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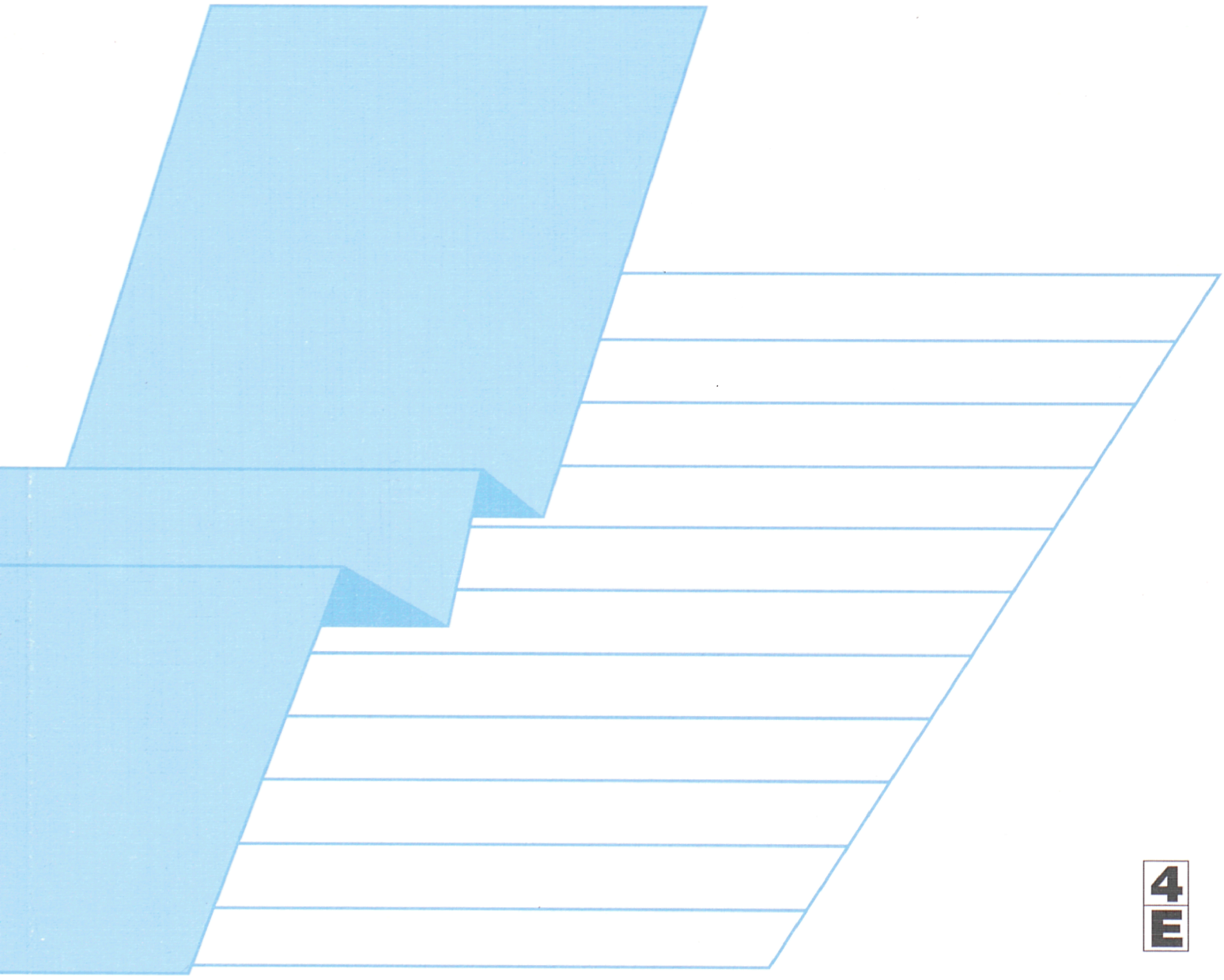
METHODOLOGICAL ASPECTS OF CONSTRUCTION PRICE INDICES



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Y. Franchet
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Y. Franchet
Director-General

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Y. Franchet
Directeur général

METHODOLOGICAL ASPECTS OF CONSTRUCTION PRICE INDICES

Theme
Energy and industry
Series
Methods

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STATISTICAL DOCUMENT

A great deal of additional information on the European Union is available on the Internet.
It can be accessed through the Europa server (http://europa.eu.int).

Cataloguing data can be found at the end of this publication

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FOREWORD

The European single market is in force and Europe has arrived at the doorstep of monetary Union; the need to have harmonised European statistics becomes more and more pressing. The draft regulation on short-term indicators, which will soon be adopted, comes within the scope of the actions carried out by Eurostat to improve the comparability of statistics. To prepare the implementation of this new regulation, Eurostat is organising a series of seminars to clarify the concepts and to understand the data collection and calculation methods used for short term indicators. This will help users in their interpretation of the data.

The first of these seminars took place in Luxembourg on 21 and 22 February 1996 and covered construction price indices. This publication is the result of the work undertaken in that seminar where the methodological aspects connected with construction price indices were discussed in detail. This publication has been made possible by the contributions of the experts from many European countries who took an active part in this seminar and who enriched it by the presentations they gave and the comments they made.

This publication contains a documentation of the collection and calculation methods of the construction price indexes in several European countries. The methodologies used by Denmark, Germany, Spain, France, Italy, the Netherlands, Sweden, the United Kingdom and Switzerland are described in detail. This work also includes the definitions proposed by Eurostat for the various types of construction price indexes as well as a precise description of the terminology used in this field.

INDEX

I. Definitions

1. Introduction

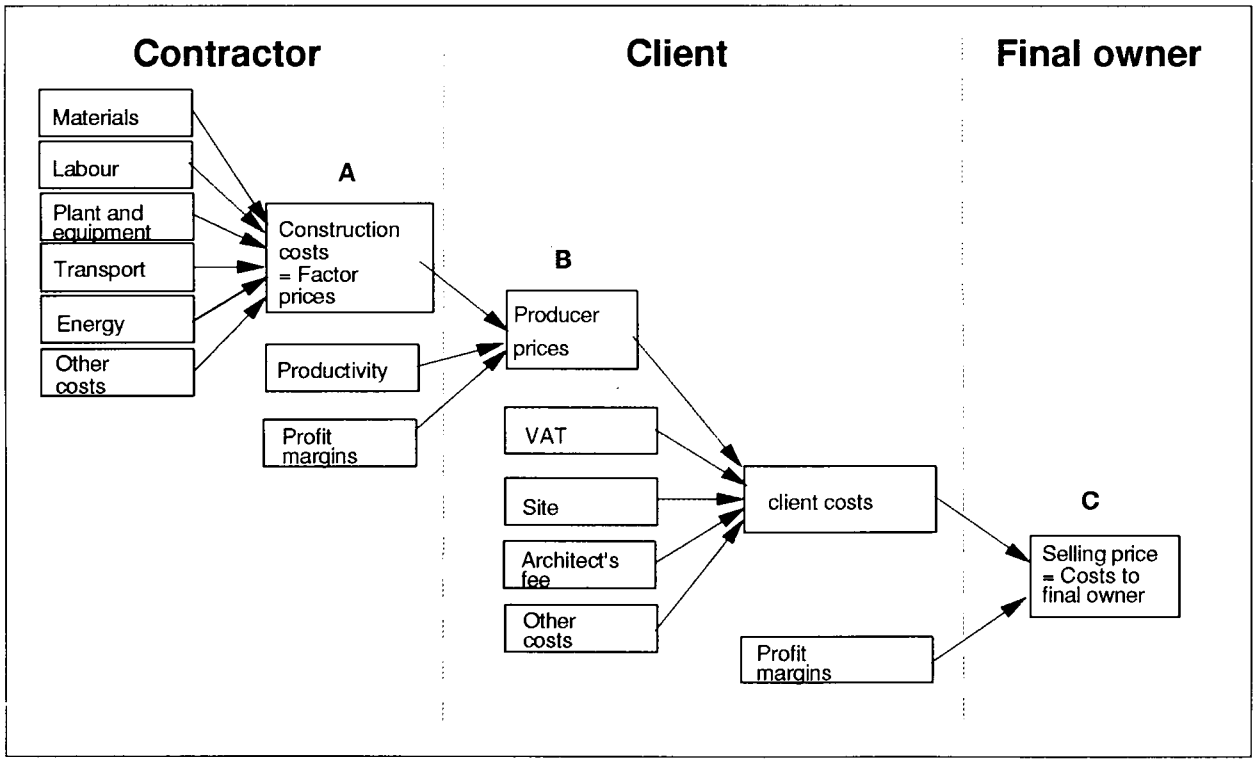
The terms 'Cost index' and 'Price index' are frequently used in the construction industry and are open to confusion. Some clarification of the two is needed.

In the context of this publication, construction is defined according to Division 45 of NACE Rev.1. It covers the following activities: site preparation, construction of building or civil engineering structures, installation and finishing work, and the hire of construction plant and equipment with operator. It comprises new work as well as repair and maintenance work.

Different agents are involved in the process of building a road, a house, a bridge:

- the architect or the engineer,
- the material suppliers,
- the contractor,
- the client, ...

The terms 'Input price' and 'Output price' have different meanings according to the point of view of the agent concerned. In the remainder of this publication, the terms 'Input price' and 'Output price' will be considered **from the point of view of the contractor**, for the actual construction process lies in his hands.



Economic theory tells us there are three factors of production: labour, raw materials and capital. A true cost index should take account of these three factors. In practice, because of data availability, account is only taken of labour and materials. Profits (the return on capital) are included in indices of producer prices. From a theoretical point of view the difference between price indices and cost indices should point to gains in productivity. But in practice it is very difficult to observe such differences on the basis of what can in fact be measured.

2. Input price index

2.1 Definition

The **Input price index** measures the evolution of the prices of the factors employed in the activity of construction. These factors are, among others, materials, wages and salaries, plant and equipment hire. In certain countries this index is also called the "Factor price index". It does not include architects' fees or the cost of the site. It includes neither variations in productivity nor any profit margin. It corresponds to item **A** in the previous diagram.

The aim of such an index is to follow changes in costs incurred in the construction process. It is principally of interest to building and civil engineering contractors, and is used to update contracts between contractor and client.

A construction cost index will measure the movements in the costs incurred by the contractor/producer carrying out the construction work, i.e. costs of labour, materials and plant and overheads, *together with an adjustment for changes in productivity*. Such an index is very difficult to obtain. For this reason, in the remainder of this publication we will use the terms input price index and construction cost index as synonyms.

2.2 Elements included in the input price index

Input price indices show the evolution of prices paid by the contractor for the different factors that are used in the construction process. Nevertheless there are differences between the available indices in the EU Member States. These differences concern both the elements included in the index (materials, wages, equipment, transport, overheads, ...) and the coverage. (See Table I in chapter IV: Annex).

2.3 Methods

The input price indices are in general calculated from other indices already available from different sources: PPI for the materials, collective agreements for wages and salaries, etc. (See Table II in chapter IV: Annex).

2.4 Use

The input price indices are used for regulating contracts. They are principally of interest to contractors. Their evolution may have an impact on large amounts of money. This is the reason why they are often calculated and published by an official institution whose neutrality is recognised by both sides.

Composite input price indices are less often used than the indices of the different elements: material, labour, ...

3. Output price index

3.1 Definition

The **Output price index** shows the evolution of actual prices paid by the client to the contractor to carry out the construction process. This index takes into account not only the evolution of prices of the factors employed in the construction process but also all changes in productivity and contractor's profit margin. It does not include architects', engineer's or legal fees, VAT or the price of the land. It corresponds to item **B** in the previous diagram. Prices collected should be net of discounts.

It has to be highlighted the importance of collecting the **actual** prices paid, in the reference period, by the client to the contractor. If the prices obtained to calculate the output price index correspond in fact to those used in tenders and the variation of prices clauses (VOP) are not included, then one should call these indices 'Tender price indices'. The use of these indices as output price indices is just an approximation.

3.2 Methods

Different methods are used to compile output price indices. The following will be explained in detail:

Decomposition based methods

The results of a construction activity, roads, buildings, etc. are complex products. As a consequence some methods for calculating the prices of these objects are based on the decomposition of their construction process into "standard operations". The price evolution of these "standard operations"[1] is monitored across time and aggregated in order to obtain indices for different types of buildings. If the decomposition is made "a priori" we speak about the **component cost** method. The **schedule of prices method** is based on a decomposition made "a posteriori".

Hedonic methods

Other Member States use the **hedonic method** to calculate the output price index. In this method prices are calculated from a regression formula that takes into account different variables that have been shown to determine the price of the final product. For example the size of the dwelling, the number of extra bathrooms, the depth of the basements, the region where the dwelling is located, ... These variables may vary from country to country.

3.3 Level of detail

A distinction should be made between prices for new work and for repair and maintenance. Different evolution of prices for new work and repair and maintenance can be expected due to different reasons:

- "repair and maintenance work" is an expanding sector
- competition conditions between enter prises working in the "repair and maintenance sector" may be different that found in the "new work" sector

Most of the EU Member States that collect output price indices cover new residential buildings. Other types of construction works (non-residential buildings, civil engineering works) are only covered by a small number of Member States. Few countries calculate or try to calculate output price indices for repair and maintenance work.

3.4 Use

Output price indices are used to deflate the value of output figures. They are also used as a short term indicator to show the evolution of prices.

1) See Glossary in chapter V: Annex.

4. Selling price index

This index (item **C** in the diagram) measures the evolution of the prices paid by the final owner of the output to the client. This type of index is used by social policy makers.

II. Input Price Indices

⇒ Denmark

⇒ Italy

⇒ The Netherlands

⇒ Sweden

DENMARK

Input Price Indices

Helle Månsson and Erik Nielsen,
Danmarks Statistik

1. Regulating price index for residential construction

1.1 Historical background

Denmark's tradition of regulating indices for construction costs goes back to the beginning of the century. The first index was published in 1920 with 1914 as the base year. The types of building which have featured in the variable index each reflect different aspects of changes in society and in the construction activity and technology associated with them.

Since the first index, Danmarks Statistik has compiled new indices at various times, partly as a result of experience gained and partly with a view to reflecting the current situation in housing construction more accurately.

2. The current regulating index for residential construction

2.1 Basis

The current index is based on a very specific type of building, "Mølholm", a compact, low building constructed as terraced housing on one or two levels.

This building was selected after a detailed analysis undertaken jointly by the Ministry of Housing, the Budget Department, the National Building Agency, the Monopolies Control Authority, the National Association of Housing Associations and Danmarks Statistik, because it met basic conditions with regard to type of housing, building technology, the choice of materials, etc. In most respects, the building was representative of the prevailing construction technology and up-to-date in its selection of materials etc.

The building work, which was completed over the period 1984-85, was divided up into contracts awarded on a trade-by-trade basis, the following being included in the calculation basis for the current index:

- concrete work/subgrade
- concrete slab work
- bricklaying
- carpentry
- joinery
- painting
- heating, sanitation etc.
- plumbing
- electrical installations
- fixtures.

For two items, it was decided to work out a separate index, as follows:

- Heavy concrete slabs. The type of building work selected did not use heavy concrete slabs to the extent expected nowadays. This index is solely a materials index.
- Glazing. The tendency was and is for glazing work seldom to be included as a separate contract in new construction work, since prefabricated windows etc. are often used. For renovation work in older housing, however, glazing is often a separate contract.

The basis for the weighting of the index's contractual components was the amounts paid for the different contracts.

The index is an input price index, and does not include expenditure on the acquisition of land, architects' fees, planning or mark-ups. For certain specialised contracts such as roofing, it was decided to use an alternative to the type of building selected. In the current building the roof is made of asbestos cement corrugated plates, and because since it was considered that these plates were on the way out in the building industry, the index was calculated using cement roof tiles.

Extremely detailed returns were produced for both materials components and labour costs of the various technical indices.

In all, the specifications for the index's calculation base include:

- information on materials:
    - general discounts included;
    - VAT excluded;
    - special discounts excluded;
- information on wage elements:
    - contractual wages;
    - schedules of wages (hourly rates for certain types of work such as the installation of kitchen units and of hand-basins in bathrooms, etc.);
- information on social expenditure, i.e. the social benefits which the employer has to pay for as part of payroll costs and which in practice are calculated as a percentage addition to wages:
    - daily sickness benefits and payments to pension schemes;
    - insurance (industrial accident insurance in particular, which is of considerable importance);
    - environment and safety;
    - training.

2.2 *Sources of information*

For the index, various professional cost accountants were contacted via branch organisations etc. At present, there are two accountants for each trade contract, reporting on the following every quarter:

- agreements;
- prices of materials;
- general discounts;
- social contributions;
- insurance;
- environmental/safety requirements;
- measuring principles;
- general developments in the industry.

One of the reasons for selecting professional cost accountants as "respondents" is that they are considered to be "neutral" and at the same time to have detailed knowledge of their specialised area, including relevant agreements and changes. This last point in particular - general developments in a given area - is crucial, since in this way Danmarks Statistik collects information on forthcoming changes, etc.

2.3 *Periodicity*

Information on prices and wages, including social contributions, is collected quarterly for the first day of the relevant month. It generally takes six weeks to publish the information collected.

2.4 *Non-response*

In practice, there are no non-responses, since all the reporting is done by professional cost accountants.

2.5 Cost of compiling the index

The costs vary each quarter, since respondents are paid by the hour. Where there are new agreements, changes in measuring principles, etc. expenditure is often higher than usual. The approximate annual cost of compiling the index is shown below:

Expenditure:
- cost accountants' wages: DKR 130 000
- hours worked in Danmarks Statistik: DKR 130 000

Income:
- postcard sales DKR 65 000

Net expenditure: DKR 195 000

2.6 Type of index

The index is a Laspeyres-type.

2.7 Revisions/problems

The index is revised from time to time for various reasons such as changes in the measurement principles, new respondents or the use of different materials - a case where it is essential to assess the extent to which quality/performance has improved or to decide where one material has simply been substituted for another.

2.8 Problems

The fact that the index for residential construction is based on a single building type raises certain questions: how can it be used as a regulatory factor for other types of building? At the time when the index was established, experience with the indices used up to that point for single-family houses and high-rise buildings had shown that the two moved in parallel over the longer term. The fact that two technically different types of building were used was therefore considered to have little effect on changes in the aggregate index. At the same time, the introduction of a single index avoided one problem arising from the fact of having two indices, namely deciding which of the two indices price regulation should be based on when the building in question could not be clearly defined as either a single-family type of house or a high-rise building.

For how long can a given building be used as a basis for the regulatory index? One crucial problem with the present index is that it will become outdated within a very short time for reasons such as:

- changes in materials technology (new types of material and forms of production);
- changes in systems technology (e.g. heating systems);
- changes in construction techniques (scaffolding work);
- changes in environmental/energy requirements on building sites (e.g. waste treatment and disposal) and in buildings (e.g. insulation, recycling of water);
- general standards (ceiling heights, selection of materials, insulation);
- productivity development.

The conclusion is therefore that the type of building on which the index calculation is based should be replaced by a newer type within a few years.

2.9 User group

The index has a wide range of users such as:
- contractors (regulation of contracts);
- craftsmen (regulation of contracts);
- lawyers managing building rentals (e.g. the regulation of housing rents);
- local authorities (budgeting, the regulation of housing rents and rental contracts, etc.);

- ministries and agencies (budgeting, the regulation of rental contracts, etc.).

In addition, sales of postcards giving index information are increasing. There are currently around 350 businesses/institutions on the subscription list for quarterly data.

3. Cost index for civil engineering works

3.1 Purpose and background

This index aims to shed light on changes in costs incurred by contractors and clients. It is defined as an input price index.

The cost indices for civil engineering works (six in all) are compiled primarily because they were requested by the Roads Directorate (a department of the Ministry of Transport), which wanted a method of regulating estimates and authorisations for road construction.

The indices have gradually come to be used by other contractors and clients to regulate contracts for other forms of civil engineering work.

Which indices? There are six all together:

1. Construction cost indices for:
- trunk roads;
- motorways;

2. Regulating price indices for:
- earthworks;
- asphalting;
- concrete structures;
- steel structures.

The first of these two groups of indices has been calculated and published since 1959 and the second since 1976.
As at the end of March 1996, the construction costs indices for motorways and main road works were replaced by a single index of road construction costs. At the same time, 1995 became the new base year for all indices.

3.2 Calculation method

All indices are basically calculated in the same way and are of the Laspeyres type, i.e. they have fixed weights.

The key index components are:
- materials prices;
- wage costs;
- lorry journeys.

For all the components and parts of components, separate index values are calculated and a weighted average produced to give an overall index.

The weighted average is based on weights agreed between the Roads Directorate, DSB [Danish railways], the Contractors' Association and Danmarks Statistik. They are based on certain standard constructions already erected/calculated for civil engineering works, with associated subcontracts.

There are no seasonal adjustments.

3.3 Materials' prices

The various prices for materials are based on information collected for use in the calculation of the wholesale price index.

The price concept used here is producers' selling prices excluding VAT and excise duties but including customs and import duties. Cash discounts normally granted are not taken into account.

No price information is collected for the materials used in civil engineering work as a whole, but selected, key representative goods are used, i.e. goods which are typical of a given group.

Source: Danmarks Statistik.

3.4 Wage costs

These are defined for specific types of work and are based on wages fixed by agreement.

The following points should be noted:

- payroll expenditure includes the employers' "social expenditure" such as holiday pay and various fixed bonuses and insurance;
- mark-ups etc. are not included;
- expenditure on expropriation, administration and planning is not included, either (except in the index of construction costs for motorway work, where administration and planning costs are included).

Source: Agreement for North Zealand, zones 1 and 2, and the provinces, concluded between the Contractors' Association and the SID [General Union of Workers].

3.5 Lorry journeys

Journeys, including driver, with lorries normally used for this type of work have been selected to represent the general machine work involved in civil engineering.

Source: Danish Haulage Contractors' price schedule for the provinces.

3.6 Data collection

The data is collected either via Danmarks Statistik's own publications (wholesale price index) or via publicly-available figures from trade and branch organisations.

The most frequent problems are of timing and may occur in connection with renewals of agreements etc. But thanks to good cooperation with the relevant organisations, the problems are generally solved.

3.7 Costs

These indices do not involve any external costs. Internal costs for production and publication are estimated at around DKR 40 000.

It is very difficult to estimate income from publications etc. since such income is not shown in separate accounts. It by no means covers costs, however.

3.8 Publication

The indices are published quarterly, normally 5 to 6 weeks after the period to which they refer. They appear in both hard copy and electronic form.

Only total indices are published, but interested parties may obtain information on sub-indices and the weighting basis on application to Danmarks Statistik.
As a service for our users, the indices are published both with and without daily allowances for sickness (calculated as an average maximum absence during the period in question).

3.9 Revisions

Three types of revision may be made:

1. previously published series are revised if errors are discovered;
2. the weighting basis and representative goods used are changed at irregular intervals when all parties agree that the existing basis no longer reflects reality;
3. very occasionally, there may be revisions in the kind of index calculated.

An additional index for road repairs and maintenance may be produced in the future.

Danmarks Statistik supplies specially-produced indices for special, large-scale contracts such as those connected with the construction of the Øresund bridge.

ITALY

Construction Cost Index Numbers in Italy

Giuseppina Galante and Sylvain Romano, ISTAT

1. General

1.1 Introduction

The National Statistical Institute calculates the construction cost index numbers for:

- residential buildings (since 1967)
- buildings for industrial use (since 1977)
- highways (since 1977).

The latter two indices were introduced to consolidate the first one and to increase information on cost trends in two other important sectors of construction, i.e. industrial buildings and public works.

1.2 Frequency

The frequency of the index is monthly for residential buildings and quarterly for the other two, on the basis of the middle month of each quarter (February, May, August and November).

1.3 Significance

All three types of index measure the variations over time of the direct costs involved in the construction of a residential building (for the first index), an industrial building (for the second index) and a road (for the third index). They do not, therefore, include the cost of land, planning, or job management, advances of capital, company profit or the cost of connections to the various services (cost of installing production plant).

Consequently, these indices are not price indices, but rather indices of the costs relating to the inputs of goods and services purchased from industries outside the building sector, and to the labour employed at each stage of construction.

Since prices are affected mainly by costs, cost trends may, over a period of time, indicate those of the price of the product.

2. Residential buildings

2.1 Characteristics

The formulation of the index for the costs of labour, materials and transport and hire services used by the building industry requires the definition of a "product" whose technical characteristics (quality and quantity of the materials and services used) are kept constant over time.

The "product" is represented by a standard residential building, the technical and construction characteristics and dimensions of which were supplied by the Associazione Nazionale Costruttori Edili (ANCE). (See Annex 1: technical drawings).

The typology of the building comprises mixed constructional methods (traditional and prefabricated). The building is of a residential type, of entirely new construc-

tion, and is built by a small or medium-sized enterprise. It consists of three blocks connected by a single service staircase and contains 15 apartments.

2.2 Sources

The prices and costs of the elements necessary for the formulation of the index are recorded in the 20 provincial capitals under consideration:

- for labour, directly by the Institute;
- for materials, by the Statistical Offices of the Chambers of Trade;
- for transport and hire costs, by the Regional Public Works Offices.

2.3 Methodology

The general indices both for the provincial capitals and at national level are broken down into:

- group
- category, and
- elementary indices (see Annex 2).

The elementary provincial index of each cost item is obtained by dividing the price or cost of the current month by that of the base year.

The elementary indices are aggregated using weightings equal to the incidence of each cost in the overall building cost encountered in the province.

The weightings for transferring provincial capital indices to national indices are obtained on the basis of the values of investments in residential buildings in each region in the three-year period 1988-1990. (See Annex 3: Weightings).

The Laspeyres formula is used to calculate the aggregates.

3. Buildings for industrial use

3.1 Characteristics

A "standard building" is also defined for this index. Its characteristics are set out in the relevant plan provided by the Ministry of Industry, Commerce and Crafts in conjunction with the Associazione Nazionale Costruttori Edili (See Annex 4: technical plan).

The "standard building" has the following dimensions: 40x50 m, equal to a roofed area of 2 000 m^2.

3.2 Sources

The prices and costs of the items necessary for the construction of the building are recorded in each of the 20 provincial capitals considered:

- for labour, directly by the Institute;
- for materials, by the Statistical Offices of the Chambers of Trade;
- for transport and hire costs, by the Regional Public Works Offices.

3.3 Methodology

The methodology used for the calculating the indices is the fixed base methodology with constant weighting worked out using the Laspeyres formula.

The general indices both for the provincial capitals and at national level are broken down into:

- group
- category, and
- elementary indices.

The elementary indices are aggregated using weightings equal to the incidence of each

cost in the overall building cost encountered in the province.

The weightings for transferring provincial capital indices to national indices are obtained on the basis of the values of investments in non-residential buildings for industrial purposes in each region in the three-year period 1988-1990. (See Annex 5).

4. Highways

4.1 Characteristics

The index is calculated for two stretches of road of mixed type - without tunnel and with tunnel - each with a length of 100 m.

The technical/constructional characteristics of the two stretches of road were determined in conjunction with the Azienda Nazionale Autonoma delle Strade (ANAS) at the time of the 1980 base indices. They refer to class D/1 of the standards of the National Research Council:

- Design speed: 80-100 Km/h;
- Gradient: limited to 4%-4.5%;
- Curves: minimum radius R = 250m;
- Carriageway: 7.5 m consisting of two lanes of 3.75 m each.

4.2 Sources

The hourly labour costs are recorded directly by ISTAT.

The prices of materials and transport and hire costs are recorded by the Regional Public Works Offices.

4.3 Methodology

The methodology used for calculating the summary indices is the fixed base methodology with constant weighting worked out using the Laspeyres formula.

