Price Indices

20 - 22 September 2021

TURKSTAT

Price Statistics Department

PRICE STATISTICS DEPARTMENT

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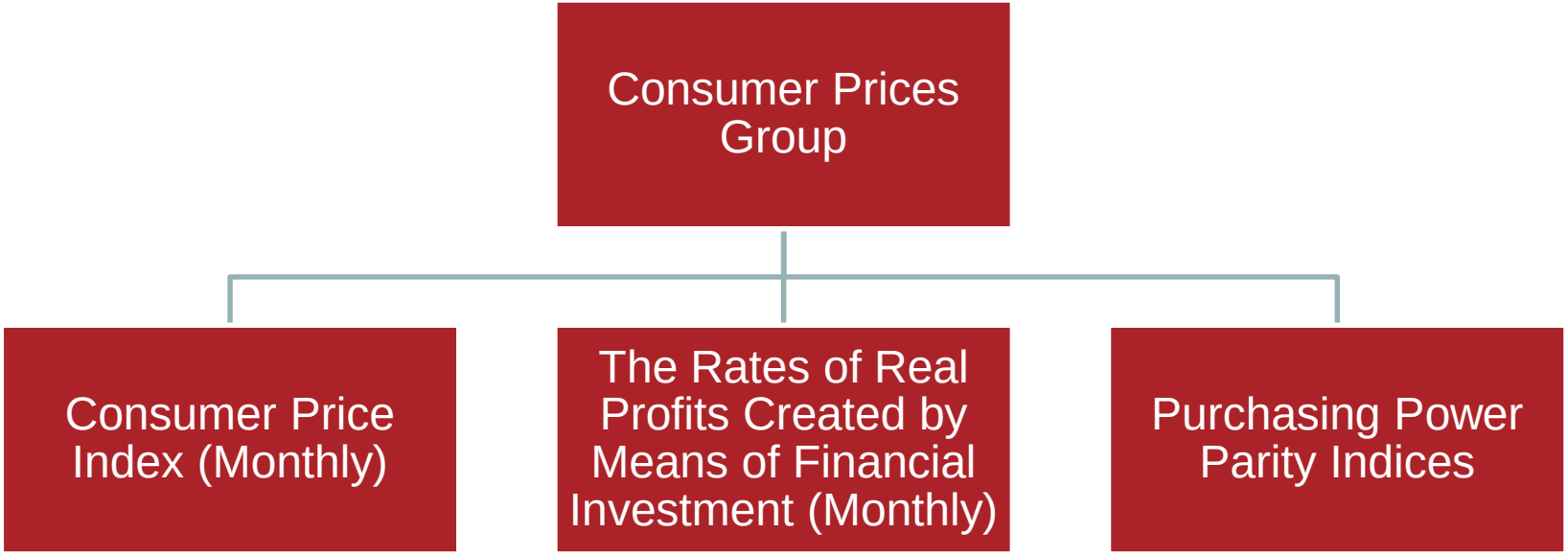
Consumer prices group:

