how much of a rise in nominal GDP is attributable to a rise in prices rather than a rise in the quantities produced
- Measures current level of prices relative to level of prices in the ***reference base year***

GDP Deflator

- GDP deflator is the price of GDP and its components
- "*Deflates*" nominal GDP by rise attributable to increase in prices

$$GDP\ deflator = \frac{Nominal\ GDP}{Real\ GDP} X\ 100$$

- Growth rate of the deflator is an indicator of inflation

$$Inflation(t) = \frac{(GDP\ deflator)_t - (GDP\ deflator)_{t-1}}{(GDP\ deflator)_{t-1}}\ X\ 100$$

Calculating Nominal and Real GDP

Year	Prices (Rs)		Quantity (Number)		Nominal GDP (Rs.)	Real GDP (2020 prices) (Rs.)	GDP Deflator
	Pen	Notebook	Pen	Notebook			
2020	10	40	500	1500	65000	65000	100
2021	12	50	1000	2000	112000	90000	124
2022	15	70	1800	3000	237000	138000	172

- What happens if prices don't change across years?
- What happens if quantities don't change across years?
- Inflation is the % change in a measure of price level from one period to the next.

$$Inflation(t) = \frac{(GDP\ deflator)_t - (GDP\ deflator)_{t-1}}{(GDP\ deflator)_{t-1}}\ X\ 100$$

Price indices and Inflation

- **Price index**: Measure of average level of prices.
- **Construction**:
  - Fix the basket of goods
  - Find individual prices (and therefore the price of the basket) (**Geometric mean** for aggregating individual prices)
  - Weighting the individual prices of a representative basket of goods and services according to their economic importance.
  - Choose the base year; and compute weighted average of the prices of goods and services in the economy (**Laspeyre's index**)

Inflation = % Rate of change in the price index = measure of cost of living

$$Inflation\ (t) = \frac{P(t) - P(t-1)}{P(t-1)}\ X\ 100$$

- Types → CPI, PPI (or WPI), GDP deflator
  - Splicing and Linking factor

Consumer Price Index (CPI)

- It measures the overall cost of the goods and services bought by the consumer
- Consumer Price Index (CPI) measures the cost of buying a representative basket of goods and services at different points in time.
- Widely used as a macroeconomic indicator of inflation and for monitoring price stability
- *Tool for governments and central banks for inflation targeting*
- Also used as GDP deflator in the national accounts.

- **Issues with CPI:** Not a perfect measure of the cost of living.
  - **Substitution bias**: disproportionate change in prices (and consumption) of commodities.
  - Introduction of new goods not included
  - Unmeasured quality changes

CPI in India

- **Indian context:**
  - 24 groups of goods and services constitute the representative basket
  - Food & beverages (54.18%) ; Pan, tobacco & intoxicants (3.26%); Clothing & footwear (7.36%) ; Housing (10.07 %); Fuel & light (7.94%); Miscellaneous (27.26%)
  - Monthly price data are collected from 1114 markets in 310 selected towns by the Field Operations Division of NSSO and the specified State/UT Directorates of Economics and Statistics and from 1181 selected villages by the Department of Posts.

Producer Price Index (PPI) or?

- Importance of CPI in India:
  - People more conscious of changes in prices of goods & services they consume and the impact on their cost of living
  - Inflation target
  - Adjustment factor for indexation of wages, salaries, etc.
  - Estimation of cost of living
- Types of CPI : CPI-UNME, CPI-IW, CPI-AL/RL

- Measures level of prices at wholesale level (producer stage) or point of bulk sale i.e. measures cost of basket of goods & services bought by the firms rather than households
- Weighting is done by using the net sales of each commodity as fixed weights

WPI – Indian context

- Indian context (Note: DPIIT, Ministry of Commerce and Industry)
- Total of 697 commodities in the representative basket
- 3 broad categories: primary articles, fuel & power, manufactured products
- Primary articles (22.62%): food, non-food, minerals
- Fuel & power (13.15%): coal, mineral oils, electricity and crude petroleum
- Manufactured products (64.23): 22 sub-groups
- Exclude the indirect taxes to conform with global PPI measures
- Weights:
  - Based on total transactions in the economy
  - Top-down approach where the weights are calculated as the share of the commodity in the net traded value (NTV) (NTV = Output – NX)
- Computation:
  - Prices for individual commodities aggregated as arithmetic mean
  - Laspeyre's index for aggregation across basket

Summary of Indian CPI and WPI (appendix)

Table 2: Description of Various Price Indices in India

		CPI-Combined	CPI-IW	CPI-AL	CPI-RL	WPI
1	Base year	2012	2001	1986-87	1986-87	2004-05
2	Universe	All India Rural & Urban Households	Households of Industrial workers	Households of Agricultural labourers	Households of Rural labourers	All transactions at first point of bulk sale
3	Centres/ price quotations	1181 village (268351 quotations) and 1114 urban (281001 quotations) markets covering all districts and 310	Selected markets in 78 selected centres	Shops and markets catering to 20 States (600 villages)		5482 quotations
4	Items covered	299	393	182		676
5	Weights of major groups					
	Food, Beverages and Tobacco	48.24	48.47	72.94	70.47	26.07
	Fuel & Light	6.84	6.42	8.35	7.9	14.91
	Housing	10.07	15.29	–	–	59.02
	Clothing & Footwear	6.53	6.58	6.98	9.76	
	Miscellaneous	28.32	23.32	11.73	11.87	*
	Total	100	100	100	100	100
6	Basis for Weighting Diagram	68th round Consumer Expenditure Survey (2011-12)	Working Class Family Income and Expenditure Survey (1999-2000)	38th Round of Consumer Expenditure Survey (1983) – for agricultural labourer	38th Round of Consumer Expenditure Survey (1983) – for rural labourer	Gross Value of Output (GVO) at current prices, National Accounts Statistics (2007)
7	Methodology	Geometric mean for elementary item index and Laspeyres Index Formula for higher level index	Weighted arithmetic mean according to Laspeyres Index Formula			
8	Producer	Central Statistics Office, Government of India	Labour Bureau, Government of India			Ministry of Commerce & Industry, Government of India

* Consists of Non-Food Manufactured Products, Non-Food Primary Articles, and Minerals

Ref: Das & George (2017): Comparison of Consumer and Wholesale Prices Indices in India: An Analysis of Properties and Sources of Divergence, RBI Working Paper Series No. 5

Price indices and inflation

- Inflation vs. deflation (What is disinflation?)
- Issues:
  - Choice of base year
  - Choice of the representative basket of goods
  - Biases in the indices: upward bias in price, overestimating growth

Additional concepts

- Indexation
  - Value of salaries to account for inflation
  - Today's salary in past value terms

$$S(t=1) in\ P(t=0) terms = \frac{S(t=0)\ in\ P(t=0)\ terms}{P(t=0)} X\ P(t=1)$$

    - Correction of the Rupee amounts for effects of inflation
    - Cost of living allowance: provision of indexation of wage to CPI => increase in salaries/wages due to inflation
- Real vs. nominal interest rate:

Real interest rate ≈ Nominal interest rate – Inflation

    - Nominal: Measures how fast value of money in the bank account increases
    - Real: Measures how fast the purchasing power of money in the bank account increases over time

Identity of Savings and Investment

- Domestic investment and net exports constitute the investment of an economy
- National savings constitute private savings and government's budget surplus
- Introduce government, trade and business savings

Domestic investment + Net exports

=

Private savings + budget surplus

Thank you