Various specific indicators were formulated for four types of road:

- Open air road on embankment;
- Open air road in cutting;
- Road on viaduct;
- Road in tunnel;

and for five categories of labour:

- movement of materials (earth and rock excavations)
- civil engineering works (foundation excavations)
- underground jobs (tunnelling excavations)
- miscellaneous jobs (support works)
- superstructures (roadway foundations).

The costs of the items necessary for the construction of the various types of roadway are recorded in each of the 20 provincial capitals.

The elementary indices are determined for each item for each provincial capital. They are aggregated by applying various weightings to the costs and prices of the elements used in road construction according to the proportions used for each type of road and category of labour.

The weightings for transferring elementary indices to national indices are obtained on the basis of the ratio of partial costs to the total for work carried out in the base year 1990, broken down by typology and category of labour. (See Annex 6).

4.4 Nature of prices

For all three indicators for the construction sector, the hourly labour costs (supplied by ISTAT's employment and income department) are calculated according to the national contract for workers in the industry.

including any provincial contracts, additional allowances and social charges.

The prices of the materials exclude VAT and discounts. The transport and hire costs are considered on a "hot" basis, i.e. with the machine in operation and therefore including the costs of fuel, electricity and the services of the operator.

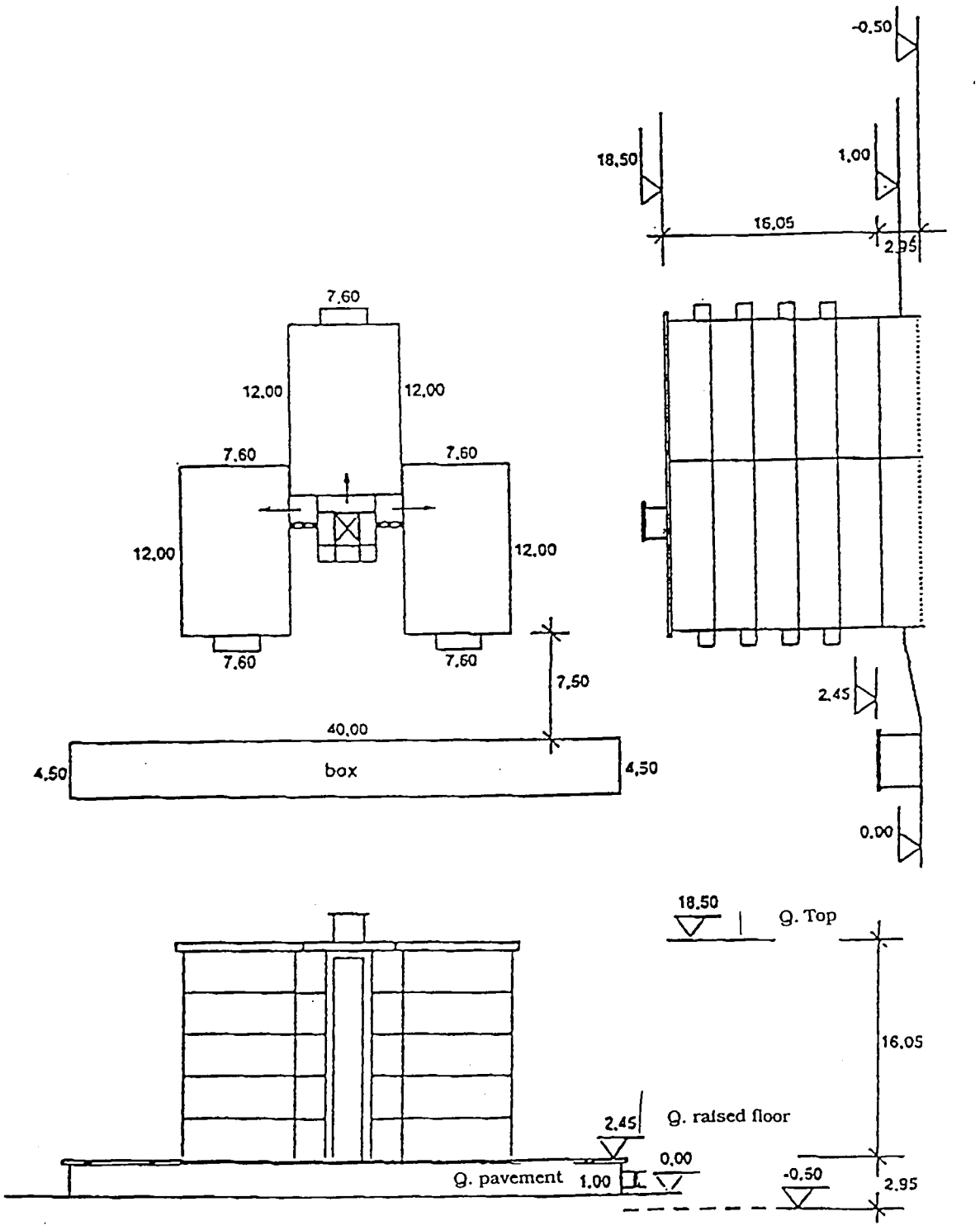
4.5 Progress of the survey

At present the base year for all the indicators is 1990.

The base year is currently being changed to 1995 for the survey on residential buildings.

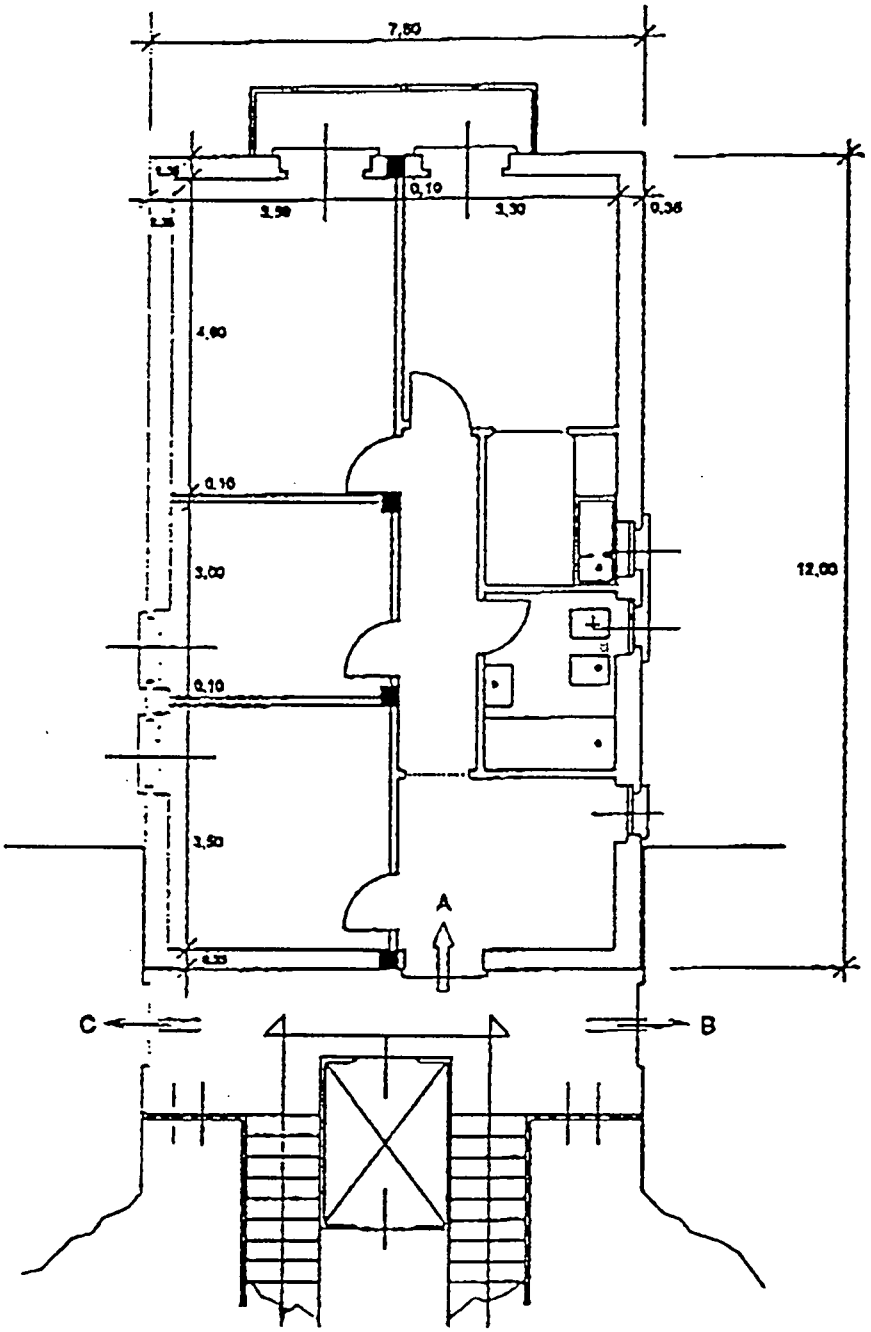
Annex 1

Residential building



Annex 1a

Standard housing unit



Annex 2

Groups, categories and products considered in the composition of the general indices

GROUPS - **categories** - products

LABOUR:
- **Specialised worker**
- **Skilled worker**
- **Labourer**

MATERIALS:
- **Inert materials:**
  - Sand
  - Gravel
  - Crushed stone
- **Binders:**
  - Hydrated lime
  - Cement
  - Gypsum and derivatives
- **Bricks:**
  - Solid bricks
  - Hollow bricks
  - Hollow tiles
- **Natural stones and Marbles:**
  - Marble-granite slabs
  - Travertine:
  - 2 cm thickness
  - 3 cm thickness
  - Stone for basement
- **Timber:**
  - Softwood joists of various sizes
  - Softwood off-cuts
- **Metals:**
  - Steel reinforcing bars
  - Miscellaneous sections - Girders
  - Galvanized drawn steel pipes
  - Lead pipes
  - Manhole covers - Cast-iron items
- **Claddings and floorings:**
  - Facade claddings:
    - *of plastic material (paint)*
    - *travertine lintels*
  - Floorings:
    - *mortar slabs of various sizes*
    - *mixed cement-marble tiles and marble tiles*
    - *misc. tiles for internal walls*
- **Fixtures:**
  - Windows and window frames
  - Roller blinds, various models
  - Clear double glazing
  - Colourless wired glazing
- **Doors - Entrance doors:**
  - Internal doors
  - Entrance doors
  - Gates for basements

GROUPS - **categories** - products

- **Miscellaneous accessories:**
  - Cement articles:
    - *precompressed reinforced concrete prefabrications - sheets*
    - *corrugated asbestos lumber sheets*
  - Drainage and ventilation equipment:
    - *polyvinyl chloride (pvc) guttering*
    - *rainwater pipes*
    - *kitchen ventilation pipes*
    - *flues*
  - Paints - Colourings in general:
    - *water paints*
    - *distempers*
    - *enamel paints*
    - *lead oxide*
- **Water supply and sanitary ware:**
  - Wash-basin
  - Bidet
  - Bath tub
  - Shower
  - W.C. bowl
  - Kitchen sink
  - Mixer unit with accessories
  - Wash-basin set
  - Shower set
- **Heating equipment:**
  - Cast-iron or steel radiators
  - Individual boiler, 10,000 calories
  - Individual burner with different energy source
- **Electrical equipment:**
  - Cables insulated with various materials
  - Polyvinyl chloride (pvc) insulated cable systems
  - Equipment junction boxes
  - Flush-mounted equipment in general
  - Equipment and connections for bells and house phones
- **Waterproofing - Thermal insulation:**
  - Synthetic or bituminous sheeting
  - Polyurethane or rockwool thermal insulation
- **Lift equipment:**
  - Elevator with cabin capacity up to 4 people and engineering labour

TRANSPORT AND HIRE:
- **Hot' transport:**
  - Motor vehicle
- **Hot' hire:**
  - Wheeled or tracked excavator
  - Wheeled or tracked digger
  - Concrete-mixer
  - Jib or tower crane

Annex 3

Construction cost indices for residential buildings

Table 1
Weighting coefficients for the calculation of the group indices for each provincial capital (1990=100)

GROUPS AND CATEGORIES	TURIN	MILAN	BOLZANO	TRENTO	VENICE	TRIESTE	GENOA	BOLOGNA	FLORENCE	PERUGIA
LABOUR	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Specialised worker	28.5	28.3	28.4	28.7	28.4	28.4	28.3	28.3	28.4	28.4
Skilled worker	47.2	47.2	47.1	47.2	47.2	47.2	47.2	47.2	47.2	47.1
Labourer	24.3	24.5	24.5	24.1	24.4	24.4	24.5	24.5	24.4	24.5
MATERIALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Inert	6.0	8.3	4.6	6.7	7.7	7.0	6.4	7.9	5.9	7.0
Binders	9.4	8.7	7.7	8.0	8.3	9.0	9.5	9.0	7.1	9.7
Bricks	12.2	11.2	15.4	14.0	14.6	14.3	11.0	12.1	9.5	10.0
Natural stones and marbles	1.7	2.7	2.1	1.3	2.6	2.6	2.5	1.5	1.5	1.3
Timber	2.1	2.1	1.5	1.8	2.0	2.3	2.1	2.2	2.6	2.7
Metals	12.0	9.7	11.1	10.7	10.9	10.9	11.3	9.0	10.4	11.4
Claddings and floorings	9.7	6.1	9.1	8.8	8.4	7.0	7.9	9.3	8.8	7.3
Fixtures	20.5	21.8	21.7	21.5	20.3	20.7	22.7	19.8	21.2	21.8
Miscellaneous accessories	7.6	8.7	8.3	8.5	8.5	9.6	7.7	10.1	11.9	11.9
Water supply & sanitary ware	4.1	5.0	5.9	5.7	5.1	4.5	4.6	3.9	5.2	4.6
Heating equipment	6.7	7.4	5.1	5.2	4.8	4.9	6.8	6.3	6.7	5.2
Electrical equipment	0.9	1.3	1.2	1.3	0.7	1.0	1.0	1.3	1.0	0.7
Waterproofing - thermal insul.	4.5	4.0	3.2	3.3	3.1	3.1	4.3	4.8	5.2	3.3
Lift equipment	2.6	3.0	3.1	3.2	3.0	3.1	2.3	2.8	3.0	3.1
TRANSPORT and HIRE	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Transport	2.7	4.5	4.8	3.4	3.1	2.9	3.5	5.3	7.0	3.3
Hire	97.3	95.5	95.2	96.6	96.9	97.1	96.5	94.7	93.0	96.7

GROUPS AND CATEGORIES	ANCONA	ROME	L'AQUILA	CAMPO-BASSO	NAPLES	BARI	POTENZA	REGGIO CALABRIA	PALERMO	CAGLIARI
LABOUR	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Specialised worker	28.5	28.3	28.4	28.2	28.3	28.4	28.7	28.2	28.3	28.3
Skilled worker	47.1	47.1	47.1	47.2	47.2	47.2	47.0	47.2	47.2	47.1
Labourer	24.4	24.6	24.5	24.6	24.5	24.4	24.3	24.6	24.5	24.6
MATERIALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Inert	5.2	8.6	4.7	5.4	5.3	5.2	4.8	5.1	4.4	7.5
Binders	7.6	7.8	9.6	9.5	6.8	10.3	9.5	7.2	9.5	10.2
Bricks	13.5	10.9	9.3	13.7	11.7	13.6	12.7	14.2	13.2	12.2
Natural stones and marbles	2.5	2.7	1.4	1.5	2.1	1.5	1.7	1.7	1.9	1.9
Timber	2.0	2.0	2.0	2.0	2.6	2.5	2.6	2.6	3.2	2.4
Metals	10.0	11.9	12.7	11.4	12.0	11.3	11.5	12.1	11.5	11.1
Claddings and floorings	10.5	6.9	9.3	9.9	6.8	7.8	9.6	9.6	8.6	9.7
Fixtures	19.7	20.8	20.4	19.0	22.1	18.2	20.3	18.0	19.2	17.3
Miscellaneous accessories	10.0	10.6	10.4	9.3	10.8	10.7	9.5	9.7	9.1	9.2
Water supply & sanitary ware	4.2	4.8	4.5	4.4	4.7	4.3	4.1	4.4	4.5	4.3
Heating equipment	7.4	5.8	7.0	5.8	6.4	6.1	5.3	5.5	5.3	5.1
Electrical equipment	1.3	0.8	1.1	0.9	0.8	0.8	0.9	1.0	0.9	0.9
Waterproofing - thermal insul.	3.3	3.2	4.6	4.4	4.8	4.7	4.6	5.2	5.1	4.8
Lift equipment	2.8	3.2	3.0	2.8	3.1	3.0	2.9	3.7	3.6	3.4
TRANSPORT and HIRE	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Transport	2.4	4.6	5.2	4.2	5.2	3.0	4.8	4.3	5.2	4.7
Hire	97.6	95.4	94.8	95.8	94.8	97.0	95.2	95.7	94.8	95.3

Annex 3a

Construction cost indices for residential buildings

Table 2

Weighting coefficients for the calculation of the general indices for each provincial capital (1990 = 100)

PROVINCIAL CAPITAL	LABOUR	MATERIALS	TRASPORT and HIRE	TOTAL
TURIN	48.52	40.99	10.49	100.00
MILAN	49.60	40.81	9.59	100.00
BOLZANO	49.39	41.34	9.27	100.00
TRENTO	49.59	41.08	9.33	100.00
VENICE	45.99	40.98	13.03	100.00
TRIESTE	46.08	40.58	13.34	100.00
GENOA	47.72	41.16	11.12	100.00
BOLOGNA	48.22	42.10	9.68	100.00
FLORENCE	49.78	40.08	10.14	100.00
PERUGIA	50.16	40.76	9.08	100.00
ANCONA	46.16	42.99	10.85	100.00
ROME	49.92	39.48	10.60	100.00
L'AQUILA	50.20	42.23	7.57	100.00
CAMPO BASSO	45.49	44.29	10.22	100.00
NAPLES	52.37	39.11	8.52	100.00
BARI	47.76	37.99	14.25	100.00
POTENZA	47.56	39.50	12.84	100.00
REGGIO CALABRIA	46.89	42.45	10.66	100.00
PALERMO	46.38	41.00	12.62	100.00
CAGLIARI	44.74	43.28	11.98	100.00

Annex 3b

Construction cost indices for residential buildings

Table 3

Weighting coefficients for the calculation of national indices by category of material (1990 = 100)

PROVINCIAL CAPITAL	INERT	BINDERS	BRICKS	NATURAL STONES and MARBLES	TIMBER	METALS	CLADDINGS and FLOORINGS
TURIN	57.745	69.154	62.695	50.861	57.407	69.221	76.180
MILAN	225.775	180.366	163.877	228.536	162.271	158.349	136.617
BOLZANO	9.581	8.645	10.670	5.492	7.157	9.115	10.253
TRENTO	6.999	8.906	12.517	10.128	6.263	10.098	11.341
VENICE	111.380	91.605	113.262	116.197	80.158	95.440	99.972
TRIESTE	24.835	24.268	26.984	28.301	22.895	23.200	20.275
GENOA	12.640	14.378	11.673	15.465	11.849	13.464	12.839
BOLOGNA	76.128	66.088	62.741	44.064	60.368	52.156	73.444
FLORENCE	35.982	33.188	31.392	29.638	44.597	38.327	44.165
PERUGIA	12.278	13.076	9.448	7.327	13.479	12.032	10.571
ANCONA	24.576	27.387	33.860	35.949	26.962	28.310	40.258
ROME	94.125	64.834	63.873	92.780	63.521	77.844	61.711
L'AQUILA	19.365	30.307	20.590	17.582	23.505	31.702	31.796
CAMPO BASSO	6.815	9.168	9.248	6.018	7.172	8.590	10.241
NAPLES	75.287	73.123	88.774	93.106	103.415	102.049	78.647
BARI	54.464	81.953	75.671	49.813	72.220	70.346	66.391
POTENZA	7.031	10.582	9.990	7.637	10.895	10.127	11.550
REGGIO CALABRIA	27.971	30.253	42.120	29.785	40.689	40.191	43.365
PALERMO	67.615	110.974	107.407	91.007	139.490	105.291	107.729
CAGLIARI	49.408	51.745	43.208	39.314	45.687	44.448	52.655
TOTAL	1.000.000	1.000.000	1.000.000	1.000.000	1.000.000	1.000.000	1.000.000

PROVINCIAL CAPITAL	FIXTURES	MISCELLANEOUS ACCESSORIES	WATER SUPPLY and SANITARY WARE	HEATING EQUIPMENT	ELECTRICAL EQUIPMENT	WATER-PROOFING THER. INSULATION	LIFT EQUIPMENT
TURIN	63.678	50.784	56.487	68.691	56.238	53.733	66.338
MILAN	192.491	163.656	193.934	215.734	242.781	177.905	168.147
BOLZANO	9.873	8.397	11.430	7.993	12.608	9.717	7.239
TRENTO	10.677	8.669	12.725	8.321	12.156	10.117	7.535
VENICE	95.191	85.500	106.268	75.310	67.942	94.170	70.139
TRIESTE	23.680	23.313	22.871	18.379	22.766	22.979	17.117
GENOA	14.545	10.570	12.437	14.453	12.461	9.905	13.180
BOLOGNA	61.891	67.694	54.059	65.302	83.218	57.244	71.393
FLORENCE	42.048	50.331	45.094	44.497	39.389	39.585	49.369
PERUGIA	12.440	14.558	11.601	9.912	8.159	11.736	8.968
ANCONA	29.906	32.238	27.967	37.011	42.091	28.375	23.947
ROME	73.142	79.545	74.248	67.533	55.152	74.683	53.366
L'AQUILA	27.399	29.697	26.449	31.128	30.508	26.608	29.855
CAMPO BASSO	7.726	8.125	7.899	7.770	7.403	7.537	8.542
NAPLES	101.048	105.588	94.013	95.945	74.999	93.077	105.495
BARI	60.973	77.022	62.615	68.001	52.058	65.969	74.770
POTENZA	9.592	9.593	8.501	8.251	8.281	9.113	10.327
REGGIO CALABRIA	32.153	36.955	34.955	32.491	35.740	43.291	44.695
PALERMO	94.581	95.605	96.477	87.233	94.775	116.232	119.996
CAGLIARI	36.966	42.160	40.192	36.045	41.275	48.024	49.582
TOTAL	1.000.000	1.000.000	1.000.000	1.000.000	1.000.000	1.000.000	1.000.000

Annex 3c

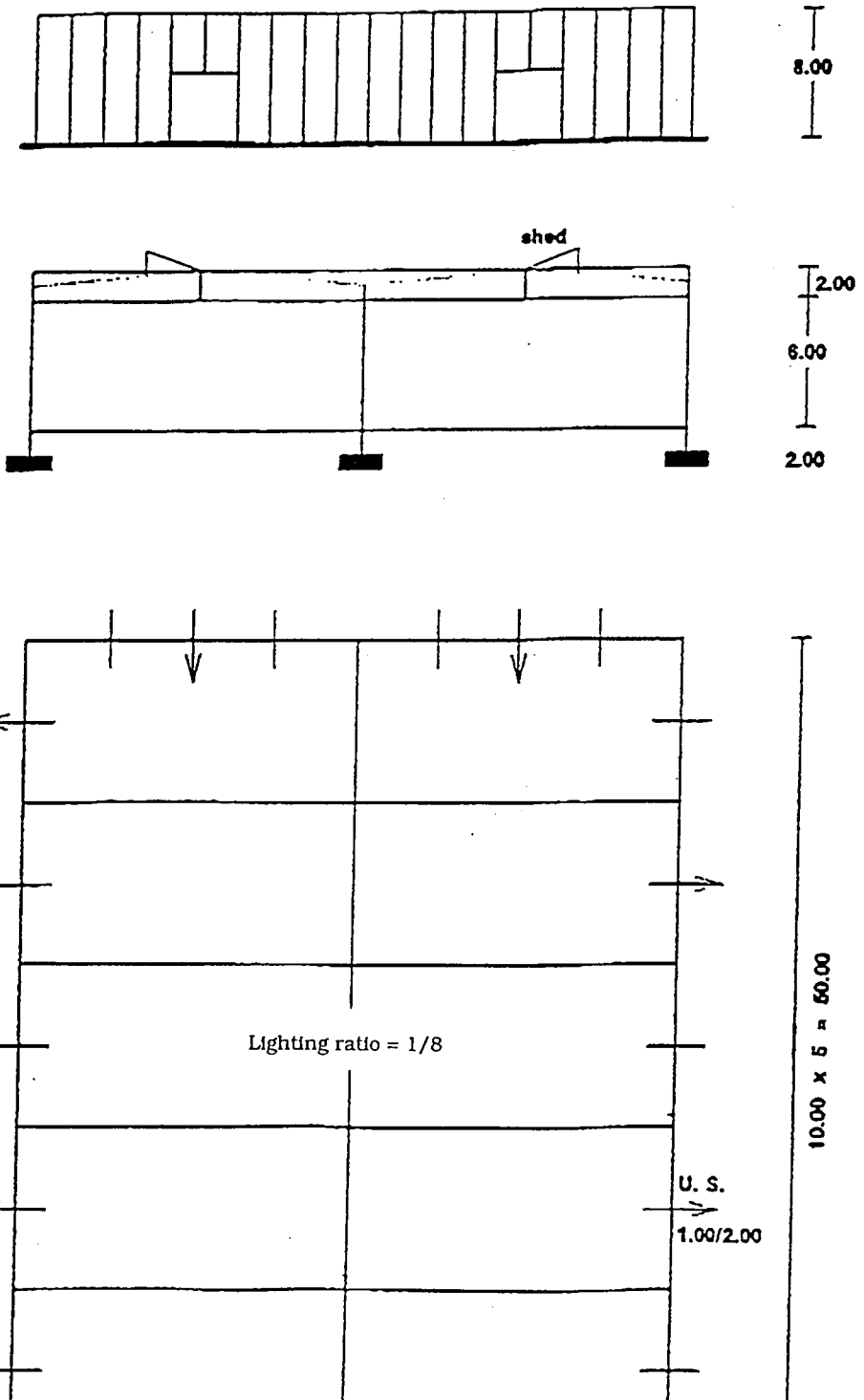
Construction cost indices for residential buildings

Table 4
Weighting coefficients for the calculation of national indices by group
(1990 = 100)

PROVINCIAL CAPITAL	LABOUR	MATERIALS	TRANSPORT and HIRE
TURIN	63.039	63.312	60.900
MILAN	183.694	179.699	158.748
BOLZANO	9.506	9.363	7.996
TRENTO	10.054	10.006	8.431
VENICE	90.290	95.676	114.384
TRIESTE	22.204	23.249	28.748
GENOA	12.724	13.048	13.258
BOLOGNA	61.280	63.617	55.030
FLORENCE	42.216	40.423	38.432
PERUGIA	12.039	11.633	9.746
ANCONA	27.949	30.951	29.382
ROME	76.337	71.799	72.495
L'AQUILA	27.318	27.325	18.426
CAMPO BASSO	7.168	8.300	7.200
NAPLES	104.835	93.104	76.295
BARI	72.259	68.344	96.397
POTENZA	9.730	9.633	11.744
REGGIO CALABRIA	33.808	36.393	34.344
PALERMO	95.612	100.485	112.645
CAGLIARI	37.938	43.640	45.399
TOTAL	1.000.000	1.000.000	1.000.000

Annex 4

Standard industrial building



Annex 5

Construction cost indices for buildings for industrial use

Table 1
Provincial weighting coefficients for the calculation of elementary national indices (1990 - 100)