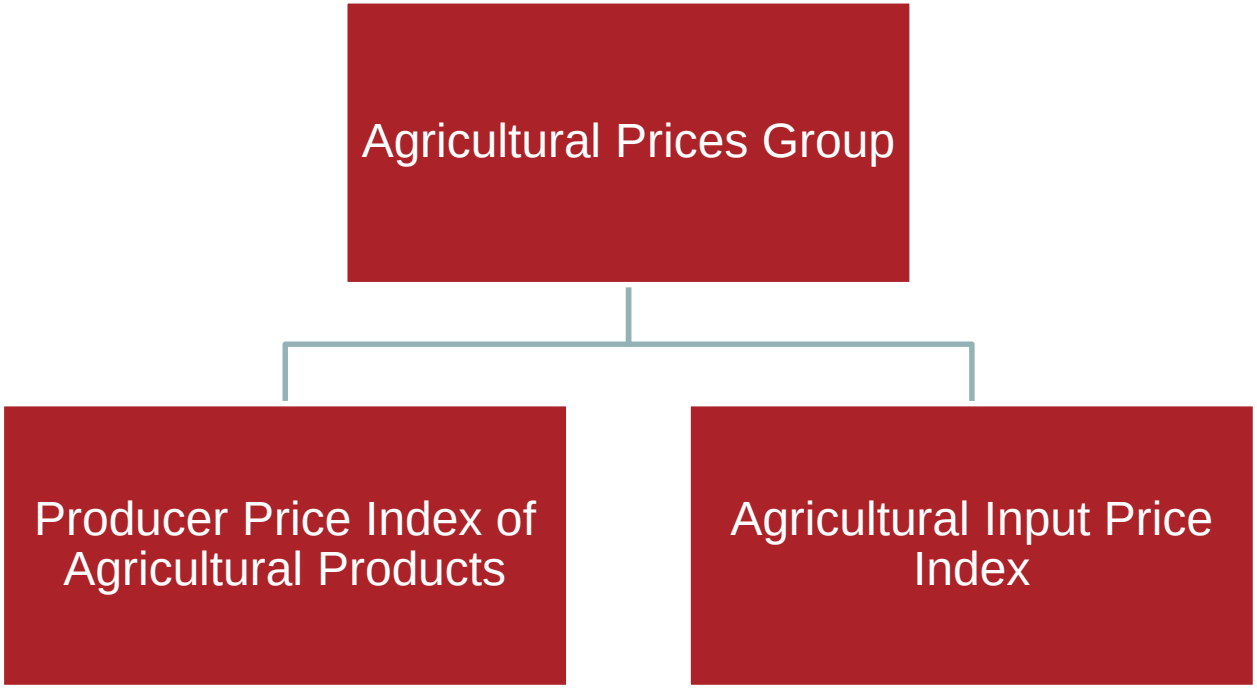
29 persons work in central office to produce:



PRICE STATISTICS DEPARTMENT

Agricultural prices group:

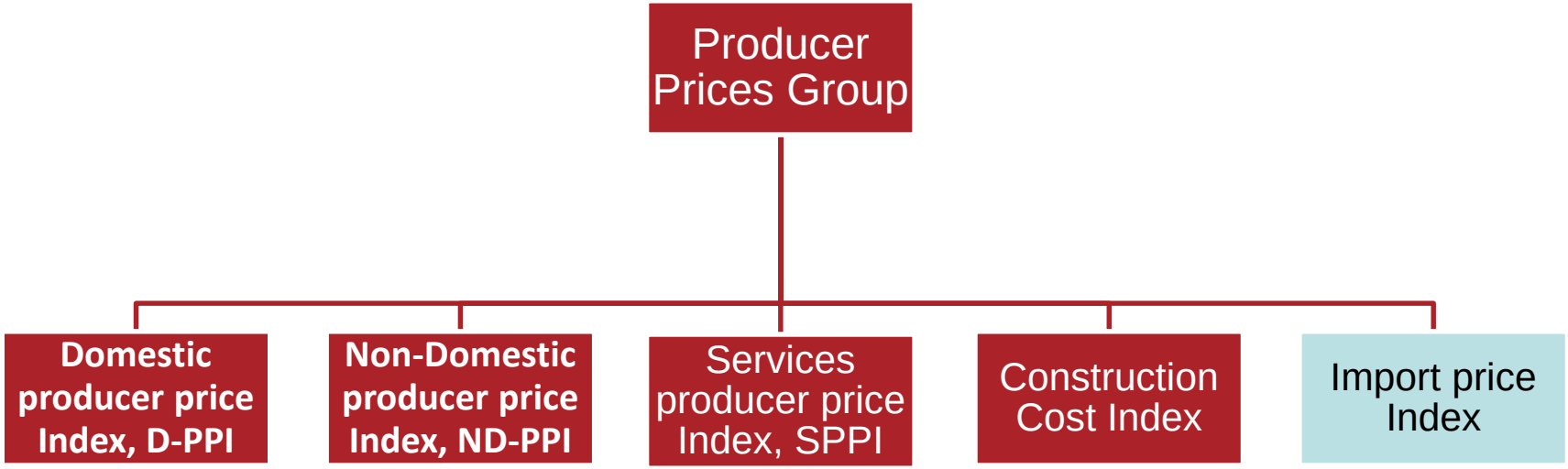
10 persons work in central office to produce:



PRICE STATISTICS DEPARTMENT

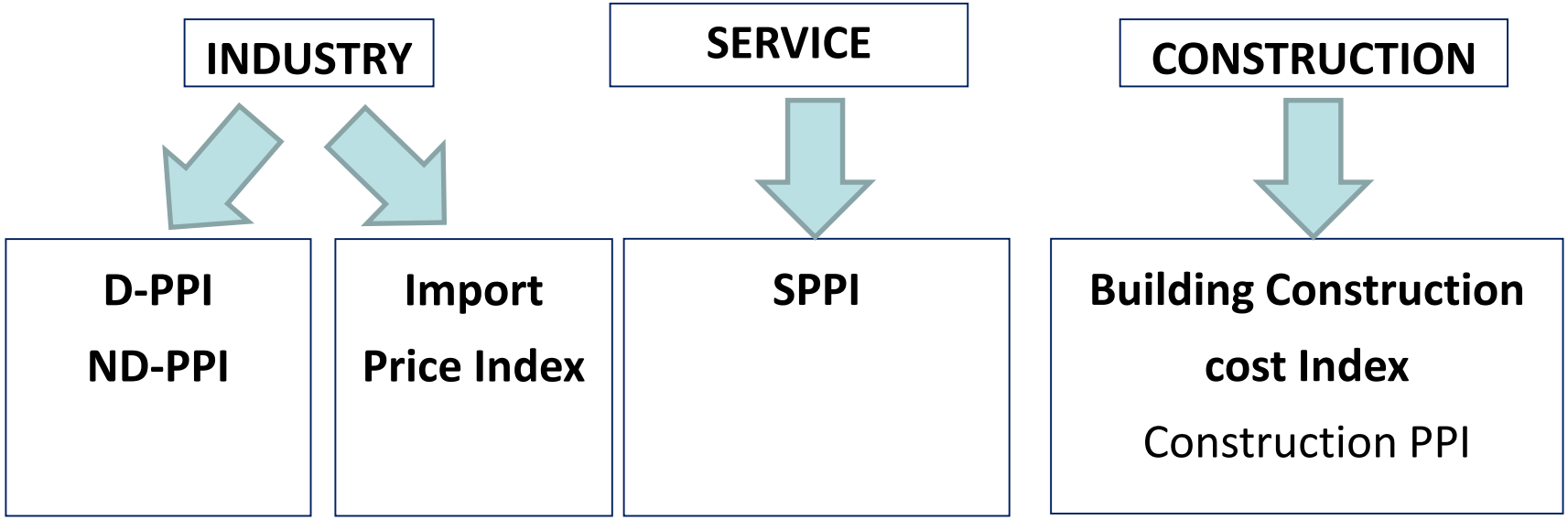
Producer prices group:

13 persons work in central Office to produce:



Producer Price Group

PPI according to European Union



Producer Price Index (PPI), measures the average change over time in the selling prices received by domestic producers for their output.

Price Indices

Index Numbers

Index numbers are used to measure change in a number of contexts, most notably in economics. Such changes are commonly measured over time. However, index numbers can also be used to measure changes over some other domain, such as geographical regions.

Laspeyres Price Index

How much of the growth in value is due to inflation, the growth in prices. One approach is to fix the quantities in equation to what they were at the base period. This gives us a Laspeyres price index, *PL:*

$$P_{0:t}^{La} = \frac{\sum\left(p_t^i q_0^i\right)}{\sum\left(p_0^i q_0^i\right)} = w_0^i \sum\left(\frac{p_t^i}{p_0^i}\right)$$

Laspeyres price index is a base period turnover weighted arithmetic mean of price relatives.

Price Indices

Paasche Indices

Laspeyres indices hold prices or quantities constant as at time 0.

Why not as at time *t*?

$$P_P(0,t) = \frac{\sum_{i=1}^{N} p_{ti} q_{ti}}{\sum_{i=1}^{N} p_{0i} q_{ti}}$$

A Paasche price index is therefore a current period turnover weighted mean of price relatives. Similarly, a Paasche volume is a current period turnover weighted mean of volume relatives

Price Indices

The Axiomatic Approach

There are certain axiomatic properties (or tests) that it is desirable for index numbers to have.

We shall list some of these for price indices – there are corresponding tests for volume indices. We assume all prices and quantities are strictly positive.

Price Indices

The Axiomatic Approach

Identity/Constant Prices Test:

$$P(\{p_{0i}\},\{p_{0i}\},\{q_{0i}\},\{q_{ti}\})=1$$

This means that if the prices don't change then the price index takes the value 1.