GROUPS AND CATEGORIES	TURIN	MILAN	BOLZANO	TRENTO	VENICE	TRIESTE	GENOA	BOLOGNA	FLORENCE	PERUGIA
LABOUR										
Specialised worker	88.1	264.4	9.6	6.3	176.7	38.2	8.1	108.3	48.0	10.0
Skilled worker	81.2	267.0	9.6	6.4	178.1	38.3	8.1	109.0	48.4	10.0
Labourer	87.8	266.6	9.5	6.3	177.0	38.1	8.1	106.1	48.0	10.0
MATERIALS										
INERT MATERIALS										
Sand	51.0	281.8	3.7	183.5	165.6	60.7	9.1	52.8	26.3	5.0
Gravel	48.8	357.2	5.7	4.1	199.5	36.7	12.7	61.5	32.7	9.8
BINDERS										
Cement	132.8	250.8	6.6	5.4	169.1	40.1	7.7	96.4	39.7	8.9
FIXTURES										
Entrance doors	69.0	306.7	5.8	6.5	175.9	36.1	7.5	90.5	36.9	6.9
Door frames	89.7	234.5	6.2	4.7	186.5	49.6	13.2	95.5	44.6	7.6
Glazing	80.4	121.5	7.5	5.7	235.3	49.9	3.7	112.5	64.5	9.7
METALS										
Iron	84.7	252.5	6.7	6.5	227.2	41.1	8.6	86.3	43.4	9.6
Stranded steel	73.4	298.8	6.4	4.6	189.8	49.6	11.1	115.3	41.5	10.9
Steel wire netting	67.1	371.8	6.1	4.7	170.5	52.4	11.5	57.2	34.0	10.0
Galvanised sheet	81.7	295.5	9.8	6.0	178.8	38.9	15.8	88.2	44.4	10.7
Cast iron manhole	62.2	279.5	7.3	5.3	144.1	41.6	14.2	96.8	50.7	9.1
CEMENT ARTICLES										
Corrugated cement asbestos	94.5	201.2	9.9	6.9	153.2	38.0	10.2	134.1	57.1	10.9
THERMAL INSULATION										
Rockwool	78.0	198.0	8.3	7.9	221.7	32.6	11.3	98.4	30.9	14.8
PAINTS										
Enamel	67.0	275.9	6.5	3.6	161.5	53.9	10.2	112.9	45.8	8.2
OTHER MATERIALS										
Hardeners	57.9	330.3	7.2	3.2	74.0	52.7	6.1	203.3	50.6	8.2
Solid bricks	86.3	303.5	7.6	6.9	173.0	47.0	6.5	98.5	37.8	8.0
Timber	98.5	270.8	8.2	5.1	185.9	42.7	9.0	92.4	46.9	11.6
TRANSPORT AND HIRE										
TRANSPORT										
Trucks	76.0	274.2	11.0	5.2	162.6	38.2	10.0	109.1	51.3	8.6
HIRE										
Rollers	85.6	286.2	7.7	4.9	193.8	29.4	8.6	79.8	48.4	12.2
Diggers	77.4	301.9	7.0	5.3	151.1	42.5	9.3	100.3	49.9	8.5

Annex 5b

Construction cost indices for buildings for industrial use

Table No 1 (Cont.)
Provincial weighting coefficients for the calculation of elementary national indices
(1990 - 100)

GROUPS AND CATEGORIES	ANCONA	ROME	L'AQUILA	CAMPO-BASSO	NAPLES	BARI	POTENZA	REGGIO CALABRIA	PALERMO	CAGLIARI	ITALY
LABOUR											
Specialised worker	33.1	51.7	30.3	5.8	34.1	36.1	10.0	7.5	17.7	16.0	1.000.0
Skilled worker	33.4	52.1	30.6	5.8	34.2	36.3	10.1	7.5	17.8	16.1	1.000.0
Labourer	33.3	51.8	30.4	5.8	33.9	36.0	10.0	7.5	17.8	16.0	1.000.0
MATERIALS											
INERT MATERIALS											
Sand	17.1	59.0	19.2	3.1	14.2	17.1	4.4	4.2	12.4	9.8	1.000.0
Gravel	22.3	58.4	28.2	3.5	25.4	22.6	8.9	21.0	27.2	14.0	1.000.0
BINDERS											
Cement	28.7	56.7	27.4	5.5	29.1	35.2	9.9	7.9	26.7	15.4	1.000.0
FIXTURES											
Entrance doors	84.3	42.7	19.2	8.4	23.6	29.0	8.3	8.5	26.4	9.8	1.000.0
Door frames	111.0	45.3	16.6	3.9	25.0	32.1	9.9	11.1	1.8	11.2	1.000.0
Glazing	44.8	54.4	34.9	5.2	38.4	61.2	16.5	7.5	37.2	11.2	1.000.0
METALS											
Iron	31.4	55.7	24.3	5.6	38.4	36.0	6.7	5.4	16.3	15.6	1.000.0
Stranded steel	4.8	59.8	25.9	4.9	30.3	28.4	8.2	6.5	14.7	15.1	1.000.0
Steel wire netting	31.4	45.4	35.1	4.5	28.9	24.4	6.2	6.8	15.7	18.3	1.000.0
Galvanised sheet	35.1	54.8	23.5	5.6	41.8	31.7	7.4	7.8	4.5	17.9	1.000.0
Cast iron manhole covers	70.1	62.5	28.1	8.5	30.7	27.7	9.6	7.3	31.5	13.2	1.000.0
CEMENT ARTICLES											
Corrugated cement asbestos	46.2	77.2	30.0	5.5	41.7	34.7	10.8	5.2	14.0	18.9	1.000.0
THERMAL INSULATION											
Rockwool	19.5	87.9	68.6	4.4	26.1	40.5	10.6	5.5	20.6	14.4	1.000.0
PAINTS											
Enamel	49.7	55.4	27.2	10.5	30.8	38.8	8.8	5.0	14.6	15.7	1.000.0
OTHER MATERIALS											
Hardeners	39.3	50.4	23.5	4.0	25.4	28.5	7.6	8.1	13.7	10.0	1.000.0
Solid bricks	27.5	42.8	19.9	5.7	27.1	28.3	9.9	10.3	35.1	18.3	1.000.0
Timber	35.4	40.8	28.3	6.6	31.6	32.6	10.0	7.2	22.5	15.9	1.000.0
TRANSPORT AND HIRE											
TRANSPORT											
Trucks	34.1	66.9	26.4	4.8	35.8	33.4	9.0	7.9	18.1	17.6	1.000.0
HIRE											
Rollers	27.8	56.5	26.1	5.1	40.4	31.6	9.4	8.6	17.2	18.7	1.000.0
Diggers	27.0	55.3	28.4	5.1	39.5	31.5	10.0	9.3	20.8	19.8	1.000.0

Annex 5c

Construction cost indices for buildings for industrial use

Table 2
Weighting coefficients for the calculation of national indices
(1990=100)

GROUPS AND CATEGORIES	PERCENTAGE WEIGHTING		
	Category (*)	Group (*)	Total (*)
GENERAL INDICES			100.00
LABOUR		100.00	46.63
Specialised worker		19.81	9.23
Skilled worker		21.37	9.97
Labourer		58.82	27.43
MATERIALS		100.00	38.85
INERT MATERIALS	100.00	27.51	10.89
Sand	31.54	8.58	3.37
Gravel	68.46	18.83	7.32
BINDERS	100.00	15.50	6.02
Cement	100.00	15.50	6.02
FIXTURES	100.00	27.88	10.82
Entrances doors	34.40	9.59	3.72
Door frames	57.00	15.89	6.17
Glazing	8.60	2.40	0.93
METALS	100.00	13.41	5.22
Iron	29.50	3.96	1.54
Stranded steel	27.02	3.62	1.41
Steel wire netting	24.14	3.24	1.26
Galvanised sheet	15.00	2.01	0.78
Cast iron manhole covers	4.34	0.58	0.23
CEMENT ARTICLES	100.00	4.78	1.86
Corrugated cement asbestos	100.00	4.78	1.86
THERMAL INSULATION	100.00	3.10	1.20
Rockwool	100.00	3.10	1.20
PAINTS	100.00	2.30	0.89
Enamel	100.00	2.30	0.89
OTHERS MATERIALS	100.00	5.52	2.15
Hardeners	81.98	4.53	1.76
Solid bricks	1.17	0.06	0.03
Timber	16.85	0.93	0.36
TRANSPORT AND HIRE		100.00	14.52
TRANSPORT	100.00	92.34	13.41
Trucks	100.00	92.34	13.41
HIRE	100.00	7.66	1.11
Rollers	71.15	5.45	0.79
Diggers	28.85	2.21	0.32

(*) Weightings obtained for the total value of investments in non-residential buildings for industry.

Annex 6

Construction cost indices for highways

Table 3
Weighting coefficients for the calculation of indices by labour category and road typology (1990=100)

	movement of materials	civil engineering	underground jobs	misc. jobs	superstructures	total index
			HIGHWAYS WITHOUT TUNNEL			
GENERAL INDEX	26.8	24.5	-	25.5	23.1	100.0
LABOUR	23.2	39.9	-	28.2	8.7	100.0
MATERIALS	6.7	33.4	-	28.1	33.8	100.0
HIRE	36.7	13.4	-	25.9	24.0	100.0
TRANSPORT	45.1	9.5	-	21.8	23.6	100.0
GENERAL INDEX	100.0	100.0	-	100.0	100.0	100.0
LABOUR	20.5	38.5	-	26.0	8.9	23.6
MATERIALS	7.1	38.7	-	28.9	41.6	28.4
HIRE	36.4	14.5	-	26.8	27.6	26.6
TRANSPORT	36.0	8.3	-	18.3	21.9	21.4
GENERAL INDEX	26.8	24.5	-	25.6	23.1	100.0
LABOUR	5.5	9.4	-	6.6	2.1	23.6
MATERIALS	1.9	9.5	-	7.4	9.6	28.4
HIRE	9.7	3.6	-	6.9	8.4	26.6
TRANSPORT	9.7	2.0	-	4.7	5.0	21.4
			HIGHWAYS WITH TUNNEL			
GENERAL INDEX	21.5	19.6	19.9	20.5	18.5	100.0
LABOUR	16.9	29.0	27.3	20.5	6.3	100.0
MATERIALS	5.1	25.3	24.2	19.8	25.6	100.0
HIRE	30.9	11.3	15.8	21.8	20.2	100.0
TRANSPORT	41.3	8.7	8.4	20.0	21.6	100.0
GENERAL INDEX	100.0	100.0	100.0	100.0	100.0	100.0
LABOUR	20.5	38.5	35.7	26.0	8.9	28.0
MATERIALS	7.1	38.7	36.5	28.9	41.6	30.0
HIRE	36.4	14.6	19.9	26.8	27.6	25.2
TRANSPORT	36.0	8.3	7.9	18.3	21.9	18.8
GENERAL INDEX	21.5	19.6	19.9	20.5	18.5	100.0
LABOUR	4.4	7.5	7.1	5.3	1.7	28.0
MATERIALS	1.5	7.6	7.3	5.9	7.7	30.0
HIRE	7.8	2.9	3.9	5.5	5.1	25.2
TRANSPORT	7.8	1.6	1.6	3.8	4.0	18.8

Annex 6a

Construction cost indices for highways

Table 1

Weighting coefficients for the calculation of indices by road typology

1990=100

GROUP AND CATEGORY	OPEN AIR ROAD ON EMBANKMENT		OPEN AIR ROAD IN CUTTING		ROAD ON VIADUCT		ROAD IN TUNNEL	
	PERCENTAGE WEIGHTING							
	within a group	within the total	within a group	within the total	within a group	within the total	within a group	within the total
GENERAL INDEX		100.0		100.0		100.0		100.0
LABOUR	100.0	27.8	100.0	22.6	100.0	36.8	100.0	35.8
Specialised worker	21.3	5.9	22.5	5.1	23.5	8.7	52.5	18.8
Skilled worker	7.5	2.1	2.8	0.6	24.5	9.0	6.0	2.1
Labourer	71.2	19.8	74.6	16.9	52.0	19.1	41.5	14.9
MATERIALS	100.0	26.1	100.0	23.1	100.0	36.6	100.0	30.8
Chippings	34.9	9.1	42.9	9.9	15.9	5.8	25.2	7.8
Sand	15.0	3.9	17.6	4.1	6.2	2.3	14.7	4.5
Cement	27.6	7.2	32.3	7.4	23.1	8.4	28.5	8.8
Iron	18.0	4.7	-	-	54.1	19.8	24.1	7.4
Timber	-	-	-	-	-	-	6.7	2.0
Bitumen	4.5	1.2	7.2	1.7	0.7	0.3	0.8	0.3
HIRE	100.0	17.5	100.0	32.3	100.0	17.1	100.0	24.9
Bulldozers	22.2	3.9	61.9	20.0	24.5	4.2	15.5	3.9
Excavators	21.4	3.7	28.4	9.2	25.4	4.3	82.4	20.5
Vibratory rollers	19.9	3.5	1.5	0.5	-	-	0.4	0.1
Road rollers	27.5	4.8	2.4	0.8	-	-	0.8	0.2
Elevators	9.0	1.6	5.8	1.8	50.1	8.6	0.9	0.2
TRANSPORT	100.0	28.6	100.0	22.0	100.0	9.5	100.0	8.5
Motor vehicles	100.0	28.6	100.0	22.0	100.0	9.5	100.0	8.5

Table 2

Weighting coefficients for the calculation of the indices by labour category

1990=100

GROUP AND CATEGORY	MOVEMENTS OF MATERIALS		CIVIL ENGINEERING		UNDERGROUND		MISCELLA JOBS		SUPERSTRUCTURES	
	PERCENTAGE WEIGHTING									
	within a group	within the total	within a group	within the total	within a group	within the total	within a group	within the total	within a group	within the total
GENERAL INDEX		100.0		100.0		100.0		100.0		100.0
LABOUR	100.0	20.5	100.0	38.5	100.0	35.7	100.0	26.0	100.0	8.9
Specialised worker	9.8	2.0	25.5	9.8	53.3	19.0	23.8	6.2	6.9	0.6
Skilled worker	-	-	21.6	8.3	6.4	2.3	5.5	1.4	-	-
Labourer	90.2	18.5	52.9	20.4	40.3	14.4	70.7	18.4	93.1	8.3
MATERIALS	100.0	7.1	100.0	38.7	100.0	38.5	100.0	28.9	100.0	41.6
Chippings	73.4	5.2	16.8	6.5	24.7	9.0	37.9	11.0	25.5	10.6
Sand	26.6	1.9	6.2	2.4	14.6	5.3	14.3	4.1	21.8	9.1
Cement	-	-	29.8	11.5	28.8	10.5	29.9	8.6	-	-
Iron	-	-	47.2	18.3	24.8	9.1	11.0	3.2	-	-
Timber	-	-	-	-	7.1	2.6	-	-	-	-
Bitumen	-	-	-	-	-	-	6.9	2.0	52.7	21.9
HIRE	100.0	36.4	100.0	14.5	100.0	19.9	100.0	26.8	100.0	27.6
Bulldozers	50.5	18.4	5.9	0.9	16.4	3.3	56.8	15.2	-	-
Excavators	26.3	9.6	16.1	2.3	83.6	16.6	20.4	5.5	-	-
Vibratory rollers	9.7	3.5	-	-	-	-	13.4	3.6	41.7	11.5
Road rollers	13.5	4.9	-	-	-	-	-	-	58.3	16.1
Elevators	-	-	78.0	11.3	-	-	9.4	2.5	-	-
TRANSPORT	100.0	36.0	100.0	8.3	100.0	7.9	100.0	18.3	100.0	21.9
Motor vehicles	100.0	36.0	100.0	8.3	100.0	7.9	100.0	18.3	100.0	21.9

THE NETHERLANDS

Price Index for the Cost of Rebuilding of Dwellings

Sijbrand Veenstra, Statistics Netherlands

1. General

Statistics Netherlands (SN) compiles a variety of statistics, which approach and quantify the construction process from different angles of observation. For that reason the area covered is difficult to demarcate exactly. Each approach involves its own demarcation line. The thirteen statistics compiled by the Construction department are:

1.1 Institutional approach

A - Enterprises

1. Annual Production statistics (NACE 45);
2. Monthly Turnover survey (NACE 45, excl. NACE 453);

1.2. Functional approach

B - Projects

3. Building projects in preparation;
4. Building permits issued;
5. Progress of works in residential and non-residential building, incl. building starts and completions;
6. Progress of works in civil engineering;

C - Dwellings

7. Housing statistics;
8. Dwelling stock statistics;
9. Improvement of dwellings;

D - Prices

10. Price index of newly constructed dwellings;
11. Price index for the cost of rebuilding dwellings;
12. Price indices for road construction;

E - Productive hours

13. Number of productive hours per manual worker active at building sites.

Statistics related to employment, labour-costs, investments and research and development in the construction sector and national accounts are available in other SN-departments. The common denominator of these statistics is that they relate directly or indirectly to construction works, including all constructions "of any size which are man-made in situ and are land-bound" e.g. buildings and accompanying amenities such as ponds, fencing etc., infrastructural works and works which arise as a result of moving earth. Since construction entails production in situ these companies are frequently organised and run on a project basis. Construction is a complicated organisational process involving the distinct functions of commissioning, designing and producing.

The parties involved are commissioners of works, government authorities, architects and engineers, design engineers, heating-, lighting-, acoustic- and air conditioning-consultants etc., main- and sub-contractors supplying industries, ancillary services, regulatory, supervisory, subsidy granting and advisory bodies.

In macro-economic terms, the construction sector is an important branch of industry, which accounts for about 7% of GNP in the Netherlands. The construction sector has a highly complex structure. Hence the great need, policy-wise, for (rapid) information. Indeed, over the years, a wide-ranging and comprehensive system of statistics has evolved. Despite this, supply and demand for information are still not completely in tune. This is also true for price statistics of the construction sector in the Netherlands. In this paper the relevant "construction-

prices" available in the Construction department of SN will be described.[2)]

1.3. Construction prices indices

The price indices for the construction sector aim at allowing production at current prices to be converted into volume figures. These indices may also serve to adjust budgets and agreed contracting costs.

2. Price index for the cost of rebuilding of dwellings

2.1 Type of index

This index was started in 1990 and covers the rebuilding of all types of residential buildings, whether in the public or private sector. It is based on input costs, and covers the costs of materials (at the point of purchase i.e. excluding any costs of transport to the site), labour, the installation of water, gas- and electricity supplies, telephone, plus bathroom- and kitchen fittings. It does not cover profits, building-site costs, etc. Insurance companies asked SN to introduce this index. They also provided SN with the basic information for 6 representative dwellings. These dwellings are weighted according to their relative importance.

The index is compiled monthly. It has a base 1990 = 100 and is calculated according to the Laspeyres formula. The next update is foreseen in 2000.

The insurance companies use this index to adjust yearly the insured sum (building costs) of a dwelling in an individual insurance policy.

Another application for this relatively new index is the possibility of comparing the output- and input price development of dwellings. An explanation of the differences in trend or development between these indices is difficult to give. Several reasons can be named. One possibility is an increase or decrease of the profit margin of construction establishments specialised in the construction of dwellings.

2.2 Source of price data

The index is compiled using data on material costs etc. which is collected for the purpose of the producer price index calculation. VAT is included, but these prices are not net of any discounts.

Only 23 materials are followed in the index. These 23 materials represent more than 80% of the total material costs (law of Pareto). The development of labour costs in the construction sector in the long term is followed by the Hourly Labour Costs Statistics. This information becomes available with a certain time-lag. For the short term development the labour cost information is extrapolated with Wage Rate Indices. These wage rate indices include gross wages only. The labour costs statistics include gross wages and all the social contributions paid by employers.

The labour and material inputs are weighted together in line with their relative importance in the six dwelling projects. The labour costs represent about 50% of the total cost-price.

2.3 Other relevant information

- **periodicity**: monthly figures
- **staff-capacity**: 1 person about 2 days per month
- **regional details**: not possible
  response burden: no response burden
- **no provisional figures**
- **main publications**: SN-Internet, SN-Weekly Bulletin, SN-Monthly Construction Statistics publication.

2) Note of Eurostat: See also chapters III.1 and III.3 below.

SWEDEN

Factor Price Index for Dwellings

Ali Otmani, Statistics Sweden

1. Summary

The factor price index for dwellings includes separate index series for apartment blocks and group-built houses. All these indices have 1968 as the base year.

The factor price index for dwellings is calculated according to the Laspeyres formula. During the period 1968-1985 the weighting system was based on cost studies carried out on buildings completed between 1968-1971. The weighting system was revised as from 1986 and is now based on cost studies of buildings built in 1980. The index calculations are based on representative standard products. Information is provided by suppliers to building contractors and developers. Pricing is based mainly on list prices. The prices generally relate to prices excluding freight costs, which are booked separately. They are measured on the 15th of each month. Wages are measured after contractually agreed wage increases. Wages include social security contributions. Costs are also measured for machinery, vehicles, fuel, electricity and various other costs.

A special quarterly index series covers the effect of wage drift in the wage share, i.e. the full trend in earnings is taken into account.

2. Background

Statistics Sweden (SCB) calculates two diferent types of price indices for newly constructed dwellings. The indices are called factor price index and construction price index.

The factor price index is input related, i.e. it measures the combined effect of the prices of building materials, wages and the other production factors which are included in the construction activity. The construction price index is an output type index. It measures price trends for the completed dwelling. The index is weighted to take account of the impact of quality changes on price trends.

The index calculations were the outcome of a special investigation by the construction index committee of that time, which had been given the task of analysing the methodology of price indices in the construction industry. The proposal was outlined in the committee opinion "Construction index for dwellings", SOU 1971:79.

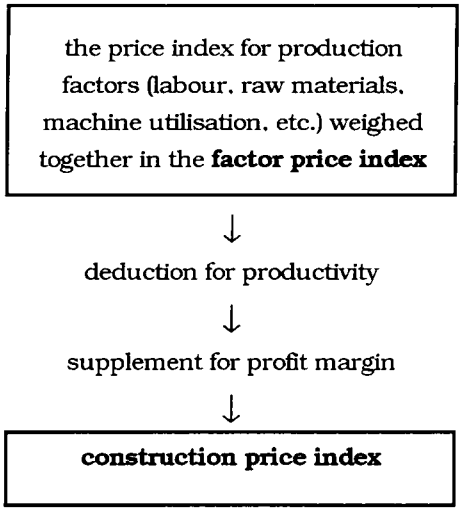
3. Index types

The factor price index therefore measures the prices of the production factors which go into the construction activity, i.e. prices for materials, labour, machine utilization, etc. Using special sales figures for these factors the recorded price changes are weighted and combined to form a total index, showing the combined effect of such changes on construction costs. The calculations presuppose that construction techniques and building organization remain unchanged, which means that the index does not take account of productivity changes, more effective use of materials and similar factors which can affect cost developments. All SCB's current calculations of construction cost trends,

namely the construction cost index, the contract index E84, are of this index type.

The construction price index measures the prices linked to the completed building or project, i.e. the prices the developers actually have to pay for equivalent building projects.

The difference between these two index types can be illustrated in the following way:



By taking the factor price index and after deduction for productivity and adjustment for profit margin changes in the contractor chain, we get the construction price index. Quality correction occurs in both index calculations, but at different levels.

Other index types. In addition to the construction prices it is also interesting to measure the construction cost for the finished building. The difference between these concepts is the developer's or developers' profit. An index which measures the construction cost and which - in contrast to the factor price index - takes account of productivity changes (cf. previous point) is defined as **the construction cost index**. SCB does not undertake such index calculations. The indices which SCB calculates and which are traditionally presented as construction cost indices are actually of the factor price index type.

4. Presentation of index calculations

4.1 Index series

The factor price index for dwellings is calculated in four main series

- the factor price index for apartment blocks, monthly, excluding wage changes arising from wage drift
- factor price index for group-built houses, monthly, excluding wage changes arising from wage drift
- factor price index for apartment blocks, quarterly and annually, including wage changes arising from wage drift
- factor price index for group-built houses, quarterly and annually, including wage changes arising from wage drift.

The aim in calculating the factor price index both excluding and including the effect of wage drift is partly to obtain an index series which measures the total cost trend, mainly for the purposes of economic analysis, and partly to obtain a series which is adapted to the index form which has traditionally been used as a basis for cost adjustments to contracts. In such cases it is apparently assumed that wage increases arising from wage drift match productivity increases in the construction industry, which is why such indices should only measure the contractual wage changes.

4.2 Calculation basis

The weighting system for the factor price index during the period 1968-85 was based on the housing board's study of housing construction costs for the period 1968-71. These show the breakdown of construction costs by different cost types. Such relatively detailed cost breakdown was calculated in the case of apartment blocks for 30 projects comprising around 3 000 housing units and in the case of

group-built houses for 14 projects comprising approximately 500 housing units.

As from December 1985 the weighting system for the factor price index for apartment blocks has been based on cost studies relating to nine projects with approximately 2 000 housing units. All the projects are part of 1980 housing output.

The cost basis includes house construction and land. Previous so-called construction cost indices encompassed only the actual building.

4.3 Index structure and weighting

The factor price index is calculated as a fixed base index with 1968 as the base year and according to Laspeyres' formula.

The weighting system by type of cost is displayed in relative detail in the following table.

The table breaks down both main and sub-contractors by type of cost. The level of detail can be taken one step further to arrive at the level at which current index calculations are made.

Weighting system for the factor price index

Type of cost	Apartment blocks Weight in 0/00		Houses Weight in 0/00	
1. Building materials	341		346	
Stone material		3		6
Prefabricated concrete		40		12
Other concrete products, cement, brick and mortar		35		17
Timber products		28		62
Joinery		43		61
Iron and steel goods		50		33
"White" goods		15		22
Floor coverings		11		9
Painting and decorating materials		5		8
Insulation goods (heat)		9		25
Facing boards		8		24
Sanitary material + ventilation		55		46
Electrical material + lift		30		17
Other material		9		4
2. Wages	238		263	
Construction work (incl. land)		171		207
Painting and decorating		9		14
Sanitary installations		21		13
Electricity		16		13
Other		21		16
3. Machinery	42		39	
4. Transport, etc.	66		74	
Transport by truck		52		64
Electrical power		8		5
Fuel		6		5
5. Costs (works management, tools etc.)	138		133	
Administrative salaries		88		47
General costs		50		86
Contractors' costs (1-5)	**825**		**855**	
6. Client's (placing the order) costs	**175**		**145**	
Interest and loan charges		101		68
Planning		50		34
General developer costs		24		43
	1000		1000	

4.4 Price measurement

Price data are collected each month for approximately 300 representative goods and qualities. The collection time is the 15th of each respective month. For the most part price measurements are based on price lists after deducting general discounts for building contractors. In certain cases prices are measured on the basis of actual (invoiced) prices. The prices relate to orders placed at the time of measurement and in general prices of materials do not include freight costs to building sites which are measured and booked separately. The current price measurement method means that price changes are reflected in the index somewhat earlier than they penetrate actual costs in the contractor chain. Furthermore changes in special discounts are not taken into account.

Wages are measured in the monthly series of the factor price index on the basis of the contractual wages with an addition for social contributions. The trade federations provide documentation on contractual wage adjustments. Value added tax is not included in these series. Furthermore prices are measured for machinery, vehicles, fuel, electricity, miscellaneous costs and developer costs.

In the quarterly series which include wage drift, wages are measured on the basis of the actual earnings trend. Data on the wages actually paid out are obtained from the wage contract statistics compiled by the Research Department of the Construction Workers' Federation. In the case of administrative wages the wage drift is calculated in all index series, apart from the series on planning.

Prices of materials are provided by the major material suppliers (factories, mills, wholesalers and retailers) within the respective sector. They total about 200.

5. Reliability

The index calculations are marred by several items of uncertainty, the foremost being connected with the accuracy of the pricing of the selected goods, the representativeness of the selected goods and the representativeness of the actual weighting system. The current methodology of price measurement is likely to result in systematic errors principally owing to the low level of list price flexibility in sales to building contractors. This is primarily due to the fact that the purchasing of building materials is often carried out via time and/or project-linked agreements. Since for the most part price surveys have to be based on list prices, errors mainly occur with the periodization of price trends. Another significant factor of uncertainty in this context is that list price suitability can change over time.

The product selection can involve risks of systematic errors as a result of so-called "project specific" goods having to be represented by standard goods or by special price calculations. This problem increases if manufacture shifts towards the material supplier side, since standardisation thereby tends to decrease.

The weighting system developed by the Housing Board's cost surveys is not based on a probability sample of building projects. The Housing Board has also had to rely on contractors' and developers' cooperation in providing research material, with the result that there was a high dropout rate. Only state mortgaged housing was surveyed. However, it was considered that the gaps in the sample were not such that their effects on the wage system would seriously damage the quality of the actual index calculations.

In the case of group-built houses the primary research material - comprising 32 projects - could not be processed for weighting

calculations owing to the fact that the cost specifications were not adequate for houses with a high level of prefabricated components. Such houses, primarily factory-manufactured houses, are therefore not included in the basic weighting data for houses built in groups. In principle the index for group-built houses therefore covers only so-called site-built houses .

6. Application

Like other types of construction indices the factor price index is used in analyses of construction cost trends. The factor price index is calculated on the assumption of unchanged productivity. This means that the index gives an incomplete picture of cost developments in the event of productivity changes. High productivity tends to lower prices while lower productivity tends to increase prices. A factor price index therefore probably overestimates the cost increase. This feature restricts the use of the factor price index for economic analysis. Thus for deflations and for various upward adjustments of funds an index like the construction price index would be preferable. However, the factor price index can be an alternative when making upward adjustments to contracts and to the budgets for work in progress. For this purpose the monthly calculation of the factor price index (Table 1), which is not affected by wage drift, is used. That portion of the wage cost increases which depend on wage drift is assumed to be offset by increased building productivity.

Revaluing a contract with the factor price index (excluding wage drift) means in principle that the seller is compensated for the cost increases revealed by the index between two points in time, i.e. the cost to the seller of building the same house at point-in-time 2 as at point-in-time 1, where the same construction technology and building organization are used, deducting however any cost increases resulting from wage drift over the period.

When revaluing a contract with the factor price index it is also necessary to take account of an unregulated portion according to the regulations concerning the application of the law governing contract index E84. When using the group index series in E84 an unregulated portion of 10% applies, which means that only 90% of the contract total is index-linked.

There are a number of exceptions to this adjustment method. Where the index is used for cost adjustments in the case of houses the SCB can refer to the Housing Board's time coefficient, which is the normal adjustment instrument in the case of state mortgaged group housing projects. For small houses this applies when the preliminary decision was taken after 1 July 1982. In the case of houses where the preliminary decision was taken prior to this time the so-called valuation coefficient is used. The time coefficient is calculated on the basis of the factor price index for group-built houses, excluding wage drift, with adjustment for assumed productivity changes apart from those reflecting wage drift. The approved production cost is adjusted upwards by the time coefficient for the period between the preliminary decision and completion.

On the basis of an agreement between the trade federations and the Consumer Ombudsman an index series, known as MT 74, which is a type of construction price index, is used for sales of prefabricated timber houses.

To adjust its contracts the Housing Board has constructed a model which departs from previous practice in the field. According to this model the developer is only compensated for cost increases of built-in materials etc. Inputs of such goods and services have thus been

fixed at a standard rate of 60%. The partial index figure for the group 'materials, machinery and transport' from the factor price index for apartment blocks is used as an adjustment index. The index increment is limited to that portion which exceeds 4% per year.

7. The organization of index calculations

For SCB's various construction index calculations there is an organization which cooperates with external authorities and purchasers.

Responsibility for the principles used to compile and calculate the indices resides with a construction index authority linked to SCB. This includes representatives of both developers and contractors.

The SCB calculates and fixes the index figure. An advisory body, where representatives of contractors and developers obtain some insight into the current calculations, is involved in the calculation of the factor price index and the contract index E84.

Since the index is largely used for cost adjustments of tender contracts, the contractors and developers have formed a special cooperative body, the Contract Index Committee (KEX). KEX has the task of coordinating the needs of the interested parties represented in the committee on the question of adjustment indices. Vis-à-vis the SCB and the building index authority the KEX is primarily responsible for stipulating the specifications for the construction index series to be calculated by the SCB for this purpose, and also for questions relating to the regulations governing the application of the law to adjustments of tender contracts. The committee acts as an advisor to the SCB on the index calculations.

8. Analysis of results

8.1 Published data

The factor price indices - monthly series and quarterly series - are reported in detail in the monthly publication "BYGGINDEX (Construction Index)". It is also reported in Statistiska Meddelanden (P series) every quarter. In addition to the total index, partial series for different types of costs are included.

The publication BYGGINDEX, which also includes other index series linked to the construction market, is published around the 25th of each month following the calculation month (excluding July).

The main series of the factor price indices (monthly, quarterly) are also reported in the Allmän Månadsstatistik and in the Tidseridatabase (Time Series Database), which covers the quarterly series.

III. Output Price Indices

III.1 The Component Cost Method

⇒ Germany

⇒ France

⇒ The Netherlands

⇒ Switzerland

GERMANY

Calculation of Construction Price Indices by the Statistisches Bundesamt

Hubert Vorholt, Statistisches Bundesamt

1. Introduction

There is a long tradition of construction price statistics in Germany. A housing price index for the whole of Germany was first calculated over eighty years ago. The methods used at that time would be described today as a factor price index, since construction costs were mainly calculated on the basis of prices for building materials and wages of construction workers. Since craftsman-based construction became less common as time went by and at the same time improvements in productivity in the construction industry made it likely that the trends in factor and selling prices would be different, the methodology of construction price statistics was changed for the base year 1958 so that genuine producer (selling) price indices could be calculated. It is this methodology, which relates to traditional construction and has remained fundamentally unchanged to this day, which is described below[3].

2. Coverage of the construction price indices and the information they provide

Most of the price indices calculated in Germany for the main economic branches, e.g. agriculture, manufacturing industry or wholesale trade, on the basis of their selling prices measure price movements for the entire output of these branches. This has the advantage that data on the turnover etc. of these branches can be directly deflated with appropriately defined price indices. However, the documentation needed for weighting the figures on the basis of which such institutionally defined price indices are calculated does not exist, and obtaining them would be extremely costly in terms of time and effort. Construction price indices should therefore measure "only" the price trends for selected, particularly important products (= types of structure). For purchasers, i.e. those who order construction work, they can at the same time be regarded as purchase price indices.

However, the costs which are recorded for the purposes of construction price indices represent only part of the costs involved in a construction project, i.e. only the "integral construction operations" (= mainly the works which become components of the structure itself).

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3) For further information see Volholt, H.: "Zur Neuberechnung der Baupreisindizes auf Basis 1991" in Wirtschaft und Statistik 1/1991, p. 21ff and Horstmann, K. et al.: "Neuberechnung von Preismesszahlen für Bauleistungen und eines Preisindex für Wohngebäude" in Wirtschaft und Statistik 11/1959, p. 586ff. Eurostat's methodology data base (MONALISA) also contains detailed information on German construction price statistics.
Since 1968 the Statistisches Bundesamt has, in addition to the price indices described in this paper, calculated prices indices for prefabricated one-family dwellings. However, these are not dealt with here since this price index, which is calculated on a six-monthly basis, is not suitable for the observation of short-term trends.

The time to which construction price indices refer is the conclusion of the contract between the builder and his client. This has the advantage that price trends can be recognized at an early stage, which makes it easier to observe short-term trends.

In selecting the types of structure for which prices indices are calculated, the Statistisches Bundesamt bases itself on the requirements of users. Price indices are at present calculated for nine types of structure/maintenance work, some of which are broken down into sub-categories:

Residential buildings

- Total residential buildings and a breakdown into one-family buildings, blocks of flats and mixed-use buildings

Non-residential buildings

- Office buildings
- Industrial buildings (total and broken down into two sub-categories)

Other types of structure

- Roads (total and broken down into two sub-categories)
- Road bridges (total and broken down into three sub-categories)
- Embankments
- Sewers
- Sewage treatment works

Maintenance work

- Maintenance of blocks of flats including decorative repairs, and broken down into
  a) maintenance excluding decorative repairs and
  b) decorative repairs in a dwelling.

In the official German price statistics, priority is given to analysing genuine price changes, which means in particular excluding any effect of changes in consumption habits. The best way to achieve this objective is to use the Laspeyres method, according to which the price series between two base years are given a fixed weighting for calculating the index. However, the weighting systems must be regularly updated so that the calculated price indices remain representative of current consumption habits. This is done approximately every five years in accordance with international recommendations.

3. The construction contracts in Germany and how they are concluded

The construction industry is different from many other branches of manufacturing industry in that products (= structures) are generally individually designed by architects according to the instructions of their clients and are then produced (= built) by construction companies. This design and production process is governed in Germany by a large number of laws and regulations. The VOB (general conditions applicable to construction works) lays down the procedure for obtaining offers and awarding construction contracts and the components of construction contracts[4].

Under the VOB, the work of construction firms is generally based on detailed specifications laying down which individual construction operations are to be performed, what building material is to be used and how. The construction operations are put

4) The VOB is compulsory for public-sector clients and, since it seeks to establish a fair balance between the purchaser (client) and contractor (construction firm) in a construction project, is often the basis of construction contracts between private parties.

out to tender, whereby building firms are invited to submit offers for providing these operations for a price to be specified in the offer. The construction firm is bound by its offer until any contract is awarded. The most favourable offer is selected by the client or his representative and the contract is awarded.

Part C of the VOB contains the ATV (general technical conditions of contract), which are intended for defining "construction works" (= areas of construction operations) and for obtaining, by means of a checklist, the exact description of standard operations (in particular building materials/components, type of construction method, particular difficulties involved, and invoicing).

This part of the VOB has been expanded by the inclusion of the StLB (standard specifications). The StLB comprises a collection of "building block" texts for the specification of major (components of) standard operations. They thus provide a "common language" for the construction industry. This enables construction firms to calculate prices exactly and largely to dispense with applying a safety mark-up to their bids.

4. Construction price statistics: survey and processing methods

Since construction operations are covered by construction contracts, it is these contracts which are used in construction price statistics as the basis for observing prices. However, since the number of standard operations is almost unlimited, only a selection of representative standard operations can be observed for the purposes of price statistics.

The Statistisches Bundesamt selects standard operations which, according to expert opinion and the documentation (see below) used to calculate weighting systems, are typical for the building of the types of structure for which price indices are calculated. A general description of these standard operations is drawn up and used as a basis for observing prices. The Statistisches Bundesamt bases its descriptions on the VOB. 220 different types of standard operations are currently defined as survey headings.

For example, the survey heading "Wall covering of ceramic tiles", a sub-category of "Wall and floor tiling", is described as follows in the price survey form:

> _____m^2 wall covering of
>
> ceramic stoneware tiles
> DIN EN 159
> ceramic earthenware tiles
> DIN EN 176 - 178
> ceramic split tiles
> DIN EN 121, 186, 187
>
> to be placed and pointed
>
> in a normal mortar bed
> in a thin bed
>
> Colour _____, Type_____
> Size_____x_____mm
> Area_____

The surveyed firms must first of all expand the general descriptions by specifying the way in which they regularly carry out the work under a particular heading[5]. All subsequent price returns submitted by the

5) These fixed goods variants are called "price representatives" in price statistics. They are intended to represent the corresponding type of goods, in this case the survey heading.

firm must refer to this specific standard operation. Since any given general description is differently expanded by each firm depending on the differing conditions and circumstances, the prices recorded under the survey headings are based on a broad cross-section of standard operations actually performed on the market.

Four times a year - in February, May, August and November - a price survey is conducted for construction price statistics. The prices to be reported are market prices at the time of the award of contract (not bid prices) excluding turnover tax. They must relate to a construction contract concluded in the survey month - if necessary, in one of the two preceding months - which covers (among other things) the performance of the specific standard operation. If no contract is concluded during this period but a previous one is carried out, it is the price for this contract which must be entered, with allowance being made for any sliding-scale clauses. If this is not the case either, the respondent firm must enter an imputed price based on the price trend for a similar type of standard operation for which a contract has been concluded. If it looks as though a particular standard operation will not be performed in the foreseeable future, the operation under the survey heading must be redefined.

A firm normally has to report prices for several standard operations, with the result that at every survey date the total number of prices recorded is approximately 35 000. The firms submit their prices after the end of the reference month to the competent Statistical Office of their *Land*. The Statistical Offices of the *Länder* then calculate the index for each recorded price: the ratio of the current price of a standard operation to the corresponding average price in the base year, multiplied by 100 ("firm index"). The (arithmetic) average of the firm indices for a given survey heading is then calculated, and the resulting 220 "*Land* indices" are forwarded to the Statistisches Bundesamt, which calculates the "national index" for each standard operation by weighting the *Land* indices with the turnover on construction work in the *Länder* during the base year. The national indices are finally converted into construction price indices for selected, typical structures by weighting them according to a weighting system for the different types of structure. The weighting system gives the relative importance which each of the 220 different standard operations typically has in the particular type of structure.

Since prices are recorded excluding turnover tax, the final step involves adjusting the price indices in line with any increase/decrease in the tax rate.

Since the survey agencies only ask for prices for individual construction operations rather than for entire structures, the price survey does not place too great a burden on them. This means that no compensation for extra work has to be paid to them and the price survey can be carried out by a large number of survey agencies, which in turn means that it is relatively easy to take account of criteria of representativeness in selecting survey agencies.

This selection is carried out with the specific aim of ensuring representativeness, as well as ensuring that the survey agencies have the requisite qualifications to be able to define the standard operations under the survey headings in accordance with the specifications and assess the extent of genuine price changes - while keeping the price-forming factors constant - from the point of view of the purchaser. In addition, the survey agencies are selected in such a way as to avoid any great fluctuation in the

group of survey agencies and thus to avoid gaps in the time series.

Since there is already an ongoing survey of a range of standard operations, it is relatively easy to introduce a price index for a further type of structure: prices only have to be recorded for a few additional standard operations specific to the type of structure. For example, for the price index for sewage treatment plants, which was first calculated for the base year 1991, seven new standard operations were defined as survey headings. On the other hand, in order to avoid an overall increase in the cost of the statistics, standard operations are removed from the survey programme if the corresponding price trends have been similar to those for other works in the survey programme (and are likely to remain so in the future).

5. Devising the weighting system

Most price statistics can use the results of specialised statistics to compile weighting systems, but this possibility does not exist for construction price statistics. So that weighting statistics can be compiled, calculation data must first be obtained on standard operations carried out in the base year for given types of structure. This is a major problem for the Statistisches Bundesamt, since there are no relevant address lists. The clients of construction firms have often to be contacted indirectly (e.g. via associations or local authorities). If this succeeds, they then have to be persuaded to give the invoice material to the Statistisches Bundesamt. If the project initiators themselves are very interested in construction price statistics, e.g. local authorities in the case of price indices for sewers or sewage treatment plants, this is a very easy matter, and experience shows that the take-up rate is about 50%. However, it is often very low in the case of private project initiators.

Once the documentation has been obtained on fully invoiced construction projects, the standard operations listed in it are first allocated to the survey headings. A standard operation might, for example, be described as follows in an invoice:

No	Quantity	Description	Unit price	Total price
111	20m²	Wall tiling on existing backing - Height to 2.00m - placing in diagonal joint pattern, white cement mortar pointing, joint width 4 mm; Tile type ..../Manufacturer..... Size 100x150 mm	100 DM	2000 DM

This standard operation would be allocated to the heading "Wall covering of ceramic tiles" in the survey programme. If the total prices for all standard operations in the invoice material which can be allocated to a survey heading are added and the sum is divided by the total price of the structure, this gives the (relative) weight of this survey heading. This is done for all the survey headings. In this way a weighting system is obtained for each individual structure for which invoices are available. The system for the type of structure is obtained by calculating the systems for the individual structures.

However, these calculations only take account of the integral standard operations (Cost groups 300 and 400 of DIN 276 - Costs for building [applied by analogy to civil engineering]). These are mainly the headings which become components of the actual structure. Only in the case of residential buildings is an additional price index calculated which also covers headings for the cost groups "Equipment" and "External works". In this index, figures for ancillary

construction operations are mainly obtained from the HOAI (official scale of architects' and engineers' fees).

Since building methods and forms change over time, the weighting systems must be updated whenever a new base year is adopted. This is the only way they can continue to reflect current construction methods and forms. For example, for base year 1991 there were fairly large changes in the weighting structure for road bridges, since in that year many more bridges were built with smaller total spans than in the base year 1976.

Table 1

Weightings of selected construction works (new construction of roads and road bridges)

Differences between various base years or different weighting calculations

Type of structure/ selected construction works	Weighting in ‰ calculated on the basis of:			
	base year 1976	base year 1985	for 1991, price extrapolation of weightings for 1985*)	quantitative components of base year 1991
Road construction	1000	1000	1000	1000
of which:				
Earthworks	441,33	397,98	411,14	323,98
Sewerage works	48,27	54,78	56,91	66,36
Road construction/ upper courses without binder	138,27	133,62	133,62	146,77
Road construction/ upper courses with hydr. binders	45,94	45,61	45,31	24,77
Road construction/upper courses of asphalt	246,50	283,90	266,30	320,34
Road bridges	1000	1000	1000	1000
of which:				
Earthworks	97,95	90,91	94,26	106,43
Road construction/ upper courses of asphalt	31,61	35,23	32,66	31,37
Concrete and reinforced concrete work	594,03	588,37	585,96	467,32
Structural steelwork	133,18	129,86	130,26	144,80
Non-steel structural metalwork/ fitting	27,60	34,14	36,04	31,37
Scaffolding work	52,50	54,87	52,85	56,07

*) Weightings for base year 1991 obtained from the original weightings for base year 1985 and the price trend from 1985 to 1991

It should be noted, on the other hand, that the relatively small number of construction projects evaluated means that the weighting systems are also partly influenced by random factors, the extent of which is, however, limited owing to building regulations and practical requirements.

Table 2
Number of invoices processed
Base years 1985 and 1991

Type of structure	No of invoices
Total residential buildings	56
- One-family buildings	22
- Blocks of flats	25
- Mixed-use buildings	9
Office buildings	13
Industrial buildings	31
Road construction	49
Road bridges	61
Sewers	25
Sewage treatment works	26

Since compiling the weighting systems requires an enormous amount of work, in each base year new systems cannot be compiled for all types of structure. For the weighting systems for the types of structure which are not included, a simpler extrapolation method is used, whereby for the new base year the headings for the previous base year are increased/decreased depending on the changes in prices for the corresponding standard operation between these two base years. No account is taken of any changes in the quantitative structure.

Since the building price indices calculated on the new base are projected backwards until February of the base year, the results for a fairly long overlapping period can be compared with the results published on the previous base. For price changes calculated for base 1991, for example, there were three cases during the overlap from February 1991 to May 1994 in which there were relatively significant differences from those calculated on base 1985 (see Table 3). There were differences of up to one percentage point in both directions. The three cases concerned types of structure for which the updating of the quantitative structure had sometimes produced considerable changes in the weighting schemes. These three types of structure were industrial buildings, roads and road bridges.

Table 3
Price changes for structures between February 1991 and May 1994

Former Federal territory
Base 1985 = 100 and 1991 = 100
Results including turnover tax

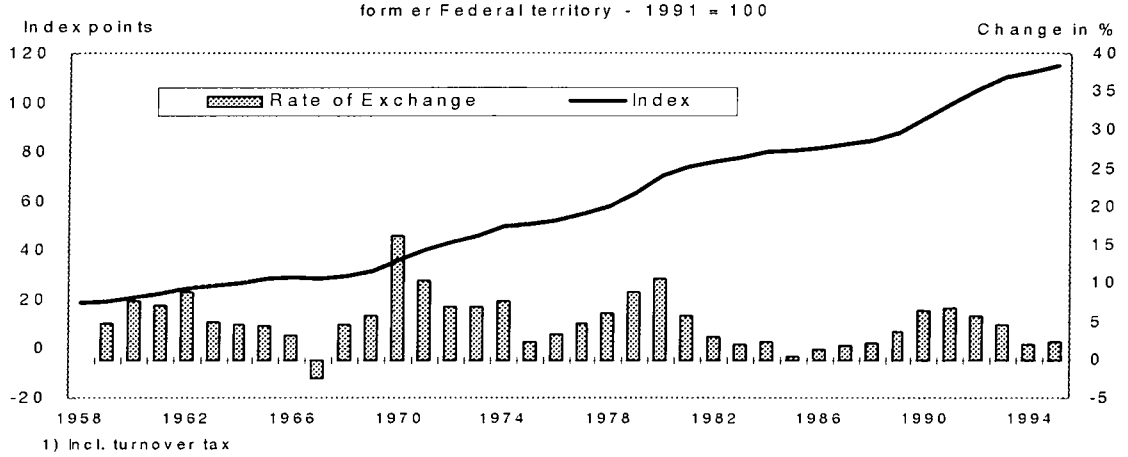
Type of structure	Price change in %	
	Base 1985	Base 1991
Total residential buildings	16.2	16.2
One-family buildings	16.3	16.3
Blocks of flats	16.2	16.3
Mixed-use buildings	15.5	15.7
Office buildings	15.3	15.3
Industrial buildings	13.5	14.5
Road construction	11.8	11.0
Road bridges	10.9	11.5
Sewers	14.6	14.6
Dams	13.9	13.9
Sewage treatment works	-	14.7

6. Results

The selected results of the price index for residential buildings set out below are given as a representative example for the other construction price indices. The annual

indices have risen steadily since this price index was first calculated in 1958. The only exception was 1967, when the price index fell by 2.4% compared with the previous year. If we consider the rates of change, however, a well-defined cyclical pattern becomes apparent (see Figure 1).

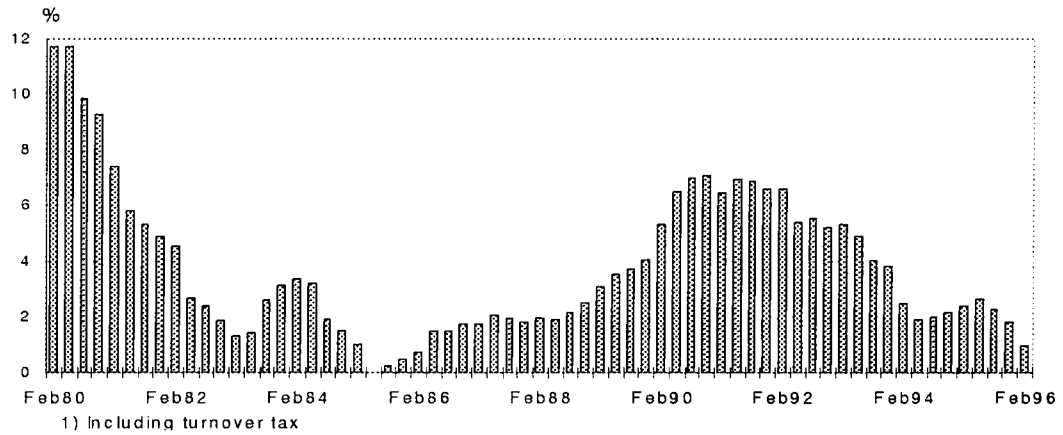
Figure 1
PRICE INDEX FOR RESIDENTIAL BUILDINGS[1)]
and its annual average changes in relation to the previous year in %
TRADITIONALLY BUILT NEW CONSTRUCITON
former Federal territory - 1991 = 100



1) Incl. turnover tax

There is a seasonal pattern in the rates of change of the price index for residential buildings in relation to the previous quarter: the steepest price rises are usually in May, while they are relatively small in November and February. If the index figures in one quarter are compared with those for the same quarter for the previous year, the cyclical pattern observed in the rates of change of the annual indices is even more marked (see Figure 2).

Figure 2
PRICE INDEX FOR RESIDENTIAL BUILDINGS[1)]
Changes in relation to the same month in the previous year in %
TRADITIONALLY BUILT NEW CONSTRUCTIONS
Former Federal territory - 1991 = 100



1) Including turnover tax

Table 4 shows an extract from the published results. Since the standard operations were selected in such a way that they also provide representative coverage of construction works, it is possible to portray the price indices broken down by construction works.

The table shows, for example, that in Germany in 1995 the prices of carcasing work for the construction of new residential buildings rose in relation to base year 1991 at a below-average rate (+ 15.6%, corresponding to an annual average rate of change of +2.9%), while those of finishing works rose at an above-average rate (+19.5%, annual average rate of change + 3.6%). Over the five-year period, the index of construction works on base 1991 = 100 ranges from 107.6 (sheeting work) to 125.7 (embankments for technical structures), the annual average rates of change ranging from +1.5 to +1.7%.

Table 4
Extract from the published results for the price index for residential buildings (New traditional constructions)

Germany - 1991 = 100

Construction work	Weighting	1995 index *)
Earthworks	29,35	114,4
Sheeting work	1,69	107,6
Pile driving	0,32	110,5
Sewerage works	10,83	113,2
Masonry work	152,97	117,5
Concrete and reinforced concrete work	202,53	112,5
Natural stonework	9,36	118,9
Concrete stonework	7,55	120,5
Carpentry and structural timberwork	51,70	116,4
Structural steelwork	0,19	109,8
Insulation	8,41	119,7
Roofing and roof insulation	39,61	120,4
Plastering and stucco work	82,89	117,0
Scaffolding work	4,90	109,2
Carcasing	602,30	115,6
Plumbing	15,53	119,8
Wall and floor tiling	32,90	118,7
Screed work	18,77	120,5
Mastic asphalt work	0,27	114,4
Cabinetmaking	78,91	116,4
Parquet flooring	3,80	122,5
Roller shutters	7,71	116,3
Non-steel structural metalwork, fitting	38,42	118,9
Glazing	2,96	119,1
Paintwork	21,30	120,9
Floor covering	13,62	118,5
Wallpapering	7,74	122,4
Air conditioning	3,99	116,7
Heating and hot water systems	48,26	122,8
Gas, water and drainage installation	49,22	121,3
Electrical cables and wiring	41,33	119,2
Lightning protection	0,46	118,2
Embankments for technical structures	6,31	125,7
Handling equipment	6,20	115,5
Finishing work	397,70	119,5
Integral construction operations	1000	117,1

*) Including turnover tax

FRANCE

Housing maintenance Price Indices
I P E A
Methodological Note

Odile Bovar, Ministère de l'Equipement

1. IPEA field

1.1 Objectives

Maintenance and improvement works, particularly on housing, account for an increasingly large proportion of building activity. We therefore had the idea of devising indices for measuring movements in the prices of housing maintenance and improvements. A combined index, the IPEA (housing maintenance price index) will measure price trends for the whole range of these works. Partial indices will also be published. These indices will supplement the only index available for this sector: the new construction cost index (ICC).[6]

These indices will act as a deflator for calculating the volume of activity, as an indicator for assessing short-term trends, and as an index for index-linking contracts.

1.2 IPEA coverage

Coverage extends to maintenance and improvement work on existing housing (houses and blocks of flats) in Metropolitan France.