Tabular Standard/Basket/Constant Quantities Test:

$$P(\{p_{0i}\},\{p_{ti}\},\{q_{0i}\},\{q_{0i}\})=\frac{v_t}{v_0}$$

This means that if the quantities don't change then the price index takes the value of the growth in turnover

Price Indices

The Axiomatic Approach

Positivity Test:

$$P(\{p_{0i}\},\{p_{ti}\},\{q_{0i}\},\{q_{ti}\})>0$$

This means that the price index is always positive (if all prices and quantities are positive).

Continuity Test:

$$P(\{p_{0i}\},\{p_{ti}\},\{q_{0i}\},\{q_{ti}\})$$

is a continuous function of its arguments; there are no step

Price Indices

Fisher index

The Fisher index tends to perform best in these tests. A criticism of the axiomatic approach arises if we consider an index defined as always being equal to one, which we shall call the “One” index:

Clearly, such an index is of no practical use. Even so, it does pass some of the axiomatic tests.

Price Indices

Elementary Aggregate Indices

Unweighted Index Formulas

- Carli: Average of Price Relatives
- Dutot: Ratio of Average Prices
- Jevons: Geometric Average

Price Indices

Dutot Index for an Item

- The ratio of average (arithmetic) prices

$$I_D^{o;t} = \frac{\frac{1}{n}\sum p_i^t}{\frac{1}{n}\sum p_i^o} = \frac{\sum p_i^t\left(\frac{p_i^o}{p_i^o}\right)}{\sum p_i^o} = \frac{\sum p_i^o\left(\frac{p_i^t}{p_i^o}\right)}{\sum p_i^o}$$

for a set of varieties in the current period to the average price of the same (matching) set of transactions in the base period.

Price Indices

Carli Index for an Item

- The arithmetic average of price relatives

$$I_C^{0:t} = \frac{1}{n}\sum\left(\frac{p_i^t}{p_i^0}\right)$$

Unweighted average of the long-term price relatives (current /base period price)

For the same (matching) set of transactions.

Price Indices

Jevons Index for an Item

- The geometric average of price relatives

$$I_J^{0:t} = \prod \left(\frac{p_i^t}{p_i^0} \right)^{1/n} = \frac{\prod \left(p_i^t \right)^{1/n}}{\prod \left(p_i^0 \right)^{1/n}}$$

Unweighted average of the long-term price relatives (current /base period price)

For the same (matching) set of varieties.

= ratio of geometric avg. prices in current period to geo. Avg. prices in base period.

CONSUMER PRICE INDEX

Coverage (data characteristics)

- **Definition:** Consumer Price Index (CPI) measures the changes of the current retail prices of goods and services purchased by consumers over a given time period.

- 2003 based CPI is aimed to calculate the inflation rate by using the change of the prices of goods and services existed in the market.

- For this purpose, expenditures of households, foreign visitors, constitutional population and all of the final monetary expenditures are taken into account. This concept left the owner occupied housing and expenditures from household production out of the coverage from the consumption expenditures.

Coverage (data characteristics)

- **Classification:** In determining the weights and calculating the index, Target Based Individual Consumption classification (COICOP) is used and according to this classification expenditures are organized in 43 sub-groups and 12 major groups. 415 commodities are used in the compilation of the index.
- **International and regional guidelines:** There are no important differences between Turkey's methodology reported by EUROSTAT and relevant international or regional standards.

Coverage (data characteristics)

- **Sources of weights:** Continuous Household Budget Survey conducted by the Turkish Statistical Institute (TURKSTAT) yearly 13248 private households of all socio-economic groups (3-year total data are used), tourism survey, constitutional population expenditure survey and administrative records.

- **Time period of current weights:** From January (t-4) to December (t-2) (1/3 from (t-4), 1/3 from (t-3), 1/3 from (t-2)).

Coverage (data characteristics)

Transactions coverage:

In 2003=100 based CPI, all of the final monetary consumption expenditures made for the consumption of goods and services in the domestic markets are taken as bases.

In the index 225 district centers consisted all of the 81 city centers are included. 408093 prices are compiled from 27886 outlets in a month and 4281 tenants are included in the scope of the index. Number of outlets and prices can change during the year because of seasonality.

Coverage (data characteristics)

- **Population coverage:** Index coverage of the population is the whole population of Turkey without any groupings according to income level or geographical areas.

- **Geographical coverage:** All of the final domestic monetary consumptions of the households, foreign visitors and constitutional population are taken into account.