The following are not included:

- major renovations or refurbishment involving work which is similar to new construction, i.e. work carried out after virtually total demolition;
- work following a change of use, e.g. industrial buildings converted into blocks of flats;
- work not involving market prices, such as:
  work sub-contracted by another firm;
  maintenance work carried out on a flat-rate labour basis;
  do-it-yourself work by private individuals;
- supply of materials only (distributive trade) or only placing of material without supplying it.

1.3 Definition of prices

We measure the changes in market prices for housing maintenance and improvements. This involves measuring the movements in the price of transactions between a construction firm and its (public or private) end customer. This means that works carried out by a firm as a sub-contractor are not included. The price recorded in the last month of each quarter is that which figures in the contract at the time it is signed.

The price excludes VAT and must take account of any rebates and discounts granted to the customer. These transaction prices include specific taxes and expenses payable by the firm, such as site expenses, rubble removal, etc.

We survey the prices of works which are representative of the price trend for a whole range of works carried out by a firm.

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6) See chapter III.2 below.

2. Breakdown of the IPEA field

The field of maintenance and improvements has been broken down into families (see Table 1), which in turn have been broken down into categories (see Table 2). It should also be pointed out that there is an intermediate calculation level for calculating the indices by category: the category indices by stratum (see paragraph on calculation and weighting).

2.1 Breakdown of the area into "families" of homogeneous works

The field of maintenance work was broken down into 12 subsidiary fields called **"families of works"**, each of which corresponds to a class of the NAF[7] classification, with one exception: masonry carcass work, which comprises three NAF classes (45 2A, 45 2B and 45 2V). These families do not, on the other hand, correspond to the NACE classes, of which the NAF is a more detailed breakdown.

Table 1

NAF code	Family of works	Weight in % (1993)
45 2J	Roofing	07
45 2K	Waterproofing and dampproofing	02
45 2V(*)	Carcass work	25
45 3A	Electricity	10
45 3E	Plumbing	11
45 3F	Heating	07
45 4A	Plastering	02
45 4C	Timber and PVC windows and doors	09
45 4D	Floor and wall coverings	04
45 4F	Metal fittings	04
45 4H	Glazing	01
45 4J	Painting and decorating	18
	Total E-A	100

(*) This heading concerns classes 45 2V, 45 2A and 45 2B

7) French classification of activities (note of Eurostat)

This breakdown into major families is consistent with the activities surveyed in the annual survey of businesses. The proportion of works carried out directly by firms (excluding sub-contracting) is used as a weighting in the calculation of the combined index. The NAF is relatively well adapted to the grouping of homogeneous works.

It has been decided that glazing will not be surveyed, since it accounts for such a small proportion of the IPEA field. Furthermore, specialised insulation work will not be a separate family, since insulation is included in a number of works forming part of the activities of plastering, roofing, windows and doors, and carcass work.

2.2 Breakdown of families into "categories" of homogeneous works

Each family of works is itself broken down into major **categories of works**. These categories are laid down in consultation with technicians in the sector. They are homogeneous mainly in terms of the nature of the works carried out. For example, the "painting and decorating" family is subdivided into internal paintwork, internal wall coverings, and external coatings. Thus they are homogeneous in terms of the materials used and techniques applied. We also try to check that these categories correspond to subdivisions which figure in estimates and that they cover the most common works carried out by the trade in question.

2.3 Standard operations

For each category the firm defines work classes which are homogeneous in terms of price trends. It chooses a type of work which is representative of each class, called **standard operation**. The choice of these standard operation is based on a knowledge of the behaviour of specific prices on the firm's

markets. These works give rise to transactions which will be the subject of quarterly price collections. These transactions are characterised by the nature of the works, the quantities sold, the size of the site (e.g. in m^2), the type of customer, and the particular site conditions: demolition, scaffolding, rubble removal, etc.

Table 2

Field (level 4)	Family of works (level 3)	Category of works (level 2)	standard operation monitored in the firm (level 1)
Housing maintenance and improvements	Plumbing	Mains water supply	Mains water 1
			Mains water 2
		Waste water removal	Drains
		Bathroom valves and taps	Fitting of mixer tap
		Bathroom fittings, hot water supply	Fitting of wash basin
	Coverings	Tiling	Ceramic wall tiling
			Stoneware floor tiling
		Soft floor coverings	Laying of fitted carpet on screed
	Timber and PVC doors and windows	Windows and external doors	...
		Doors, other works	...

3. Sampling

This type of survey is completely new in this sector. It was thought preferable to approach volunteer firms and initially, therefore, not to take a random sample. A panel of firms is proposed by the trade associations concerned on the basis of quotas laid down by the statistical department of the Ministry for Infrastructure.

For each family we look for about 120 respondent firms, so that on average 600 prices are recorded per family per quarter. When the coverage of the IPEA field is complete, this will mean a sample of almost 1 500 firms supplying the prices of about 7 000 standard operations.

What are the criteria for drawing up a sample of firms representative of price trends in this field? There are many factors which influence the movement of these prices, but few can be found in business registers or in the annual survey of businesses which can be used as sampling criteria.

The factors influencing price movements may be considered *a priori* to be the following:

- all elements determining factor costs: the prices of materials, labour and energy, whether the firm belongs to a joint-purchasing association, etc.;
- competitive factors influencing the profit margins set by the firm: type of customer (private individuals, companies such as trustees, public contracts, etc.), award of a label recognising the firm's special qualifications;
- the economic climate of the moment, which enables the firm to increase or decrease its profit margins. Since markets tend to be localised, it may be assumed that in certain regions the effects of the economic climate may be felt at different times. Some regions are rather more dynamic than others;
- the size of the firm: it may be assumed that, in view of their production capacity, craft firms cannot react in the same way as large firms to offers of building works of widely differing scope.

For all these reasons, the samples used for each family are drawn up on the basis of the following two criteria:

- the size of the firm: up to 10 employees/more than 10 employees;
- the location of the firm according to France's main planning regions: North, Paris region, Ile-de-France, Centre-East, West, South-West, East and Mediterranean Basin.

Once the strata have been defined, the number of firms is proportional to the value of the direct works, excluding sub-contracting, in each stratum.

The units are not randomly selected. This may constitute a bias (although it has not been proved), but it does make it possible for the moment to be certain of the "volunteer status" of the firms selected for an operation which is as yet little known.

The sample is initially made up of firms whose main activity is that of the family in question, with a minimum turnover threshold. Works in the same family which are carried out as secondary activities by other units surveyed for other families of works are then added. A lower turnover threshold is applied to these "associated" works, which thus have less weight. Such cases are typical since this type of firm engages in a number of activities.

4. Calculation and weighting of the index

The calculation method used is the Laspeyres method. A particular weighting is applied to each calculation level. There are generally four levels of aggregation for calculating the IPEA combined index. It is possible to have more if one wishes to calculate, for example, a partial index for finishing works.

4.1 -Basic index

$$I^t_{e,p} = P^t_{e,p} * 100 / P^r_{e,p}$$

where $I^t_{e,p}$ is the change in the price of standard operation p of firm e in quarter t, with $P^t_{e,p}$ the price of work p in quarter t and $P^r_{e,p}$ the price of standard operation p in the reference period when $I_{e,p} = 100$.

4.2 Stratum indices for each category (level 1)

$$I_{ij} = \sum_{e \in (i,j)} C^0_{e,p} * I^t_{e,p} / \sum_{e \in (i,j)} C^0_{e,p}$$

where i is stratum i defined by crossing a size-class and a geographical zone, and j is a work category within a family.

The basic indices are weighted by $C^0_{e,p}$, which is the turnover of the firm on work category j for which p is the representative. The turnover is that for base year 0, which is the turnover recorded for the financial year during visits to firms.

Note: the stratum is not regarded as a breakdown level of the field but as a calculation level for the purpose of improving the accuracy of the index, and as a calculation device to enable the results of the sample to be matched against a known statistical source.

4.3 Category indices (j) (level 2)

$$I^t_j = \left[\sum_i A_{i,j} * I_{i,j} \right] / A_j$$

There are no statistical sources enabling us to determine the proportion *(Aj)* of the categories of works in a given family (see note above), nor the proportion *(Aij)* of works in a category by stratum. However, the annual business survey tells us the distribution by stratum of all the works in a family *(Ai)*.

We therefore seek to estimate *Aij* from *Ai* and from the structure provided by the firms surveyed:

If we have an estimator *Rij* of *Aij/Ai*, then we have *Aij=Rij*Ai*, the chosen estimator of *Rij* is *aij/ai*, where *aij* is the distribution of works in the categories by stratum of the firms in the sample.

Thus $Aij = Ai\,(aij/ai)$

$Aj = \Sigma\, Ai\,(aij/ai)$

4.4 Combined family index (level 3)

$$I_f = \sum_j A_j * I_j \,/\, \sum_j A_j$$

The weightings *(Aj)* are deducted from the estimator, giving

$$Aj = \sum_i A_{ij} = \sum Ai(aij / ai)$$

4.5 Combined IPEA index (level 4)

$$I = \sum_f A_f * I_f \,/\, \sum_f A_f$$

The weightings *(Af)* are the amounts recorded for housing maintenance works, less any works carried out as a sub-contractor, in the annual business survey, in which each family is aligned with one or more NAF classes.

5. Collection

5.1 Price collection

Each price collection was defined with the firm in question during a visit by an enumerator. It is sent quarterly by post, and there are two follow-ups and then a reminder by telephone. The coverage rate is between 80 and 90% depending on the family.

5.2 Treatment of non-responses

Sometimes a firm does not enter the prices of one or more works for a particular quarter. The firm's returns are not amended, but the basic indices are estimated. They are estimated automatically by imputing to the missing index the changes in the stratum to which it belongs, i.e. the changes in the category of works in a given geographical zone for a given size-class. This therefore involves making the major assumption that the behaviour of non-respondent units is the same as that of respondent units.

5.3 Quality effect

Checks are carried out during input of prices. Changes regarded as excessive are sometimes explained by changes in the products used in the work. An adjustment is then made to reconstitute the change which would have occurred in the price of the work if its components had not been changed.

We estimate, in conjunction with the firm, the change which would have occurred in the price of the work if it had not been changed.

We thus seek to estimate the coefficient involved in the formula for calculating the basic series.

6. Publication

It is planned to publish the combined IPEA index and the indices by family, none of which have yet been published since it is first necessary to have adequate coverage of the field and price collections over a fairly long period. The first price collections began in September 1993 on painting, then in December 1994 on three other families (floor

coverings, timber windows and doors, and plumbing). We shall have to wait for the results of several quarters for three families currently being surveyed (electricity, plastering and roofing) before we can begin to publish the IPEA indices.

7. Main problems encountered

7.1 Breakdown of the field

The problems involved in the annual survey with regard to the application of the classifications are also encountered here. They mainly concern works which are closely related and hence difficult to distinguish between when defining the content of a particular family.

7.2 Minimum amount for maintenance and improvement works

A minimum amount is imposed in order to make sure that the transactions concerned are regular. The sample is composed of very small firms engaged in a number of building works, from which housing maintenance is singled out. Since it is only the turnover on this which is recorded, we often have to eliminate from the sample firms which are not easy to recruit in the first place.

7.3 Surveying a population of craft firms

They have a shorter life-span than other types of business, they are difficult to contact since the head of the firm is often away at building sites during the day, etc.

7.4 Real transactions

The prices recorded must reflect real transactions net of rebates and discounts. The method which seeks to reconstitute a standard building site *a posteriori* may involve a bias which is difficult to prove.

Despite these difficulties, this method seems promising enough to contemplate perhaps extending it ultimately to other types of construction. It is not original, since it is an adapted version of the method used in Germany for the whole construction sector and of that used in France for the index of industrial selling prices.

This projet was initially conducted, at the request of the French Ministry for Infrastructure, by Mr Elias, an engineer at the Centre Scientifique et Technique du Bâtiment (CSTB). The INSEE provided assistance on a number of occasions, in particular by proposing the estimator used to calculate the weightings (Christian Hesse).

THE NETHERLANDS

Civil Engineering - Price Index for the Output of Road Building

Sijbrand Veenstra, Statistics Netherlands

Statistics Netherlands has a set of six different indices based on the tender price for civil engineering construction. The indices cover the cost of materials, including transport to the site, labour, sub-contractors, equipment hire, overheads and profits.

The indices are calculated twice-yearly, according to the Laspeyres formula. The base-year is 1979=100. A booklet with a full description of all the details of the specific project, amounts, length, circumstances etc., was supplied to the respondents. The six specifications were updated two years ago.

The indices are based on the following six types of work:

- construction of a brick pavement road
- construction of an asphalt road
- the upkeep of asphalt roads outside the built-up area
- construction of sewerage in a built-up area
- construction of sewerage outside the built-up area
- undertaking of mechanical earthwork for the construction of roads, bridges and fly-overs.

1. Calculation and weighting

The tender price-data used in the index reflect discounts where these can be obtained. They include the total amount of labour costs, including the social contributions paid by the employer and exclude VAT. The returned questionnaires also include for several parts of the project, the actual cost-price. Weighting is not required, because the price indices derived for the specified projects are not compiled in an overall index.

2. Other relevant information

Other relevant information on this survey is summarised below:

- **periodicity**: twice a year: (February and August)
- **staff-capacity per year**: 0.5 - 0.75 full-time equivalent
- **total number of received tenders per half year**: 120 - 150
- **response rate**: 80 - 90 %
- **response burden**: 120 minutes per tender
- **regional details**: no regional details
- **respondent**: construction establishment in the civil engineering sector
- **provisional figures**: 1 period
- **main publications**: SN-Internet, SN-Weekly Bulletin, SN-Monthly Bulletin of Construction Statistics
- **internal checks**: comparison of results with labour costs-information and producer price indices and external equipment indices.

SWITZERLAND

The Swiss Construction Price Index

General Design

Yves Guillod, Swiss Federal Statistical Office

1. Mandate and objectives

1.1 Background

The plan to set up national statistical indicators of construction costs goes back several decades already. However, all efforts up until now have failed, due to either the methodological difficulties encountered or to a lack of funds.

The project's launch was supported by the tabling of a parliamentary motion in March 1993 by Councillor of States Bisig calling for the creation of a national construction cost index.

1.2 Field to be covered

In order to ensure that our goals would be achieved, we didn't want to set our sights too high from the outset. This is why only the following three construction types were chosen as the field to be covered in the first phase:

- A civil engineering project (new construction), in all likelihood a road section with an underpass.
- A non-residential building (new construction) of an average level of technical complexity, that is to say, offices or shops.
- A residential building (renovation), probably an apartment block.

1.3 Objectives

The construction cost index is intended to reflect as accurately as possible the current state of the entire construction market and to give a reliable account of "pure" trends of the prices paid by public or private clients throughout Switzerland.

1.4 Applications

The Swiss construction cost index will be used for the following three main applications:

- As a short-term indicator (short-term economic analysis)
- As the basis for calculation of real values (deflation)
- Direct practical applications (incorporation in various indices)

2. Methodology for the future Swiss construction cost index

2.1 General approach

The project's general approach, which is rational and pragmatic, has tried to:

- Make as much use as possible of existing sources of information, i.e. construction and trades nomenclatures, the experience of existing Swiss and foreign indices and the data already obtained by other statistical systems.

- Achieve maximum compatibility with Swiss construction statistics, for example, and with EUROSTAT for the construction nomenclature.

- Adopt a modular structure which will allow future increases in the number of types of construction observed, without entailing too much extra work or extra cost.

2.2 *Consulting interested parties*

During the preparatory work, it became clear that all interested parties would have to be informed. A presentation of the project was therefore sent to them together with a questionnaire which would help us to get a better picture of their wants and needs. The results of this consultation, which have been incorporated as fully as possible into the general design, showed that:

- There is a real need for such an index, especially in the public sector.
- The choice of the three first-phase construction types meets with wide approval.
- Regionalisation of the results is necessary.

2.3 *The steering group*

As it is essential that this new statistical system is well supported by the industry and in economic and political circles, the planning of the general design was carried out with the help of a steering group comprising representatives and experts from the construction sector, the federal offices concerned, the statistical offices of the cantons and towns and economic research institutes.

2.4 *Definition of the index*

The Swiss construction cost index will be a true price index (output price index). It must reflect market price trends. That is to say that the prices collected will be VAT-free contract prices, less all discounts, taking into account the contingency and profit margins that companies may allow themselves depending on the fluctuations in supply and demand.

2.5 *The type of index*

The Swiss construction cost index will be a Laspeyres-type index, with a constant base period weighting plan. However, it will be implemented flexibly in order to be able to take account of changes in the quality and range of goods and services, and changes of data providers.

2.6 *The statistical system's first objective*

The first objective of this new statistical system is to measure price trends in the construction sector. However, where it proves to be possible and of interest, absolute average prices of construction operations and components, or for completed work (for example the price per cubic metre of concrete, per square metre of reinforced concrete slabs or per cubic metre of construction) will also be calculated and published.

3. The price collection method

The chosen price collection method is that of recording the prices of jobs done. This stems from the notion that construction is not a whole, but the sum of the various partial jobs done by the different building trades. This consists of periodically asking the data providers for their prices for a series of clearly defined unitary jobs which are considered to be sufficiently representative of the types of construction whose evolution is to be measured.

This allows a less complete definition of the standard basket. In the field of construction, the experience of foreign countries shows that

the jobs of which the basket is composed must represent at least 75% of the total price of the object in order to give a representative general index for the object. It has been noted, moreover, that in practice, 80% of the total price can be achieved with only 20% of the total number of jobs which go to make up a contract. It is therefore clear that a judicious choice of a small number of jobs can give reliable results.

The main advantages of this method are the following:

- It guarantees a good match between the prices recorded and the market situation because it allows contract prices to be recorded.
- It can be applied equally well to civil engineering and the building industry.
- It affords greater flexibility in the collection of prices because the weighting plan or job list can be relatively easily updated using the accounts of construction work already carried out. If need be, new jobs done can be added to the price collection formula, or conversely, jobs which are no longer used can be removed.
- It also affords greater flexibility for the user. In fact, its modular structure should encourage him to use the indices available in a way which is more appropriate for his needs.
- It allows an enlargement of the statistical system without significant cost because, in the case of an extension of the price collection to new construction types, a large proportion of the prices already collected can be re-used. In order to do this, it will be sufficient to incorporate them into a new weightings plan.
- In all likelihood, the costs involved for the price-collecting authority as well as for the data providers will be lower. In fact, the number of prices collected is lower and the prices received can often be applied to several construction types.

3.1 Particular problems associated with the price collection

A few problems, arising from the choice of this method, remain to be solved:

- Its applicability to the technical trades (heating, electricity, etc.) has still to be tested by pilot surveys. In this case it is more difficult to define the standard jobs done because these are closely linked to the intended construction project and therefore vary from building site to building site.
- Complementary methods must be introduced for the domains of architects' and engineers' fees and additional costs (insurance and banking costs, taxes and administrative fees). These methods will very likely be comparable to those for invitations to tender.

3.2 The construction nomenclature

The construction nomenclature must meet the general criteria listed below. These are not always mutually compatible. Where this is the case, the optimal solution will have to be found. A good construction nomenclature must therefore:

- Meet the specific needs of a construction costs index.
- Be compatible, on several levels, with its statistical environment.
- Make the best use of existing information sources and take advantage of all possible synergisms, in particular through the use of all the figures and data already collected.

- Correspond as far as possible with international nomenclatures and recommendations, and primarily with those set up by the European Union (EU).

From the very outset, its general structure should distinguish between civil engineering and the construction industry, and then within each of these domains between new construction and renovation work. At the present moment in time, the most highly detailed level consists of a distinction, for the building industry, between residential and non-residential buildings and, for civil engineering, between highway construction and other civil engineering projects.

3.3 The jobs done nomenclature

The aim of a price index is to keep close track of changes over time in the price of the goods under consideration. This implies that the goods should be clearly and unequivocally defined. In the present case, the goods are constructions. A nomenclature describing in detail all the jobs carried out in the course of these constructions is therefore essential.

The basis of this nomenclature has been provided by the Swiss Research Centre for Building Rationalization (CRB). The CRB has in fact developed, in the field of construction, a system, made up of various nomenclatures covering the different activities in the field of construction. This system is well established in practice and has the advantage of also being available in computer-readable format. It meets the main criteria which a jobs done nomenclature should satisfy:

- Homogeneity: this is guaranteed by a clear and unequivocal formulation of each job.
- The level of detail: this is very high and provides an overview of all the very different jobs done.
- The existence of data for the weighting: the fact that the system is actually used by the trade facilitates calculation of this.

4. The standard basket

4.1 The contents of the standard basket

From the Swiss point of view, the construction costs index, in terms of the global index by type of structure should keep track of market price trends from the purchaser's (the client's) point of view. This means that, apart from land prices (which are the subject of another statistical system currently being prepared by the Federal Statistical Office), all expenditure items which come into the building process, and therefore into the final price of the project, must be taken into account. That is to say that, in addition to the actual construction work (earthworks, carcassing, finishing, external features), site preparation and connection to mains services, secondary costs (insurance, banking, etc.) and engineers' and architects' fees should also be recorded.

On the other hand, the operating equipment is not to be taken into consideration since the construction cost index is applied, by definition, to the completed structure only, prior to installation of any movable fittings, furnishings or decoration. Thus composed, the basket is also compatible with national accounts and the construction cost index will therefore be a reliable basis for the calculation of real figures of construction investment.

4.2 The structure of the standard basket

The Catalogue of Standard Building Description (CSBD Construction) set up by the CRB is the classification used to define the structure of the standard basket. The forms for the collection of the prices of jobs done in the Swiss construction cost index will be set out in accordance with this catalogue system for all the construction sectors in which its use

is sufficiently widespread to allow representative market prices to be collected.

In the installations sector of the building industry, where the CSBD has recently been published and is at present the least used, it might be temporarily necessary to use the labels of jobs done effectively used in practice for tenders, instead of the CSBD items, in order to ensure the collection of real market prices.

4.3 *Determination of the standard basket*

The exact determination of the jobs done to be taken into account for each construction type will be made at national level on the basis of a sample of accounts representative of the type of project taken from throughout Switzerland. For the first construction types in which price trends will be observed by the Swiss construction cost index, these accounts will be obtained from construction clients mainly in the public sector, but also in the private sector.

This important phase of the project will require the involvement of construction professionals in order to arrive at a truly representative standard basket, and the result obtained will have to be tested in practice using pilot surveys. The main aim is to regroup all the chosen jobs in a single comprehensive form for each trade, covering all the construction types under consideration in the index.

4.4 *The standard basket aggregation plans*

For publication, the elementary jobs will be aggregated in three ways. The first two are part of the CRB system and the third is in response to the requirements of national accounts.

- The first approach stems from the idea that a construction project is made up of a whole series of different elements (windows, insulated cavity wall, reinforced concrete slabs). Therefore it gathers the elementary jobs as such complete elements described in a classification known as the Code of costs by element.
- The second approach is derived from the idea that a construction project represents a certain number of work categories (windows and exterior doors, masonry, concrete and reinforced concrete). Therefore it gathers the elementary jobs in such work categories, which are also accounting heads, in the Code of construction costs. It must be said that work categories can also be defined as a collection of elements from the first approach.

The priority for the Swiss construction cost index is to publish, in all cases, aggregated indices for construction operations. However, whenever possible and if the elementary jobs done taken into consideration allow it, aggregated indices of construction elements will also be published.

- The third approach should allow deflation of the production accounts of the construction branches. Jobs should therefore also be aggregated according to the structure of the General industrial classification of economic activities (NACE). It will therefore be necessary to develop a conversion key between the CRB system and the NACE.

4.5 *Regionalisation of the index*

The particular features of the construction sector lead almost inevitably to the need to regionalise the results. If, in certain sectors of the economy (industry, for example), the markets are national, international or even global, in the construction sector on the other

hand (at least for the building trade), the markets are often regional if not local. This situation is also displayed in the results of the consultation, and the steering group also considered regionalisation to be very important.

Regionalisation of the Swiss construction cost index involves defining the corresponding regions. Division into small units such as communes or districts is ruled out by the excessive costs that this would entail. The same goes for dividing up into cantons: the calculation of separate indices for each canton would still be too expensive. Therefore, the only regionalisation which can be considered is one in which the number of regions is relatively low.

Preference has been given to a geographical and political approach which groups together geographically-linked cantons as major regions, taking into account the geographical boundaries of each canton, since this is the only method with which comparability with other statistical systems is assured. For the time being, a geographical and political division of Switzerland into five or nine major regions is being considered. Furthermore, it is equally possible to extract from these major regions several cities which themselves could be considered as extra regions. These cities would thus be, on the one hand, a part of a major region and, on the other hand, an autonomous region with its own results.

The final definition of these major regions will only be decided at a later, more detailed design stage. In this way, any possible future changes in the FSO's general regionalisation plan can be taken into account. This regionalisation plan must also be developed in conjunction with the corresponding studies which the EU is carrying out.

5. Weighting

5.1 *Applying weights to the jobs done*

The weighting of the jobs done, for a particular construction type, will be taken from the same accounts used for defining the standard basket. It is therefore defined for Switzerland as a whole and is valid for all regions.

5.2 *Applying weights to the construction types*

This weighting is essential, in the long term, for the aggregation which will allow the building trade index on the one hand, the civil engineering index on the other and finally, the general construction cost index in Switzerland to be obtained. The weighting of each construction type will be done at regional and national level. The primary source of these weightings is the Swiss construction statistical system and more specifically the survey of completed constructions.

5.3 *Degrees of calculation and aggregation*

Different degrees of calculation and aggregation must also be defined. The first degree consists of compiling the list of the individual prices received. These prices must then be aggregated to obtain the index for each job done. This will very probably be done using the basic indices method, although the average price method could also be used in some domains. The jobs done indices are aggregated in turn (weighted mean) to obtain the regional project indices. The regional indices for a particular construction type are then aggregated (weighted mean) to come up with the national index for this construction type. Finally, in the long term, the indices for the different construction types will be

aggregated (weighted mean) to give the overall index, for the building trade or civil engineering, in each region and for all of Switzerland.

6. Categories of data suppliers

One of the important factors influencing the representativeness of the index is the quality of the prices sent in by the data suppliers. In order to improve the match between the prices received and market prices, requesting prices from clients as well as companies is being considered because, as a general rule, clients are only aware of the prices for their own contract, that is to say, real market prices. However, before being able to take full advantage of this source of information, the necessary experience will have to be acquired by means of pilot surveys.

6.1 Method of choosing the sample

In order to have reliable and well motivated data suppliers, the sample will be specifically targeted. This will also lead to a reduction in the costs involved in bringing the data suppliers up to date. Concerning the category of the enterprises the following criteria should be adhered to when making the choice:

- The maximum number of large enterprises should be included in the sample in order to cover, in terms of turnover, a significant proportion of total construction volume.
- Small and medium-sized enterprises should similarly be taken into account, in order to ensure that this sector is adequately represented in the sample.
- The regional distribution should be balanced. In this case, the determining criterion for regional distribution is not the location of the registered office of the enterprise, but on the contrary, the location of the building site from which prices have been sent in.

So far as is possible, and so long as it is worthwhile, these criteria should also be applied to the choice of clients and, if necessary, of architects and engineers.

7. Price collection details

7.1 Periodicity of the price collection

The Swiss construction cost index is a short term indicator which must therefore reproduce faithfully and without excessive distortion the movements which take place in the Swiss construction market in the course of the year. In order to achieve this aim, a bi-annual periodicity is sufficient: the Swiss construction cost index will therefore be calculated on a half-yearly timetable. In this way, the costs incurred by the data providers and the price collection authority are kept within reasonable limits.

7.2 Price collection periods

The Swiss construction cost indices will be calculated on 1 April and 1 October each year. They will therefore be comparable with existing regional construction cost indices. Equally, in terms of the indices of producer prices and import prices, the majority of the surveys concerning investment in capital goods also take place in these two months.

However, for the new Swiss construction cost index, 1 April and 1 October should not be considered as reference days, as in the case of the regional housing construction cost indices currently in use in Switzerland, since for the April index, the data used will in all probability be the prices of contracts completed in

February and March and, for the October index, the prices of contracts completed in August and September.

7.3 The weighting period

The statistical sources for the weighting should be gathered throughout 1996. For the jobs done weighting, these sources are the accounts of construction projects carried out for clients mainly in the public sector, but also from the private sector. These accounts, taking into account the duration of the projects, will therefore give a picture of projects constructed in the years 1993, 1994 and 1995. These three years will form the weighting period for the Swiss construction cost index.

7.4 The reference period

According to the general programme which has been set up, the first indices should be published in 1997. The reference period of the Swiss construction cost index, that is to say, the point at which the index has a value of 100 points, will therefore be within that year. The current aim is to be able to fix the reference period as October 1997.

7.5 The extent of the price collection

The first estimations of the extent of the price collection show that, depending on the final choices, it will be necessary to process from about 45 000 prices per collection for a regionalisation of 5 major regions to about 80 000 prices per collection for a regionalisation of 9 major regions.

7.6 The organisation of the price collection

The organisation of the price collection will be that used traditionally for price statistical systems: sending out forms (on paper and diskette), quality control and data verification tests, computer processing the data, further data verification, general evaluation of the results, final calculation of the indices and dissemination of the results.

8. Future enlargements of the statistical system

The Swiss construction cost index, which in its introductory phase will be limited to three construction types, will be extended to cover other construction types. This enlargement will be carried out in stages, and the priorities for which new items should be taken into consideration first have still to be decided. It is almost certain however, that new construction of residential buildings will be the first additional construction type to be observed by the Swiss construction cost index.

eurostat

III.2 The Schedule of Prices Method

⇒ France

⇒ United Kingdom

FRANCE

ICC
The French Index of Construction Costs

Claudie Louvot, INSEE

The index of construction costs measures the trend in market prices paid by the owners of newly constructed buildings to the builders. **It is a price index, not, as its name suggests, a cost index**, since it incorporates trade margins and benefits of productivity.

Its scope is confined to the prices of new buildings intended for use mainly as non-communal dwellings. The most notable exclusions are repairs and maintenance work. The ICC covers only the market prices for buildings (materials and construction work) applying on the date of the contract. The ICC does not take account of the price of land, demolition, various infrastructure systems or networks, architect's or design office's fees, etc., or property development costs. It therefore reflects the trend in the production prices of new houses, not that of their selling prices.

The ICC is published quarterly in the Official Journal. Its base is 1953 = 100. It also appears in the Monthly Statistical Bulletin (BMS), and can be consulted on Minitel.

1. From the legal origins of the index to its current use

The index of construction costs was created in 1953, with a view to indexing "building savings". This involved preserving the value of private investments, including interest on those investments, against increases in construction costs, which the definition of the ICC answers perfectly. It also provides a construction cost deflator which is well suited to the national accounts.

Since the creation of the ICC, its regulatory use has gradually developed, and it now has a major role in the indexing of rents. Until 1958, rents were completely unregulated, at least for houses built after 1948. The law of 1 September of that year laid down a method of calculating them, but, in view of the housing shortage, it excluded new houses so as to encourage housebuilding.

In order to limit inflation, and with a view to fairness, the regulations of 30 December 1958 prohibited automatic indexing of the price of goods and services in line with general indices, such as the general price index. It was still possible to index rents on the basis of numerous indices, provided that they had a bearing on construction or hiring (e.g. INSEE's or the FNB's construction cost indices, the index of the Société des Architectes, the BT01 index and the "Rents and Charges Index").

The role of the ICC in the indexing of rents was reinforced by the law of 9 July 1970. This law prohibited the use of the Rents and Charges Index, which was judged inappropriate because it was a component of the retail price index. Instead, it recommended using the ICC, which provided the "simplest and most reliable" measure. Failing this, it admits the possibility of using a direct index related to the object of the contract. Moreover, any indexation clause which became inadmissible had to be replaced by a clause based on changes in the ICC[8],

8) These provisions were extended to commercial rents in 1977.

unless the parties agreed on a different, legally admissible index.

Since the introduction of the "Quilliot Law" of 22 June 1982, the question of choosing a reference index no longer arises. This Law states that, if the leasing agreement provides for the rent to be raised, "the increase in the rent which results from it may not exceed that in (INSEE's) cost construction index". By giving the ICC this indexing role, the law in fact confers on it something akin to exclusivity.

Apart from some minor adjustments[9], the most recent important regulatory changes date from the summer of 1994, with the Housing Law of 21 July. The legislators preempted the statisticians and took the initiative with smoothing. Henceforth, the annual variation in the average of four quarters of the ICC will serve as the basis for revising rents. Otherwise, the law remains unchanged. The ICC attracted some criticism for being "erratic" and failing to pave the way for equitable quarterly revisions.

Originally conceived as a means of maintaining investment in new housing, the ICC now also preserves capital invested in existing housing. This is not really compatible with its original intention, nor with the interests of tenants, which are, by definition, diametrically opposed to those of their landlords. This is the source of the ambiguity in its current use. Apart from return on capital, there are too many other factors affecting investment in the rental sector (appreciation, taxation, competition from securities), and it is not unreasonable to level the accusation that using the ICC as a means of indexing rents has a genuinely inhibiting effect on the market.[10].

2. Choice of method and overall approach

Compiling a construction cost index involves comparing the prices of a wide range of complex commodities over time. To this end, they need to be broken down into simpler elements. The question is how best to proceed.

Perhaps the most natural method would consist in selecting a type of building, so as to define the basic benefits which it represents. By means of periodic surveys, one could then measure the trend in the prices of these benefits. The indices thus obtained would be aggregated, by reference to the type of building, which would be used simply to define the weighting system. This was the preferred option in Germany, whose industrial base, composed of many medium-sized companies, is suitable for carrying out numerous surveys, some of which are highly involved. This situation does not apply in France, where the craft industry predominates.

From a more general point of view, this method has the advantage of allowing indices to be calculated by trade, type of labour or type of work. On the other hand, it requires frequent reweighting, so as to allow for developments in construction technology. Moreover, it ignores price reductions, which

9) The most important of these was made in 1990, when ICC's indexing role was temporarily extended to cover renewed leases not involving a new tenant (in the Paris region only).

10) One might see in this an attempt by the Forecasting Directorate to exert an economic influence, which suggests that the ICC does not particularly act against the interests of owners (Cf. Note No. 93-c3-099/lc/ph/cs of 8 March 1993).

are frequently available on global markets, particularly in the case of large-scale operations.

Hence, the underlying idea applied to the ICC is to monitor *real and overall contracts.* These are surveyed using a sample, which is renewed for each calculation. The price trend is then measured. It is at this point that they are broken down. The survey is accompanied by the compilation of a file containing not only estimates, but also all the documents (particularly the plans), providing a quantitative insight into the physical characteristics of construction.

Armed with this information, a team of quantity surveyors can break down each building in the sample into its basic benefits. It also has at its disposal a document, the General Evaluation Form (BGE), which shows the prices for these benefits in 1987[11]. It can then calculate what would, at least in theory, have been the overall construction price in 1987. This yields elementary indices, related to the BGE price. These then have to be aggregated using a method described below, *whose underlying idea is to weight the index of each file*[12] *by a factor which increases in line with the number of houses that it comprises and the BGE price.* In other words, the elementary indices are weighted by the relative volumes. The ICC is not calculated in this way in the third quarter, when the conditions for collecting information are not favourable (Cf. section 5).

This method undoubtedly has a number of advantages over the "component cost" method, but it is not without its drawbacks. At a time when the process of European integration is focusing our attention on short-term economic indicators, the ICC is not an ideal index. Firstly, it does not become available until more than three months after the reference date. Its calculation requires inputs from three quarters: firstly, the Surveys Office of the SDISC; secondly, the Office for Assistance to Computer-assisted Management of Markets and Price and Cost Indicators, which calculates the BGE prices, after which INSEE collects all the data necessary for the calculation (basically, weightings and prices). Because of these processing delays, the ICC is based on fairly remote information, although precautions are taken to remedy this lag. It is also open to the charge that its sample is constantly renewed, which probably generates sampling risks. Thirdly, compilation of the ICC calls for highly specialized work, that of the quantity surveyors, which INSEE is not in a good position to monitor.

3. Drawing the ICC sample

In accordance with an INSEE-DAEI protocol (dating from the beginning of the 1980s) concerning the calculation of the ICC, it must be based on a sample of 320 market prices. To obtain them, it is not sufficient to draw a sample of 320 building permits stored in SICLONE. Contracts are not always signed immediately after the permit has been issued and it is difficult, if not impossible, to collect all the relevant documents; also, not all building permits fall under the scope of the ICC. For these reasons, about 1200 permits are drawn, from among those which were issued in *t-2*, for the calculation for quarter *t*. This, at least, is the theory: in practice, only about half of the licences used in the calculation of quarter *t* are obtained from the sample drawn in *t-2*; the others come from the

11) The year of the most recent updates of the BGE: one for houses and one for apartment blocks.

12) The term imposed on us by usage!

previous drawing. The ICC-PRLN survey is done in two stages. The main purpose of the first stage, which is carried out by post, is to verify that the contracts have been signed, but it also ensures that the operation is covered by the ICC; the second, carried out on the ground, is intended to gather together the various documents (Cf. Annexes I and II).

The sampling base is stratified according to the number and type[13] of licences, and is sorted by region. *The probability of inclusion, corresponding to the drawing of 320 permits in the survey base,* is obtained through an optimization calculation involving the variance of the index, depending on cost. The probability grows as the strata become more dispersed, and decreases as the cost of processing a file of this stratum increases: on the whole, probability increases as the size of the sample increases, albeit at a slightly lower rate.

The overall response rate is approximately one quarter: it is therefore necessary to draw four times as many units as would normally be needed for the probability of inclusion. To obtain the sampling probabilities, therefore, the initial probability of inclusion is divided by the anticipated response rates which are modulated according to size categories (Cf. Annex III).

The weightings used in the calculation are the inverse of the optimized probabilities which are rectified by a process of matching. This is intended to reduce sampling risks and correct misinterpretation of the response rates. The ICC is set to the population of housing starts during the reference quarter. This choice was dictated by two factors: firstly, one cannot fix the ICC, according to use, on known sizes of the population, mainly because of the mixture of samples. Secondly, the ICC claims to be representative of changes in house-building costs from one quarter to another, which makes it essential to define its field in a consistent and precise manner. The matching is done by post-stratification, with the layers crossing type and region.

13) Detached, semi-detached/terraced, apartment blocks.

4. The main steps in the calculation[14]

4.1 *The calculation formula*

The trend in market prices in relation to BGE prices is obtained by aggregating the elementary indices, the weightings being their BGE price multiplied by the extrapolation coefficient. It is expressed as follows:

$$E_t^b = \sum_i \frac{q_i x_i \left(\frac{y_i}{x_i}\right)}{\sum_i q_i x_i} = \sum_i \frac{q_i y_i}{q_i x_i} =$$

$$= \frac{\text{sum of weighted market prices}}{\text{sum of weighted BGE prices}}$$

(y_i is the market price, x_i the BGE price and q_i the weighting of a file, for the quarter t)

It is virtually certain that the relative structure of BGE prices accurately reflects that of the prices of services in 1987; but it is probable that the BGE is not as accurate with regard to their level. So as to involve the BGE prices only in the structure, when calculating the ICC, the development of a quarter in terms of BGE

14) Cf. Annex IV

prices is related to that of all the files of the previous year, still in relation to the BGE prices; this is the first reason for catenating the indices. The catenation $\left(I_{t,n}^{n-1}\right)$ thus obtained is applied to the index for the previous year $\left(I_{n-1}\right)$, which itself is the result of a similar calculation.

The index for quarter *t* of year *n* is written

$$I_{t,n} = I_{t,n}^{n-1} \times I_{n-1},$$

$$\text{where } I_{t,n}^{n-1} = E_{t,n}^{b} \Big/ E_{n-1}^{b}$$

4.2 *Adjustments for "category effects"*

Broken down into elementary services, the indices in relation to BGE prices are Paasche indices: they express the ratio of the value of the "basket" of the benefits to its volume, at 1987 prices. If the real prices of these services differ between one "category" of housing and another (for example, between houses and apartment blocks, or between regions), and if the BGE does not take this into account, the price developments of these two categories in relation to the BGE $\left(E_{c,t,n}^{b}\right)$ will be different. If their respective weights vary over time, the result is a mechanical effect, "the category effect", on overall development $\left(E_{t,n}^{b}\right)$.

If the goods constituting these categories are similar, they are said to be "substitutable", and are considered to be one and the same commodity. There is no structural distortion by category and the development of the index is normal. Otherwise the "category effect" exists and has to be eliminated. The "categories" used in the calculation of the ICC are mainly defined by the type of housing (detached, semi-detached/terraced, apartment blocks) and region (5 groupings).

The purpose of treating the "category effect" in the ICC is to adjust the BGE prices in each category, so as to make them homogeneous in terms of real prices (Cf. Annex VII). To this end, a coefficient is applied to the BGE prices. It is differentiated by category and reflects the trend in prices for this category between the date of the BGE and the year preceding the calculation quarter *(n-1)*. Adjusted in this way, the price trend after the date of the BGE is equal to 1 for year *n-1* $\left(E_{n-1}^{b}\right)$ and that for quarter *t* $\left(E_{t,n}^{b}\right)$, which is equal to the catenation $\left(I_{t,n}^{n-1} = E_{t,n}^{b}/E_{n-1}^{b}\right)$, represents no more than a "pure price effect".

These adjustments require a basis for intermediate calculation; this is another reason for catenating the index. The adjustment coefficients are calculated by regression for all the files of year n-1 to calculate the index for quarter *t* of year *n*.

4.3 *The treatment of market prices*

Prior to the calculation proper, the market prices undergo various processing stages. The most important involves harmonizing them in such a way that the price trend is measured at fixed quarterly intervals. On the one hand, the contract dates are relatively dispersed, although they cannot predate the beginning of the calculation quarter by more than nine months. This rule is strictly enforced. On the other hand, prices are not

always fixed or final, and some contracts are liable to revision. Where provided for in a contract, market prices are brought up to date as far as the date of scheduling of work, using the BT01 index, and are, if necessary, revised as a function of cumulative payments. They are then referred to the first month of the calculation quarter (Cf. Annexes V and VI).

Lastly, certain prices comprise benefits not included in the price of the building in the strict sense, such as overall site supervision, design and architect's fees, or other ancillary costs (deposit on building licence, financing plan, etc.). The value of these benefits is deducted on a flat-rate basis. In the more complex case of "off-the-shelf" houses, the survey price is the selling price, including fees and promotion costs; those houses are treated as a specific category.

4.4 Robustness

Despite manual consistency checks, and the many precautions taken in calculation, files occasionally remain whose elementary indices appear too high or too low, for no apparent reason. Their impact on the index is limited by a statistical technique known as *robustness, the principle of which is to suppress outlying values.* The thresholds of robustness are fixed so that only 3% of the files are suppressed.[15]

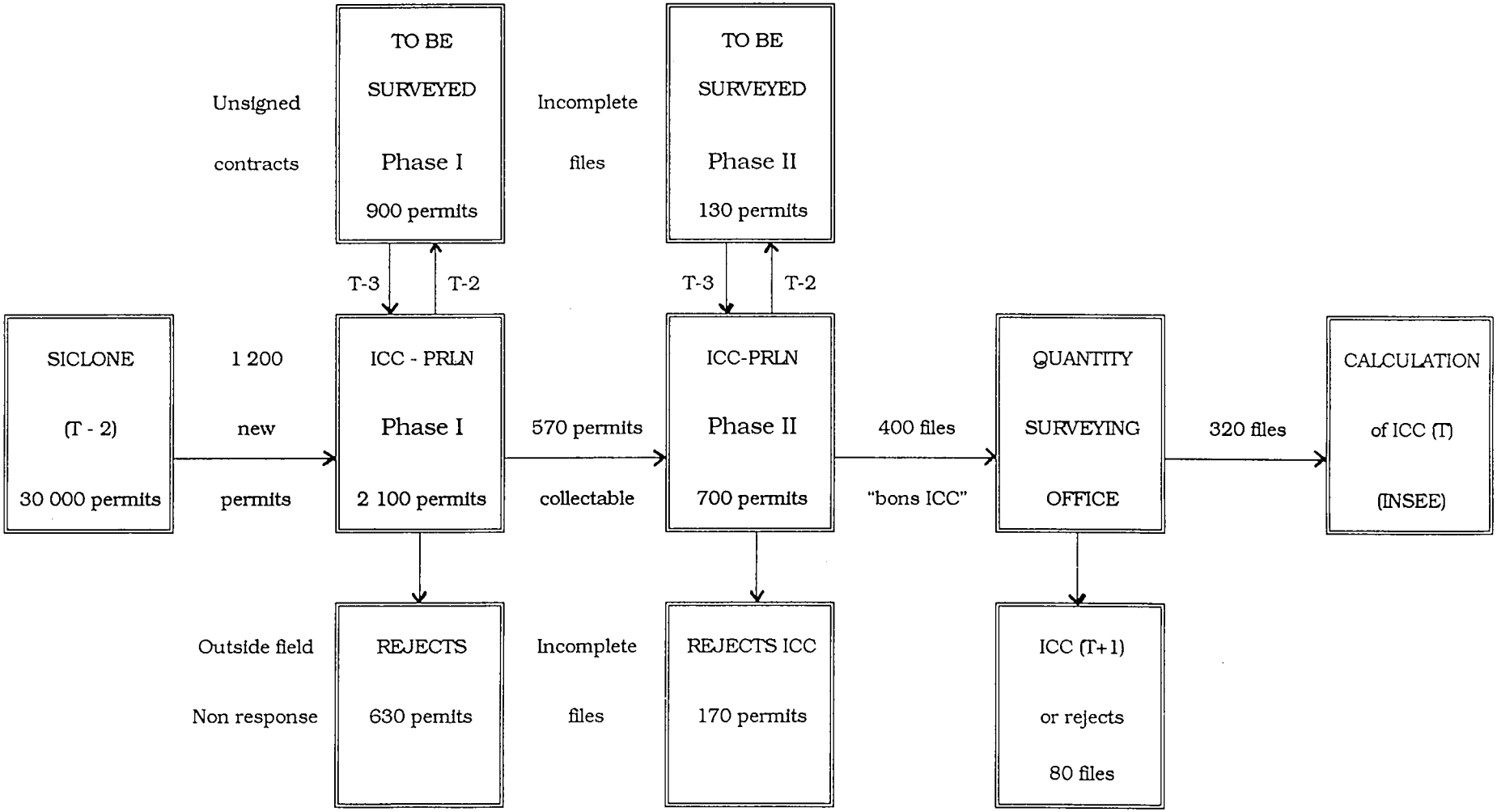
15) For the first iteration, these thresholds are fixed at 1.34/M and 1.34 x M, where M is the median of the elementary indices, which is less sensitive to outlying values and the average for all subsequent iterations (about five in order to achieve convergence).

5. The third quarter: a special case

During the summer period, the difficulties of collecting data from owners are such that it is impossible to make one calculation per survey in good time. The ICC for the third quarter is therefore based on a completely different method. A persistent, fairly close correlation between variations in the ICC and those in the BT01[16] index has been observed. Indeed, the latter is thought to account for the trend in the cost of production factors (intermediate manpower and goods), which companies recoup in their market prices. The ICC for the third quarter is therefore calculated econometrically, using the equation relating its quarterly growth rate to the last two growth rates of the BT01 index.

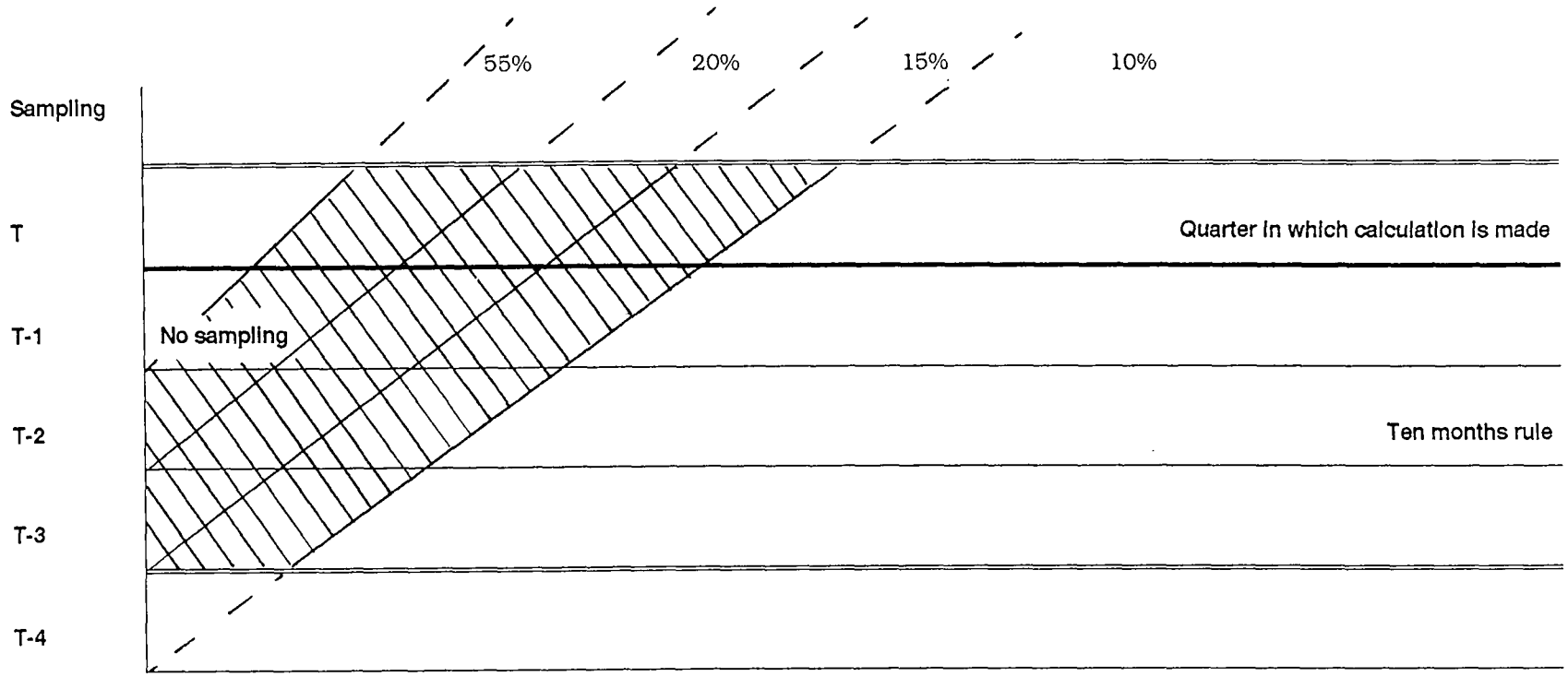
16) BT01: Factor price index covering all building activities - base 100 in 1974.

Annex I


TO BE SURVEYED Phase I 900 permits
Unsigned contracts
Incomplete files
TO BE SURVEYED Phase II 130 permits
T-3
T-2
T-3
T-2
SICLONE (T - 2) 30 000 permits
1 200 new permits
ICC - PRLN Phase I 2 100 permits
570 permits collectable
ICC-PRLN Phase II 700 permits
400 files "bons ICC"
QUANTITY SURVEYING OFFICE
320 files
CALCULATION of ICC (T) (INSEE)
Outside field Non response
REJECTS 630 pemits
Incomplete files
REJECTS ICC 170 permits
ICC (T+1) or rejects 80 files

Annex II

Composition of ICC sample



Annex III

The sampling plan

⇒ The optimized probabilities $\left(\lambda \times p_i\right)$ correspond to a sample of 320 permits from the sampling frame (to a near factor of multiplication).

⇒ To draw the necessary 1 200 permits, the sampling probabilities $\left(T_i\right)$ were defined by dividing the optimized probabilities by the anticipated response rate $\left(\tau_h\right)$: $T_i = \frac{\lambda \times p_i}{\tau_h}$

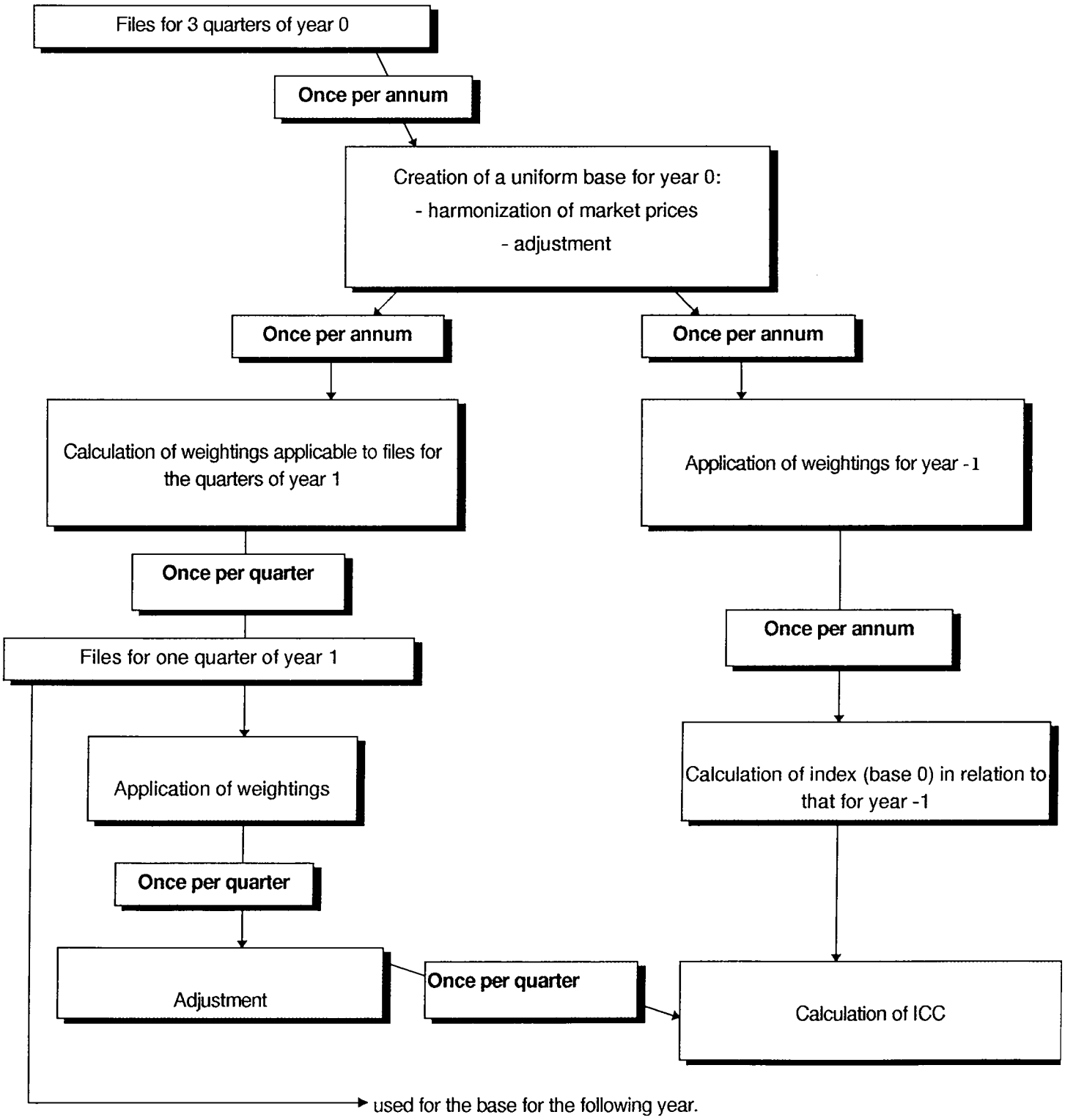
⇒ If τ_h is less than $\left(\lambda \times p_i\right)$, the entire stratum is used (exhaustiveness);

⇒ The probabilities used are defined as:

$$p_i' = \min\left(\lambda \times p_i, \tau_h\right) = T_i \times \tau_h$$

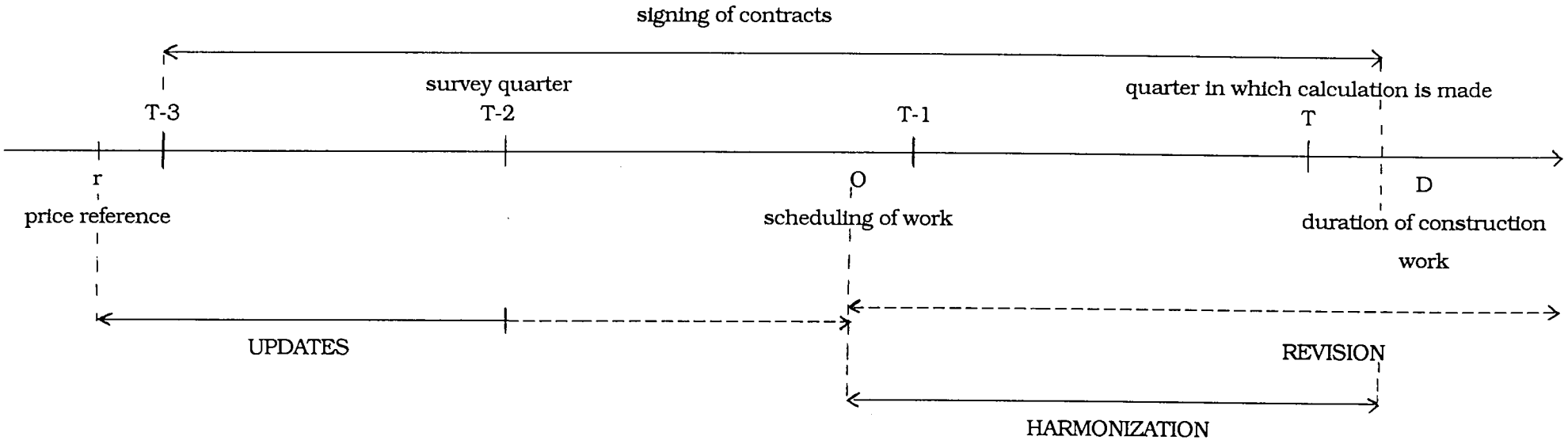
Annex IV

Steps followed when calculating the index



Annex V

Treatment of market prices



Annex VI

Price treatment formula

$$PR_d = PR_r \left(\frac{BT_o}{BT_r} \right)^{act} L(D,e) \left(\frac{BT_d}{BT_o} \right) (1-0{,}0025)^{d-o}$$

⇒ r: price reference; o: scheduling of work; d: beginning of quarter

⇒ D: duration of construction work

⇒ act=1, if the price is liable to revision, 0 if it is not.