Coverage (data characteristics)

- **Price Coverage:** Price coverage of index is constituted of purchasing prices. The prices of goods and services included within the index are retail prices including taxes but excluding any deposits and installments.

- Item baskets and the weights are updated at the end of every year and chained with the Laspeyres formulation. Every year in December new goods and services are added in the basket, goods and services which lost their importance are taken out and renewed weights are used in the calculation of index.

Coverage (data characteristics)

- Index is calculated by dividing current prices to the prices of previous December, which is "new price reference period (p_0)", and then chained by multiplying it with the index numbers of December.
- $I = w \cdot P_i / P_o * 100$
- I : index
- P_i : current price
- w : weight
- P_o: base year price

❖ $I_t = w_I \cdot P_{it} / P_{December(t-1)} \cdot I_{December(t-1)}$

❖ w_I : new weight

❖ t : time

Geometric average is used for the computations of commodity prices from commodity

Coverage (data characteristics)

- **Sources:** Household Budget Survey, Constitutional Population Expenditure Survey, Tourism Survey and administrative data.

- **Processing system:** Prices of fresh fruit, vegetables, fee paid for watching sport games (football), LPG, tube gas, jewelry (gold) and 15 specific items are collected once a week; other prices are collected twice a month, rents are collected once a month. Prices of petroleum products and gold are collected on daily basis.

Coverage (data characteristics)

- **Processing site:** Turkey's Consumer Price Index data are processed only by the Turkish Statistical Institute.
- **Seasonal adjustment:** Data are not seasonally adjusted.
- **Geographical detail:** Available in detail of 26 regions (Nomenclature of Territorial Units for Statistics 2 Level).

PRODUCER PRICE INDEX

Producer Price Index

PPI Approaches:

Output Producer Price Index

A measure of the change in the prices of goods and services sold as output by domestic producers. Covers both output sold on the domestic market and output sold as exports.

Producer Price Index means Output Producer Price Index unless otherwise indicated.

Input Producer Price Index

A measure of the change in the prices of goods and services bought as intermediate inputs by domestic producers. Covers both domestically-produced intermediate inputs and imported intermediate inputs. Valuation is at **purchasers' prices.**

Producer Price Index

Historical development of PPI in Turkey

1981

1987

Wholesale Price Index (WPI)

1994

2003

Producer Price Index(PPI)

2014

Domestic Producer Price Index (DPPI)

Non-Domestic Producer Price Index (DPPI)

Producer Price Index

PPI Coverage

Geographical coverage

- All country

Sector / product coverage:

B- Mining and stone quarrying

C- Manufacturing industry

D- Electricity and gas

E- Water.

Producer Price Index

Numerical Information Related To Domestic PPI-Scope

Main sectors	Number of Products (CPA)	Number of Enterprises	Number of Prices
Industry	**677**	**5 303**	**14 298**
Mining and stone quarrying	22	222	400
Manufacturing	652	5 041	13 762
Electricity and gas	2	2	2
Water supply	1	38	134

Producer Price Index

To calculate the index:

- I. Item basket
- II. Classification
- III. Weights
- IV. Base and current period prices

Producer Price Index

Classification

Index structure is based upon:

1. Statistical Classification of Economic Activities in the European Community (NACE)

2. Statistical Classification of Products by Activity in the European Economic Community (CPA)

Producer Price Index

Classification:

Code	Description	Level
PPI	General Index	Level 0
C	Manufacturing	Level 1
10	Food products	Level 2
10.7	Bakery and farinaceous products	Level 3
10.71	Bread; fresh pastry goods and cakes	Level 4
10.71.11	Fresh bread	Level 6
10.71.12	Fresh pastry goods and cakes	Level 6

Producer Price Index

Weight Resources

- The main sectors sales values and sector weights are obtained from National Accounts Group.
- To be able to get the products and product groups, weights;

1. Industrial production and Turnover Data,
2. Annual Industry Product Statistics,
3. Administrative registration (Ministry Of Industry And Tecnology , Ministry Of Treasurey and Finance) are used.

The weights of the items and the firms are updated every year.