⇒ e: monthly change in BT01; BT: BT01 index on the reference dates.

⇒ L(D,e): function of revision (function of cumulative payments).

Annex VII

Catenation of the ICC

The treatment of "category effects"

1. The formula

1.1 Catenation

BGE prices may not correspond exactly to market prices in 1987: the result will be distortions in the elementary indices. These distortions will almost be neutralized if instead of measuring the price trend through the evolution of the BGE price index alone, this index is also related to a counterpart relating to an intermediate base period[17] that obviously displays the same kind of distortion.

The ICC I_t for quarter t is arrived at via three steps:

1. an index I_t^0 is determined, representing the trend in market prices between quarter t and the previous year 0 (intermediate base introduced above);

2. the "gross" index thus determined is then applied to the I_o index of year 0, to obtain the ICC by catenation;

3. the index for year 0 is calculated in the same way, but on an annual basis. It results from catenating an annual link, representing the trend in prices between year 0 and the previous year, with that year's index. The index for a given year is calculated during the second quarter of the following year, when all the files of last year are available.

The catenation formula is as follows:

$$I_t = I_t^o \times I_o \,.$$
where
$$I_o = I_o^{-1} \times I_{-1}$$

The ICC, whose base year is 1953, is about 1 000; the catenation links (or "gross indices") are about 1.

Only the formula for the catenation link is explained below, since the principle of annual calculation is identical.

1.2 The catenation formula

If y_i is the market price of a file, x_i is the BGE price of this file, and q_i is its extrapolation weighting, the formula for the catenation is basically as follows:

$$I_t^o = \frac{I_t^b}{I_o^b} \quad (1)$$

where I_t^b and I_o^b are the indices in relation to the prices BGE in quarter t and year 0 respectively[18].

- I_t^b is expressed as a weighted sum of the elementary indices, their weighting being their "consistency", i.e. the

17) Three "base periods" are used in the calculation of the ICC, corresponding to different reference situations. A distinction is made between the **annual catenation base** (denoted by "0"), **the basis for calculating BGE prices (1987)** (denoted by "*b*") and the **index base year (1953)**; the latter is not referred to below.

18) In fact, as we shall see below (section 2), the BGE prices are adjusted.

relative weighting of the BGE price in the file[19].

- similarly, I_o^b is a weighted sum of the elementary indices for year 0, also weighted by the corresponding BGE prices.

The expression I_t^b or I_o^b is therefore as follows:

$$I_t^b = \sum_i \alpha_i \left(\frac{y_i}{x_i}\right), \text{ with } \alpha_i = \frac{q_i x_i}{\sum_i q_i x_i}, \text{ or :}$$

$$\boxed{I_t^b = \frac{\sum_i (q_i x_i)\left(\frac{y_i}{x_i}\right)}{\sum_i q_i x_i} = \frac{\sum_i q_i y_i}{\sum_i q_i x_i}} \quad (2)$$

The index in relation to the year of the BGE is therefore expressed simply, as the weighted sum of market prices, divided by the weighted sum of the BGE prices.

At this juncture, it is interesting to see this formula broken down into the partial indices pertaining to a *partition* of all the files. The files are deemed to be classified into k number of C_k divided "categories", which together constitute the totality of the files. These subfiles may, for example, relate to houses or apartment blocks, or a regional cross-section. The partial index pertaining to one of these categories is:

$$I_{t,k}^b = \frac{\sum_{i \in c_k} (q_i x_i)\left(\frac{y_i}{x_i}\right)}{\sum_{i \in c_k} q_i x_i} = \frac{\sum_{i \in c_k} q_i y_i}{\sum_{i \in c_k} q_i x_i}$$

and the index I_t^b is written:

$$I_t^b = \sum_k \beta_k \sum_{i \in c_k} \alpha_i^k \left(\frac{y_i}{x_i}\right), \text{ where}$$

$$\alpha_i^k = \frac{q_i x_i}{\sum_{i \in c_k} q_i x_i} \text{ and } \beta_k = \frac{\sum_{i \in c_k} q_i x_i}{\sum_i q_i x_i}.$$

β_k is the relative weighting of category k, α_i^k the weight of the elementary file index within category k.

The expression of I_t^b is therefore:

$$\boxed{I_t^b = \sum_k \beta_k I_{t,k}^b} \quad (3)$$

The various expressions of I_o^b are extremely similar, and the catenation link is written as follows:

$$\boxed{I_t^o = \frac{\sum_k \beta_k I_{t,k}^b}{\sum_k \beta_k^o I_k^{o,b}}} \quad (4)$$

2. The treatment of "category effects"

2.1 *The inadequacies of the BGE*

Broken down into elementary services, the indices in relation to the BGE prices

$$\left(I_t^b = \frac{\sum_i q_i y_i}{\sum_i q_i x_i}\right) \text{ are Paasche indices:}$$

they are expressed as a ratio of the value of a basket of services, in volume terms, at 1987 prices. If the structure of the real unit prices of these services differs from one category to another, and if the BGE unit prices do not take account of this, the result is a mechanical development of the

19) It should be pointed out that a BGE price is in fact a unit of volume, in the accounting sense, at 1987 prices.

index which is not a "pure price effect". This will lead to partial indices which differ between categories, and if the distribution of construction between these categories becomes distorted over time, the aggregated index will not accurately reflect the actual price trend.

2.2 What is a "category effect"?

Let us suppose that the partial indices ($I_k^{o,b}$) for houses and apartment blocks are unequal over the base year 0, at 120% and 105% respectively, and that they remain stable between day 0 and quarter *t*. Let us also assume that, during quarter *t*, the weightings (β_k) of houses and apartment blocks are reversed in relation to the base year (β_k^o), during which they were 70% and 30% respectively. The catenation link then applies as follows (in %):

$$I_t^o = \frac{\sum_k \beta_k I_{t,k}^b}{\sum_k \beta_k^o I_k^{o,b}} = \frac{(30\times 120)+(70\times 105)}{(70\times 120)+(30\times 105)} = 94.8$$

The aggregative index declines, while neither partial index has fallen, simply because the weighting assigned to the lowest index increased to the detriment of that of the highest index. This is what is known as a "category effect".

Is it right, in a case such as this, to say that prices are falling? If houses and apartments are one and the same commodity (i.e. they are "substitutable"), the answer is obviously yes. If, on the other hand, houses and apartments are not substitutable, which in fact they are not, it is important to ensure that the aggregative index does not develop. In fact, the two partial indices do not develop neither.

In this textbook example, it was assumed that the partial indices remained stable, which made it possible to observe only the category effect on the index. By the same token, if the partial indices developed, it would be possible to break down trends in the aggregative index into two effects: a "category effect" and a "pure price effect"[20].

Such situations are by no means hypothetical in the case of the ICC, since the structure of new building changes over time, and the ICC is a Paasche-type index (adjusted in line with new construction each quarter).

2.3 A solution to the problem of "category effects"

There are two ways of correcting the "category effect". One could either solidify the category structure or rebalance the partial indices of the catenation base (0). The problem is caused by a distortion in the structure of construction, but occurs only if the buildings differ.

In the case of the ICC, it was decided to equalize all the partial indices for year 0, by making them equal to 1 (which amounts to dividing them by themselves!).

So as not to modify the trend in prices of the category in relation to 0 ($I_{t,k}^b / I_k^{0,b}$), the current quarter indices divided by category *t* have also to be divided by $I_k^{o,b}$, and become:

$$\frac{I_{t,k}^b}{I_k^{o,b}} = \frac{\sum_{i\in c_k} q_i y_i}{\sum_{i\in c_k} q_i x_i \left(I_k^{o,b}\right)}$$

They then have to be aggregated according to the *new weighting of the category*:

20) Cf. the demonstration of INSEE method No. 17.

$$\delta_k = \frac{\sum_{i \in c_k} q_i x_i\left(I_k^{o,b}\right)}{\sum_k \sum_{i \in c_k} q_i x_i\left(I_k^{o,b}\right)}, \quad \text{and} \quad \sum_k \delta_k = 1$$

The formula of the link then becomes:

$$I_t^o = \sum_k \delta_k \left\{ \frac{\sum_{i \in c_k} q_i y_i}{\sum_{i \in c_k} q_i x_i\left(I_k^{o,b}\right)} \right\}$$

or even:

$$I_t^o = \frac{\sum_k \sum_{i \in c_k} q_i y_i}{\sum_k \sum_{i \in c_k} q_i x_i\left(I_k^{o,b}\right)} = \frac{\sum_k \sum_{i \in c_k} q_i y_i}{I_o^b \sum_k \sum_{i \in c_k} q_i x_i\left(I_k^{o,b} / I_o^b\right)} \qquad (5)$$

This is based on a simple interpretation of the adjustment: for the calculation for the index for quarter t in relation to the BGE prices, the latter are adjusted by a coefficient reflecting the divergence between the partial category index on day 0 to the overall index for the same day. The final formula of I_t^0 is very simple, since it consists in establishing the ratio of the sum of the market prices to the sum of the adjusted BGE prices. The adjustment is the main cause of the phenomenon, since it affects the structure of the BGE prices.

2.4 *Transition from the previous method to the ICC method*

In the case of the ICC, the definition of the categories depends primarily on two criteria: type (detached, semi-detached/terraced, apartment blocks) and region (5 groupings)[21]. The method described above is based on the hypothesis that categories constitute a partition of all the files; to remain faithful to it, it would have been necessary to take into account all the cross effects (i.e. 15 adjustment coefficients, some of which are likely to be negligible).

In addition, it should be noted that where there is only one k criterion (or a partition), the b_k estimator in the following regression model:

$$\frac{y_i^o}{x_i^o} = b_k + \varepsilon_i, \quad \text{with weightings } q_i^o x_i^o,$$

is the partial index relating to category k. It is the average of the variable for this category, i.e.:

$$b_k = \sum_{i \in c_k} \left(\frac{q_i^o x_i^o}{\sum_{i \in c_k} q_i^o x_i^o} \right) \left(\frac{y_i^o}{x_i^o} \right) = \frac{\sum_{i \in c_k} q_i^o y_i^o}{\sum_{i \in c_k} q_i^o x_i^o} = I_k^{o,b}$$

The adjustment method used in the calculation of the ICC is based on this assertion. Let us assume that the categories are defined by two criteria: type and region. To determine the adjustment coefficients of the BGE prices, the following regression model is used:

$$\frac{y_i^o}{x_i^o} = a_o + a_k + a_r + \varepsilon$$

where the observed values are still weighted by $q_i^o x_i^o$, and subject to the constraints:

$$\sum_k \left(\sum_{r,i} q_{r,i}^o x_{r,i}^o \right) a_k = 0$$

and,

$$\sum_r \left(\sum_{k,i} q_{k,i}^o x_{k,i}^o \right) a_r = 0$$

which amounts to defining a_o as the value of index I_o^b over the base period 0.

21) The adjustment method used to calculate the ICC is described in INSEE method No. 17.

The catenation (I_t^0) is then calculated as the ratio of the sum of the market prices to the sum of the adjusted BGE prices, using a formula similar to formula (5):

$$I_t^o = \frac{\sum_i q_i y_i}{\sum_k \sum_r \sum_i q_i x_i (a_o + a_k + a_r)} \quad (6)$$

The coefficient $(a_o + a_k + a_r)$ plays a role similar to the partial index $I_k^{o,b}$ given in section 2.3 (formula (5)). The introduction of terms crossed in the regression (variance analysis model) would have produced the same result as the method described in section 2.3. Suppressing them amounts to assuming *a priori* that they are negligible.

The idea underlying this method is to adjust the BGE prices by a coefficient (a_k / a_o) reflecting their relative divergence in relation to the average. Formula (6) is in fact *the ratio of the index for quarter t to the adjusted BGE prices (with the adjustment coefficients for year n-1), to the chain index 0 (a_o) in relation to the adjusted BGE prices (with the adjustment coefficients for year n-2).*

$$I_t^o = \frac{\sum_i q_i y_i}{a_o \sum_k \sum_r \sum_i q_i x_i (1 + c_k + c_r)}$$

where $c_k = a_k / a_o$, $c_r = a_r / a_o$, and $a_o = I_o^b$.

This procedure is faster and more flexible than direct calculation of the partial indices. When calculating the ICC, one determines not only the adjustment coefficients of the type and region in 5 groupings, but also a coefficient specific to "off-the-shelf" housing, and a simplified cross term (three types and two regions).

The BGE price adjustment requires an intermediate base between the date of the BGE and that of calculation. Annual catenation is not absolutely essential, but it makes more up-to-date adjustment coefficients possible. On the other hand, there is a risk of a slight break occurring when the adjustment coefficients change.

UNITED KINGDOM

Tender Price Indices & Output Price Indices in the UK

Dr. Sigurd Johnsen,
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1. Tender Price Indices

Tender price indices in the UK are calculated by analysing what are called Bills of Quantities, one for each construction project considered. These give, for each item or service in the contract for the project, how much in £'s that item or service contributes to the total value of the contract. The Bill of Quantities is exhaustive in the sense that the sum of these contributions equals the total tender price of the project. For each of most of the items and services in a Bill of Quantities, the money contribution is broken down as a quantity and a rate per unit quantity in £'s, such that the product of the quantity and the rate equals the money contribution. Such items and services in a Bill of Quantities are referred to as "quantifiable items". For each quantifiable item, the rate in £'s per unit quantity, for the index base year, is known from a separate study (which involved looking at all Bills of Quantities for projects awarded in the index base year). Multiplication of the base year rate by the quantity for a quantifiable item in the Bill of Quantities enables a hypothetical base year money contribution for the quantifiable item to be calculated. Thus for each quantifiable item in a Bill of Quantities, both the actual money contribution and a hypothetical base year money contribution are available. For a given construction project a Paasche index for that project is calculated by taking the quotient of the sum for all the quantifiable items in the Bill of Quantities of the actual money contributions and the sum for the same quantifiable items of the hypothetical base year money contributions. These project indices are then combined and various smoothing techniques are applied to obtain the published Tender Price Indices.

It is the existence of Bills of Quantities for the winning tenders that enables the Tender Price Index calculation just described to be carried out. In the past the UK Government has insisted on the preparation and submission of Bills of Quantities for each tender for a project where the UK Government is the client. In addition some projects in the private sector also have associated Bills of Quantities: this has made possible the calculation of Private Industrial and Private Commercial Tender Price Indices. In the future, however, Bills of Quantities are likely to become increasingly rare so that different approaches to calculating Tender Price Indices will have to be found: this is currently being actively investigated. The reason Bills of Quantities are disappearing is that different tendering procedures are increasingly being used by the UK Government: many projects now are what are called "Design and Build" projects where the details of the method of construction are not specified at the tender stage; increasingly projects are being let as "Private Finance Initiative" projects which lead often to the tenderer owning and operating the completed edifices for a period of years, again without specifying the project details at the tender stage.

2. Output Price Indices

In the UK Output Price Indices measure inflation in the total amount of a particular type of construction being carried out at any one time. They therefore depend on Tender Price Indices at a number of time points, as the work being carried out currently consists partly of work recently commissioned as well as different amounts of work on projects which were commissioned at different times in the recent and not so recent past. For types of construction, such as Private Housing or various forms of Repair & Maintenance Work, for which the UK Government has no Tender Price Indices to employ, a mix of materials costs indices (from merchants' list prices and therefore not very realistic) and labour cost indices (from Trade Union agreements and therefore also not very realistic) is used instead.

The way an Output Price Index is calculated in the UK is as follows:

- X_t is the value of New Orders for the type of work appropriate for the index in quarter t (calculated from a monthly New Orders Survey);
- α_{tT} is the fraction of work of the appropriate type done in quarter T (greater than or equal to t) which appeared in New Orders in quarter t (then α's have been calculated by following the progress of a sample of projects).

  $$\text{Thus } \alpha_{tT} \geq 0 \text{ and } \sum_{T=t}^{\infty} \alpha_{tT} = 1$$

- P_t is the fraction of work in New Orders at quarter t which is subject to price escalation following movements in materials cost indices and labour cost indices.

Then the amount of money paid by construction clients for work on fixed price (i.e. non-price - escalation) contracts in quarter T is F_T where

$$F_T = \sum_{t=-\infty}^{T} \alpha_{tT} * X_t * (1 - P_t)$$

The amount of money paid by construction clients for work on escalation of price contracts in quarter T is V_T where

$$V_T = \sum_{t=-\infty}^{T} \alpha_{tT} * X_t * P_t * \left[1 + M_t * \frac{(I_T^M - I_t^M)}{I_t^M} + L_t * \frac{(I_T^L - I_t^L)}{I_t^L} \right]$$

where M_t and L_t are the fractions of New Orders in quarter t subject to variation of price respectively for materials and labour. I^M_t and I^L_t are respectively materials and labour cost index values at quarter t.

If A_t is the appropriate Tender Price Index at quarter t, then the volume of work done in quarter T at the prices of quarter t^1 is H_T, where

$$H_T = \sum_{t=-\infty}^{T} \alpha_{tT} * X_t * A_{t^1} / A_t$$

The Output Price Index at quarter T, D_T, is then the amount of money paid by construction clients in quarter T for work done in quarter T per unit of volume work done in quarter T:

$$\text{i.e. } D_T = [F_T + V_T] / H_T$$

The Output Price Index E_T which is issued is D_T scaled so the four quarters in the base year sum to 400.

In the UK the chief application of Construction Output Prices Indices lies in deflation of construction output, the letter expressed in current money terms. The current money output in quarter T is multiplied by $[100/E_T]$ after which it represents the output in quarter T at base year values.

III.3 The Hedonic Method

⇒ The Netherlands

⇒ Sweden

THE NETHERLANDS

Index for the Output of House-Building

Sijbrand Veenstra,
Statistics Netherlands

1. Introduction

Until 1994 the series "Price indices of newly constructed dwellings" (PINB) was based on dwelling construction plans in the subsidised rental sector. A correction was made for the differences in quality which may occur in the plans in order to measure only the actual price trend. The quarterly indices have been derived from the analysis of construction plans collected for the purpose of monitoring cost-quality aspects of housing construction and the contribution of subsidies or other policy measures in public housing. The basic data were collected by the Ministry of Public Housing Planning and Environment in co-operation with the CBS. The analysis was performed by external certified experts financed by the above mentioned Ministry.

The relative importance of social housing projects has decreased gradually in the course of time to approximately 20 - 25% of all residential building activity. The execution of social housing policy has recently moved from central government to municipalities. In combination with this move the activities related to the analysis of plans were discontinued after the reference year 1994. Moreover the Ministry changed its subsidy policy from a "dwelling based policy" to a more "location based policy" and reduced the total amount of subsidies.

These points led the Construction department of SN to think about its own survey to fill the gap and to continue the PINB-series. SN has compiled the PINB since 1964. The new survey will not be restricted to the social housing sector but also to other segments, but the main aim was to continue the series, and to enlarge the covered area afterwards.

A pilot project started in 1994 to take the first step in the direction of our own survey. This project was named "A hedonic price index for housing construction". Evidence had been gathered for the ability to use the hedonic technique for the construction of price indices for residential construction. The hedonic technique was applied to the same data as used for the construction of the PINB for the period 1980-1990 and these indices were compared with the PINB for these years. In order to continue the series the department hoped to obtain information and criteria relevant for the selection of housing characteristics to be surveyed . In a report (written by G.van Leeuwen) the results of this project were described (report available from Eurostat and SN). The result of this survey was a multiple regression model in which the building-costs per dwelling were explained by quantitative and qualitative variables. The hedonic price-indices can be derived directly from this model. An important characteristic of this hedonic method is a price development without any influence of quality-changes.

2. Data collection

A questionnaire was developed to ask for the relevant quantitative and qualitative

characteristics. The "Building Permit Survey" (BPS) has an important function in this new survey. A selection of started plans from the BPS is the first step in the new survey. This selection contains only the permits directly related to "Social Housing Institutions" (SHI-rented houses).

Several characteristics from the building permit are printed on the questionnaire and are used to identify the project. These are the following variables:

- municipality
- name or identification of the plan
- address
- number of dwellings
- rental or ownership
- dwelling category (price-classes).

The SHI's are asked for the following information related to the selected plans from the BPS:

- location of the building site:
  - expansion scheme or
  - urban renewal;
- contract sum: VAT and buy off risks excluded;
- date of building contract;
- number of one family and number of multi-family dwellings;
- number of building blocks;
- gross size in m^3;
- type of access to multi-family dwellings:
  - portico or
  - gallery;
- average number of layers;
- type of roof:
  - flat,
  - sloping or
  - a combination;
- number of garages in the project;
- average depth of foundation;
- average number of living- and bedrooms;
- average number of balconies or terraces;
- the presence of a second bathroom;
- the presence of a dormer window;
- the presence of a elevator;
- the presence of special sound isolation facilities;
- the presence of special facilities in connection with elderly or disabled persons;
- more than average building site-costs, due to difficult circumstances (e.g. narrow approach ways);
- unusual constructions like cubic or spherical dwellings.

The returned data are used in a hedonic regression model (see also G. van Leeuwen and more detailed information about the actual hedonic model and calculations is available on request). For 1994 data from the old source (Ministry of Housing) and from the new survey are available. The development based on the new survey is compared with the figures already published based on the old source. The result of this comparison was positive and showed about the same development. At this moment SN is still analysing in depth the individual plans from both sources to fine-tune the hedonic model.

3. Other relevant information

Other relevant information on this survey is summarised below:

- **periodicity** : quarterly figures
- **coverage**: 20 to 25 % of all completed social rented dwellings in a year. Our goal is to enlarge the coverage to other dwelling-categories not yet covered. During the last decades the need for this step was not very large, because the mS-price development from the BPS in the separate dwelling-categories showed comparable trends
- **staff-capacity per year**: 0.5 - 0.75 full-time equivalent

- **number of plans in the survey**: 750 - 800 plans per year
- **average number of dwellings per plan**: 25 - 30
- **response rate**: 90 - 95 %
- **response burden**: 30 minutes per plan
- **regional details**: distinction between South-, North-, East- and West-Netherlands possible (yearly figures only)
- **respondent**: social housing institutions
- **short term development**: m3-development from the BPS, based on a regression model
- **provisional figures**: approx. during 4 quarters
- **main publications**: SN-Internet, SN-Weekly Bulletin, SN-Monthly bulletin of Construction Statistics, SN-Monthly bulletin of Prices
- **internal checks**: cubic meters and contract-sum from the BPS are matched with the data from the PINB-survey and other internal logical checks
- **weighting scheme**: the indices are weighted by region, the current index has a base year 1990=100 and is calculated according to the Laspeyres formula . Before the end of the year 1996 the base will be changed to 1995=100.

SWEDEN

The Output Price Index in Sweden

Astra Svarans, Statistics Sweden

1. Scope of the survey

The work covers new construction projects which have been awarded a state subsidy. The population comprises apartment blocks and houses to be placed on the market or made available with tenant-ownership or renting rights. Houses which will be inhabited by the person applying for a government grant are not included in the statistics.

Where a subsidy has been awarded, questionnaire data are collected only for projects on which the actual building work has already begun (laying of basement floor, basement walls, foundation plate, etc.).

The term "apartment block" refers both to apartment blocks proper - i.e. blocks with at least three dwelling units - and premises containing special facilities and amenities. The term "houses" refers to single-unit dwellings (detached, semi-detached, terraced or linked) and detached double-unit dwellings. The cost statistics used as the basis for calculating the construction price index only cover entities containing "normal" dwellings. Entities not covered by the cost statistics include, for example, premises with a large proportion of areas for non-residential use.

2. Variables

In order to calculate the construction price index, which reflects price trends for the finished product adjusted for the effects of quality differences, it is necessary to have data on the total price and detailed information on the features of the unit (design) which are relevant to quality and cost as well as standard valuations for assessing the quality of these features. Data on the features of the premises include various dimensions, such as area of outer walls and roof, and details of installations.

The cost data can be subdivided into a number of components, such as land costs, building costs, cost of connection to water supply, sewerage, electricity and district heating systems, general developer's costs, mortgage costs, interest charges during the construction period and VAT. The data can be broken down by, for example, region, development/redevelopment area, category of client and type of lease. Apart from cost data, the statistics also contain data on, for example, the type of purchasing and price fixing, various surface dimensions and data on building materials and structures.

A central concept in the calculation of the construction price index is the surface area over which the costs are distributed. In recent years, several different area concepts have been used in connection with the financing of housing. SCB has defined area as that which most closely corresponds to the primary usable floor area. The questionnaire sent to developers also refers to the primary usable floor area.