Producer Price Index

Domestic PPI Weights (2021)

Main sector	Weight
B-Mining and quarrying	3.51
C-Manufacturing	87.27
D-Electricity, gas, steam and air conditioning	8.38
E-Water supply	0.85

Producer Price Index

Item weight calculation formula;

$$w_i = \frac{p_0^i q_0^i}{\sum_{i=1}^{n} p_0^i q_0^i} x100$$

p_0 : Base period Price
q_0 : Base period quantity
w : Weight
n : Total item variable number
i : Item

Producer Price Index

Prices:

Domestic PPI Excludes:

- Indirect taxes (VAT, EXCISE DUTY etc.),
- Retail and wholesale margins,
- Transport and insurance costs are **not** included.

Producer Price Index

Prices

For both current and base prices the rules are:

1. The appropriate price is the basic price that excludes value added tax (VAT) and similar deductible taxes directly linked to turnover if there are any subsidies, should be added.

2. If transport costs are included, this should be part of the product specification,

3. In order to show the true development of price movements, it should be an actual transaction price, and not a list price,

4. The price collected in period t should refer to orders booked during period t (moment of order), not the moment when the products leave the factory gates,

Producer Price Index

Prices

PPIs are intended to measure a pure price change.

item specification should be drawn up in great detail or prepared on a relatively broad basis

Physical product specification

Transaction *specification*

Producer Price Index

Prices

- Base price is the price which is compared to the current price.
- The Domestic PPI's base prices of the current period is the previous December average prices.
- We take the arithmetic average of the prices of 5-15-25th day of the month.

Producer Price Group

Missing Prices

In case of *temporarily* missing prices prices are imputed. In case of temporarily missing observations one of two actions may be taken.

- Carry forward the last observed price.
- Impute the missing price by the average price change of the prices which are available in the elementary aggregate.

Carry forward should not be used unless there is clear evidence that the price would remain constant.

Producer Price Index

Sampling

Two approaches are available:

1. First selecting the observation units; then selecting the products and transactions to be priced for each of the observation units already selected.

2. An alternative approach involves first selecting products; then selecting the observation units who produce the products already selected, and identifying the transactions to be priced.

Producer Price Index

Sampling

Turkish practice:

- According to sales value in a product group, enterprises dominate at least 80% of the market are sampled.

- Judgemental sampling is used for some large groups. Product/transaction selection is made by the reporting enterprise.

Producer Price Index

Reference Period

Index reference year: 2003

Weight reference period : y-2 ➔(e.g. 2019 for 2021)

Price reference period : December of y-1
(e.g. December of 2020 for 2021)

Producer Price Index

Dissemination

- Results of the PPI are announced to the public in the 3rd day or consequent working day of the month at 10:00 with a news bulletin.

- The data are disseminated simultaneously to all interested parties through a database and news bulletin.

  http://www.tuik.gov.tr/PreTablo.do?alt_id=1076

Producer Price Index

PPI Uses in Turkey

- Estimation of inflation (CPI)
- Deflator
- Rental aggrements
- Revaluation rates
- Determination of some tax rates
- Updating procurement of value contracts
- Other escalation procedures

Producer Price Index

Index Aggregation Formula

Weights and coverage are updated every year.

Lowest level indices: Weighted arithmetic average of price relatives.

$$I^{t/0} = \sum_{i} w_i * \frac{P_i^t}{P_i^0} * 100$$

Producer Price Index

Sample CPA calculation:

CPA-6	Product	Weight	p5	p15	p25	Avg. Of 5-10-15	Avg. P0	Index
10.71.11	1	30	5	3	8	5.33	5.00	106.67
10.71.11	2	10	3	4	3	3.33	3.50	95.24
10.71.11	3	20	6	4	5	5.00	4.00	125.00
10.71.11	4	15	6	4	6	5.33	5.00	106.67
10.71.11	5	25	3	5	4	4.00	3.00	133.33

Weighted Index for 10.71.11

$$I^{t/0} = \sum_i w_i * \frac{P_i^t}{P_i^0} * 100$$

=(106.67*30+95.24*10+125.00*20+106.67*15+133.33*25)/100=**115.86**

Producer Price Index

Index Aggregation Formula

- Index Formula: Chained Laspeyres

$$I^{i}_{0:y(m)} = I^{i}_{0:t-1} \cdot I^{i}_{Dec(t-1):t(m)} / 100$$

$I_{0:t}$: index of current month
$I_{0:t-1}$: the last index (Dec.) of ref. year
$I_{dec(t-1):t(m)}$: Dec (t-1)=100 index of current month
i : index level (product, class, etc.)

Thank You…