In the case of housing units the primary usable floor area is calculated (with certain restrictions) as the total floor area bounded by the finished inner surfaces of the walls enclosing each dwelling unit. Total primary usable floor area includes communicating

areas such as corridors, stairwells etc. and the primary usable floor areas of non-residential sections.

3. The new definitions introduced in 1994

The total cost (production cost) was traditionally divided into land costs and building costs. The building costs concept as used for calculating the construction price index up to 1993 comprised costs for building work, including the costs for connection to the electricity, district heating and gas supply systems and development costs. The land costs comprised costs for the plot and for connection to the water supply and sewerage systems. All these costs included the developer's costs. It should be noted that earlier cost statistics for new construction projects used a definition of construction costs which differed from the construction price index, with site development costs included in land costs. Since 1994, the construction price index and the cost statistics for new construction projects have used the same definition.

Building costs according to the new definition include - in addition to the costs of the building work and connection to electricity, district heating and natural gas supply - site development costs (costs for site preparation and roads and paths on the developed area) excluding connection costs of the developed area. According to the new definition, land costs comprise the cost of the plot and the cost of connection to water supply and sewerage system.

The costs of projects are fixed on the basis of the project starting time.

4. Brief description of the method used to calculate the construction price index

A construction price index is an index which measures price developments for a given category of buildings under construction during a given year.

The difficulty in constructing an index of this kind is that the quality of a building changes over time and for this reason quality elements had to be eliminated from the calculations so that the index would measure buildings of identical quality. A calculated change in the index can therefore in no way be regarded as representing an improvement or deterioration in the quality of the buildings between the reference periods.

5. Description of regression model

Regression is used to quantify previously defined quality components. For the purposes of the regression, the construction price is regarded as a function of various quality features relevant to the index calculations. The simplest way to describe the technique is to assume that changes in construction prices at a given point in time can be explained in terms of a single quality variable. Let us assume, therefore, that the construction price per dwelling unit (Y) depends on the size of the primary usable floor area (X). This is assumed to be a linear function corresponding to the follcwing equation:

$$Y = a + bX$$

where a represents a fixed amount (price) which applies to the construction price irrespective of the value of variable X. The coefficient b shows how much the price changes if variable X increases by one unit,

and therefore can be interpreted as the price per unit for variable *X*. The regression line estimated in this way can be regarded as representing the average relationship between construction prices and quality feature *X* over a certain period.

Assume that at time 0 (base time) it was possible to determine the relationship between the variables price per dwelling unit and primary useble floor area, thus obtaining the following equation (regression line):

$Y = 150\ 000$ *(fixed amount)* $+ 7\ 500 * X$

and *b)* have thus been arrived at by calculating the above regression line. Assume that at time 0 there was an average primary usable floor area of 80 m^2 per dwelling unit and an average construction price of SEK 750 000, which can be calculated from the above equation by giving variable *X* the value of 80.

At time *t*, the price has increased to SEK 950 000 and the primary useble floor area to 90 m^2. The quality increase (*K*) can be calculated with the aid of the regression equation obtained at time 0 by applying the values 80 and 90 for primary usable floor area in the following equation:

$$K = \frac{150\ 000 + 7\ 500 * 90}{150\ 000 + 7\ 500 * 80} * 100 =$$

$$= \frac{825\ 000}{750\ 000} * 100 = 110$$

The value has increased from 750 000 to 950 000. This corresponds to an increase (*V*) of 27%:

$$V = \frac{950\ 000}{750\ 000} * 100 = 127$$

The price increase (*P*) can now be calculated by dividing the value increase (*V*) by the quality increase (*K*):

$$P = \frac{127}{110} * 100 = 115$$

The price increase can also be calculated directly by inserting the value of the quality variable at time *t* into the regression equation for time 0 and calculating the following quotients:

$$P = \frac{a_t + b_t X_t}{a_0 + b_0 X_t} * 100 = \frac{Y_t}{a_0 + b_0 X_t} * 100 =$$

$$= \frac{950\ 000}{150\ 000 + 7\ 500 * 90} * 100 =$$

$$= \frac{950\ 000}{825\ 000} * 100 = 115$$

In this case, only the parameters (values of *a* and *b*) have been calculated for the observation material at time 0. This gives a Paasche-type price index, since the comparison is carried out on the basis of an average building at the time of comparison (*t*).

The construction price index is always calculated as a Paasche-type index, because when the quarterly indices are being calculated estimates of the values of *a* and *b* are not available as the volume of data on which the calculations are based is too small. For example, when calculating the index link 1994-1995 the values *a* and *b* were estimated on the basis of the 1994 data, whereas only the value *X* had to be calculated on the basis of the 1995 material - either the quarterly or annual value.

The construction price index is also calculated as a chain index, which means that the relationship between prices and quality is re-examined each year. The 1993-1994 index link is therefore calculated on the basis of

estimates of the values of a and b for 1993 buildings and the 1994-1995 link is calculated similarly on the basis of 1994 buildings.

In the same way so-called multiple regression can cover several quality variables simultaneously. The current calculation method presupposes here that there is a linear relationship between the average construction price for a number of buildings and a number of quality variables or other determining variables. In such an equation the regression coefficient b_i represents the anticipated change in the construction price as a result of a change of one unit in one quality variable where all other variables remain constant. Thus it can also be interpreted here as a unit price for the quality variable in question.

The construction price (the dependent variable) covers the price (including value added tax) per m^2 primary usable floor area. The basis of calculation is the housing project.

The variables included in the regression analysis aim to explain the variations in construction prices between different buildings. They include both variables which describe quality features in the building and variables which are not quality variables but which can also explain price differences. The former group includes variables describing area and design, standard of equipment and the joist, roof and external wall structures. The latter group includes variables which describe e.g. the geographical location, type of house, category of developer, type of contract, type of purchasing, etc.

The quality variables are measured in quantitative terms, e.g. m^2, continuous metres, etc. When constructing certain quality variables estimates of a number of sub-components have been combined to form larger concepts. This is true for example of installation variables. In the regression analysis the quality variables, like the construction price, have been divided by m^2 primary usable floor area. The remaining variables are so-called classification variables, also known as dummy variables, which assume either the value 0 or 1 according to whether they are part of the class or not.

The regression coefficients for classification variables do not give any price per unit - as the quantitative variables do - but rather represent price differences in relation to the zero variable in the group.

6. Treatment of shift effects in the index calculation

Shifts in building activity from one year to another, e.g. from one regional area with lower prices to an area with higher prices, will not be reflected in the index calculated according to the index formulae shown above. Shifts of this nature cannot always be dealt with in the same manner. In order to avoid consumers interpreting the shifts as a qualitative change, these should be reflected in modified construction prices.

If c and $\overline{Z}$ are the regression coefficient and weighted average value for those variables for which changes in volume (% changes) from one year to another should be reflected as a price change, the Paasche index formula can be expressed as:

$$I_{0t}^{P} = \frac{a_t + \sum b_{it}\overline{X}_{it} + \sum c_{it}\overline{Z}_{it}}{a_0 + \sum b_{i0}\overline{X}_{it} + \sum c_{i0}\overline{Z}_{io}}$$

Thus the quality variable X has been given the same value at the base and intersecting time $\left(\overline{X}_{it}\right)$ so that the quality change is not reflected in the index, while the shift variable has different values, $\left(\overline{Z}_{it}, \overline{Z}_{io}\right)$ respectively, since the change is to be reflected in the index.

C-variables are classification variables which describe:

- client category
- type of building
- traditional construction/prefabricated
- type of contract
- type of purchasing
- pricing method

7. Variables included in the calculations

The regression operation uses as many variables as possible in order to obtain the greatest possible transparency. The calculation of the construction price index includes only variables which are useful to residents (e.g. sanitary equipment, kitchen and laundry equipment). Other benefits for residents can result from technical changes which evidently improve the functioning of the house or its building components or result in lower running costs or a longer life for the house. Variables which cannot be regarded as quality variables from the developer's viewpoint are not covered by the construction price index. The effect of variations in these variables are regarded as price changes and are reflected in the construction price index.

The following is relevant to the treatment of various types of shifts. Shifts in the proportion of development projects to redevelopment projects and also between expensive and less expensive areas must be taken into account in the same way as quality and volume changes in housing production. The effects of such shifts on the price index must therefore be eliminated. The significance of this is obvious. If this were not done, a shift in housing construction from low cost to high cost areas would be reflected in the index in the form of a price increase, without there having been a corresponding increase in prices either in the low price or in the high price range. The same applies to shifts between redevelopment and development areas.

The same is not true of other types of shifts, such as shifts between categories of developer, type of building, form of construction, size of project and various site qualities. The effects of these shifts on the average construction costs should be reflected in the construction price index since, from the client's viewpoint, these are obviously not quality differences between different buildings. In so far as quality differences do exist, account should be taken of them in other variables.

For the above reasons the following variables were selected to calculate the construction price index. The variables are divided into three main groups:

I. standard of installations
II. surrounding areas, savings in running and maintenance costs
III. other variables

The fixing of the variables for the construction price index in 1995 is outlined below. (D) represents the dummy variables and (I-III) indicates to which of the three above-mentioned groups the variables belong.

The construction price (the dependent variable) is composed of the construction cost (costs for construction work + site development costs + the cost of drainage and water supply excluding connection costs) divided by the total primary usable floor area. Note that the definition of building costs has changed with effect from the 1994 financial year. The former definition of construction costs included costs for building work and site development costs but excluded drainage and water supply costs.

7.1 Index variables for multi-dwelling buildings

Quality variables

Variables of group I

- Standard of installations represents a composite variable UTRTOTM comprising the number of lifts, stairs, laundry facilities etc., cf. 7.3 below.

Variables of group II

- Usable floor area under joists structure (including annexes)
- Secondary usable area
- External walls + windows (incl. annexes and screen wall)
- Roof
- Heating system and heat distribution

Variables of group III

- Communication areas
- Value for class A-E premises

Shift variables

All the following variables are dummy variables and belong to group III (see above)

- Region 1 (Greater Stockholm)
- Region 2 (Greater Gothenburg)
- Region 3 (Greater Malmö)
- Region 4 (Administrative district Y+Z+AC+BD)
- Region 6 (Administrative district F+G+H+I+K+L+M excluding Greater Malmö)
- Redevelopment area

All these data are multiplied by their respective valuation figure (standard amount) which represents an estimated cost for the variables in question.

7.2 Index variables for one-or two dwelling buildings

Quality variables

Variables of group I

- Standard of installations represents a composite variable UTRTOTM which includes number of dwellings, stairs, laundry facilities etc., cf. 7.3 below.

Variables of group II

- Usable floor area under the joists structure
- Secondary usable floor area
- External walls + windows (incl. annexes and screen wall)
- Roof
- Heating system and heat distribution

Shift variables

All the following variables are dummy variables and belong to group III:

- Region 1 (Greater Stockholm)
- Region 2 (Greater Gothenburg)
- Region 3 (Greater Malmö)
- Region 4 (County Y+ Z+ AC+ BD)
- Region 5 (County AB excl. Greater Stockholm + C + D+ E and N+ O+ P excl. Greater Gothenburg + R + S+ T+U+ W+ X)
- Redevelopment area

All these data are multiplied by their respective valuation figure (standard amount) which represents the estimated cost for the variables in question.

7.3 Sub-variables of the UTRTOTM variable which exist for 1995

- Number of rooms, cooking and sanitary facilities in the dwelling.

- separating walls between terraced houses.
- balcony.
- extra outside door.
- additional entrance door in apartment blocks.
- resident's laundry.
- laundry capacity in resident's laundry.
- laundry arrangements in kitchen or bathroom.
- laundry facilities in a separate room.
- washing machine.
- supplement for lodgings comprising
  1) cooking recess cupboard.
  2) kitchen.
  3) additional toilet without shower.
  4) additional toilet with shower.
- stairwell.
- full height landing.
- full height external stairs.
- external cellar stairs.
- stairway in housing unit.
- tiles in the bathroom and shower room.
- lift.
- landing.
- convertible attic
- access balcony.

8. List of determining variables which are not included in the index calculations but which are included in the regression model

The variables marked with (D) refers to dummy variables.

- Basement or semi-basement apartment, freestanding joists, tiled ground, heated building
- Tiles on the ground, building not heated, simpler foundation
- Bearing structure (D)
- Facing (D)
- Foundation construction (D)
- Ventilation (D)
- Heat recovery (D)
- Material in vertical bearing structures (D)
- Roof covering (D)
- Form of lease (D)
- Category of client (D)
- House type (D)
- Service apartments (D)
- Average unit area
- Number of floors (D)
- Cost control (D)
- Type of contract
- Questionnaire to the investors
- Existence of investment allowance
- Number of housing units (log)
- Heating system (D)
- Construction method (D)
- Call for tenders (D)

IV. Selling Price Indices

⇒ Spain

SPAIN

Average Housing Prices per m2, calculated from Mortgage Valuations

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1. Purpose of the statistics

With the disappearance from the current CPI of expenditure on the purchase of owner-occupied housing, statistics have to be compiled on average housing prices per m^2. Furthermore, the sharp rise in housing prices over the past few years, especially up to 1990, and the lack of reliable studies on this subject led the Ministry of Public Works, Transport and the Environment (MOPTMA) to set up a study of housing prices. After analysing the various sources which might give the information required, it opted for figures from valuation companies.

The survey is quarterly at present but in the future prices may be available on a monthly basis.

The MOPTMA is also carrying out a survey on "new housing available in urban areas", which investigates housing prices in Spain's major cities. Along with prices, information is being obtained on the frequency of sales, housing characteristics, financing, etc.

2. Legal basis: valuation principles

Under Spanish legislation, only those financial entities specifically authorized to do so may grant mortgage loans.

Before a mortgage loan can be taken out, the building must be valued, and this valuation may be carried out only by the valuation departments of the financial entities which have access to the mortgage market.

The work must be carried out by specialized professionals.

The valuation criterion is market value, i.e. the net amount which a seller may reasonably expect to obtain from the sale of a property on the valuation date, with appropriate marketing and supposing that at least one potential buyer exists who is accurately informed of the characteristics of the property and that both parties, buyer and seller, are acting voluntarily and without any vested interest in the transaction.

Evaluation reports have to be signed by an architect and are valid for 6 months.

3. Number of valuations received

3.1 Changes in the number of valuations over time

The statistical series of average prices per m^2 of housing as ascertained from mortgage valuations began in 1987 with 19 759 valuations, rising to 321 661 in 1994, the most recent full year.

This increase in the number of valuations, which was due to the addition of new companies, has made the indicators more accurate, produced housing prices for some of the Autonomous Communities such as the Basque Country and Asturias and, in the near future, will improve the information available by the use of newly-designed tables.

3.2 Importance of MOPTMA data base compared with other valuation companies

Period: 1994

	Number of valuations	%
MOPTMA	321 664	97%
ATASA *	329 941	

* Professional association of valuation societies in Spain.

4. Variables derived from the valuation records: definitions

All the data required for the compilation of the index refer to housing constructed on the open market, i.e. no housing which received any kind of building subsidy from any government or other public or private body is included unless the subsidy has expired and the housing in question may thus compete on the open market, in which case it is valued at market prices. It may also be included when allocated its actual construction value.

In order to preclude any subjectiveness which might influence the final valuation, only those variables which may be considered objective have been collected from the report:

1. municipal code and name of the municipality in question;
2. post code of the area in which the dwelling valued is located.

The post code is allocated by the municipal authorities and is based on the guide to post codes produced by the Spanish postal authorities. The aim of stratifying municipalities according to post codes is to create strata which are as uniform as possible.

By way of example:

- Madrid, with 3 084 673 inhabitants, is divided into 52 post codes
- Barcelona, with 1 681 132 inhabitants, into 42 post codes
- León, with 147 625 inhabitants, has 10 post codes
- Torrelavega, with 59 520 inhabitants, has only one post code.

Where there is only one post code, there may be municipalities - in fact, there are some - which contain smaller population entities within the municipal district, and these have their own post code allocated to them. In this case it is considered that the group of post codes which go to make up the municipality in question comprises the post code of the municipality itself plus that of the smaller population entities.

3. date on which the dwelling was valued (month and year);
4. price of the dwelling;
5. m^2 total floor area;
6. age of the dwelling.

The total floor area is measured on the basis of the definition of useful area:

- **Useful area**: this is the floor space delimited by the perimeter which is defined by the internal surface of the external enclosures of a building or of

part thereof, including half of the floor space of outside areas belonging to the building and intended for private usage (such as terraces, balconies and areas for drying clothes) and excluding the area occupied on a single level by fixed internal enclosures, by vertical structural elements and by pipes or conduits with a cross- section greater than 100 square centimetres and any area above which there is under 1.5 metres' headroom.

- **Total floor area:** this is the useful area not excluding the area occupied by the interior elements referred to in the above definition and including either 100% or 50% of the external enclosures, the former in the case of enclosures abutting onto the facade or side of the building and the latter in the case of enclosures shared with other elements of the same building. Where other elements in a building exist, the share included is equal to their percentage share of the common elements of the building. To this end, the common elements of a building will be taken to mean those which, although not for private usage, may be taken into account for the purposes of calculating suitability for building, with the exception of special cases which will have to be justified individually in the valuation report. Neither the surface area of garage spaces nor of storage areas which go with a given dwelling are computed.

The age of the building (in years) will be counted from completion of the construction work or of the latest major renovation work carried out on the building to which the housing unit belongs.

5. Processing of the information received

The information is received from the companies cooperating in the survey on magnetic medium structured in accordance with instructions given by the MOPTMA. It is processed by computer as soon as it is received.

The first step is to make a geographical comparison with the post code data base, which includes existing post codes and municipal codes together with the number of inhabitants and the name of the corresponding municipality, as well as an indication of whether or not the municipality is on the coast. This comparison may throw up two types of error:

- the post code does not correspond with the municipality (the first two digits should coincide since they refer to the code for the province);
- the post code does not exist, whereupon the entry is removed and the corresponding municipal code allocated.

Once the post code errors have been corrected, a series of listings is obtained which enable the data received to be checked.

These listings are:

- the date of valuation
- the price of the housing unit and its area.

Studies have been carried out to determine ranges within which changes may occur, to give average prices and extreme areas whose value may indicate an error. Once the prices and areas have

been obtained, they are analysed and, where necessary, corrected.

To give an idea: the number of valuations in which errors were corrected during the fourth quarter of 1995 was 0.5% of the total of 72 000 valuations received to date.

In order to find the average price per m² of the housing units for which information is available for a given quarter X, the values of the units are taken, divided by their corresponding m² and the sum of all these average prices per m² divided by the number of valuations is then used to obtain the average price per m² of the housing units in the corresponding post code area.

If the municipality in question has more than one post code, these average prices are divided by the number of post codes which go to make up the municipality. In post code areas for which no information was received during the quarter studied because no housing unit was valued there, an estimate is made on the basis of the average prices for the same post code in the previous quarter. The objective to make sure that all the post codes which go to make up a municipality are actually represented. The prices are then weighted according to the number of inhabitants in each municipality.

In the case of an Autonomous Community, for example, the following is the final formula:

$$pm_{ij} = \sum_{i=1}^{H_i} \sum_{i=1}^{H_i} \frac{\sum_{k=1}^{cp_{ijk}} pm_{ijk} cp_{ijk}}{\sum_{k=1}^{cp_{ijk}} cp_{ijk}} \frac{H_{ij}}{\sum_{j=1}^{H_{ij}} H_{ij}}$$

For the national total, it will be:

$$pmn = \frac{\sum_{j=1}^{17} pm_i H_i}{\sum_{i=1}^{17} H_i}$$

where the sub-indices are:

k = post code
j = municipality
I = Autonomous Community.

Thus the index obtained is a weighted arithmetic mean of the averages of the post codes, their relative importance being determined by the weightings which in this case are the number of inhabitants.

The tables obtained using this method are as follows, where the post code, inhabitants and average prices of the housing units vary according to the strata which make up each table:

1) Average price/m² of the housing units by Autonomous Community:
   - < 2 000 000 inhabitants
   - > 2 000 000 inhabitants
2) Average price/m² of the housing units by size of the municipalities:
   - Average price/m² of the housing units by size of municipalities, under one year old
   - Average price/m² of housing units by size of municipality, over one year old.

These tables show in the first two columns: "Madrid and its area of influence" and "Barcelona and its area of influence" respectively.

For both Madrid and Barcelona, the area of influence is made up of all those municipalities which, because they are close to the two cities in question, are attracted or influenced by them in various respects: economic, social, cultural, etc.

Various factors determined the areas to be included, principally:

- distance in km from the capital (approximately 40 km)
- means of transport and existing road network.

As an illustration of the importance, from the point of view of their inhabitants, of the municipalities included in the Madrid area, the Madrid Autonomous Community has, according to the latest census, 5 030 958 inhabitants and the populations of the municipalities which make up its area of influence total 1 801 352 inhabitants, a relative weight of 36%.

In the case of Barcelona, the province has 4 690 996 inhabitants and its area of influence 2 382 229 inhabitants, a weight of 51%.

3) Average price/m^2 of housing units by geographical situation of the municipalities:
   - inland
   - coastal
4) Average price/m^2 of housing units by uniform geographical area
5) Average price/m^2 of housing units by age of building
6) Average price/m^2 of housing units in provincial capitals and municipalities with more than 100 000 inhabitants. It should be pointed out that for this table annual results are given, obtained as the simple average of quarterly data.

V. Annex

Glossary

Construction industry

All economic activities within Section F of the NACE Rev.1. These activities comprise site preparation, construction of building or civil engineering structures, installation and finishing works, and the hire of construction plant and equipment with operator. Comprises new works as well as repair and maintenance works.

Building sector

The subset of activities comprised within Division 45 of the NACE Rev.1 contributing to the construction of buildings. Includes building repair and maintenance works.

Civil engineering sector

The subset of activities comprised within Division 45 of the NACE Rev.1 contributing to the construction of civil engineering works. Includes the repair and maintenance of such works.

Contractor

A firm which undertakes works as part of a construction project by virtue of a contract with a client.

Client ("Maître d'ouvrage")

Natural or legal person for whom a structure is constructed.

Project supervisor ("Maître d'oeuvre")

Person or organisation responsible for the supervision of a construction site after having drawn up the structure plans.

Quantity surveyor

Profession responsible for evaluating the progress of work in terms of quality and value, on the basis of the technical documents relating to a given structure.

Standard operations

The supply of a component of the structure, defined in terms of its function in the structure and its constituent materials. Examples might include

- Construction of 50 m^2 of wall in 20 cm hollow breeze block
- Supply and setting of 60 m^2 traditional pantile roofing
- Installation of an insulated 200-litre electric hot water tank.

Construction

Structure connected with the ground, made from construction materials and components, and/or for which construction work is carried out.

The classification of constructions provides for two types of such structures: buildings and civil engineering structures.

Buildings

Buildings are permanently-constructed roofed structures capable of being used independently, designed to offer protection from the elements with a view to occupation or use by man, or to providing shelter for animals, goods, equipment or industrial activities.

Civil engineering structures

All structures other than buildings: infrastructure works such as railways, highways, airport runways, tunnels, dams, bridges, canals, electricity transmission systems, drilling platforms, mineshafts, recreation installations, etc.

Residential buildings

A residential building is a building exclusively or principally destined for dwelling purposes: in the latter case it is regarded as a residential building if more than 50% of the habitable/useful floor area or of the volume constructed is used for dwelling purposes.

Non-residential building

A non-residential building is a building exclusively or principally destined for purposes other than residential: in the latter case it is regarded as a non-residential building if more than 50% of the useful floor area or of the volume to be constructed is used for purposes other than residential.

Dwelling

A dwelling is a room or suite of rooms and its accessories in a permanent building or structurally separated part thereof which by the way it has been built, rebuilt, converted, etc, is intended for private habitation. It should have a separate access to a street (direct or via a garden or grounds) or to a common space within the building (staircase, passage, gallery, etc). Detached rooms or habitation which are clearly built, rebuilt, converted etc, to be used as a part of the dwelling should be counted as part of the dwelling. (A dwelling may thus be constituted of separate buildings within the same enclosure, provided they are clearly intended for habitation by the same private household eg a room or rooms above a detached garage, occupied by servants or other members of the household.)

Thus a distinguishing feature of a dwelling is that it has a separate entrance either at ground level or to a common space in a multi-occupation building.

Room

A room is an area within a dwelling formed by partition walls from floor to ceiling or roof. It must be large enough to accommodate an adult's bed (not less than $4m^2$) with not less than 2.00 m headroom over at least half its floor area. This category includes normal bedrooms, dining rooms, sitting rooms, attic rooms, kitchens and other separate rooms whose pupose is residential. "Corner-kitchens," corridors, verandas, hallways, etc. and bathrooms do not count as "rooms."

Useful floor area

This is the floor area of a building measured within the external walls, excluding cellars, non-habitable attics and, in multiple dwellings, all communal areas.

Habitable floor area

The habitable floor area of a dwelling is the total floor area, measured inside the outer and dividing walls, of all habitation rooms and ancillary rooms, such as kitchens, bathrooms, toilets, corridors, lobbies and staircases and, in multi-dwelling houses, all the common areas, but excluding cellars, lofts, non-habitable attics, open balconies and garages.

This definition is proposed in the Council Directive (78/166/EEC) of February 1978. It is essentially identical to that of **useful floor space** postulated under the E.C.E. system except that the E.C.E. definition excludes common areas in multi-dwelling buildings.

Volume constructed

The volume constructed of a residential or non-residential building is the floor area including outer walls, multiplied by the height, measured from the ground of the lowest floor - which is the cellar or, if there

are no cellars nor similar spaces, the ground floor - to the mid-height of the roof, or, if it is a flat roof, to its upper surface; the corresponding volume of the accessories as well as the annexes, calculated in the same way, has to be added. Internal spaces not roofed are to be excluded.

Table I
Input Price Index

	Elements of the input price index						Global index	Coverage
	Materials	Wages	Plant & Equip.	Transport	Energy	Others		
B								
DK	✓	✓	(✓)	(✓)	(✓)		✓	R,CE
D	✓							
GR	✓	✓				✓	✓	R
E	✓	✓					✓	B,CES
F	✓	✓	✓	✓	✓	✓	✓	B,CES
IRL	✓	✓					✓	R, Total
I	✓	✓		✓			✓	R, NR, CE
L								
NL	✓	✓					✓	R
N	✓	✓	✓				✓	R,CE
A	✓	✓	✓		✓	✓1)		R,CE
P	✓	✓					✓	R,(B)
FIN	✓	✓	✓	✓	✓	✓	✓	R, NR,CE, B
S	✓	✓	✓	✓	✓		✓	R, NR
UK	✓	✓	✓	✓	✓	✓		Total

R: Residential buildings, NR: Non-residential buildings, CE: civil engineering structures
B: Building sector, CES: Civil engineering sector, Total: Total construction industry

1) Only for road and bridge construction

Table II
Input Price Index
Sources

	Sources		Coverage
DK	Materials:	Price lists + Producer Price Indices (general discounts are included, special discounts excluded)	New one and two-storeys terraced houses with 2-6 flats (floor area = 81 m2/flat) per building
	Labour:	Collective agreements wage rates + employers contributions - subsidies	
GR	Materials:	Prices paid by the contractor for materials delivered at the site of work (includes transport)	New residential buildings in the area of Greater Athens
	Labour:	Price paid by the contractor to a workers group according to the building contract (not to the wages)	
	Other expenditures:	Prices compiled from different competent services	
E	Materials:	Producer Price Indices	Total construction industry / Building sector / Civil engineering sector
	Labour:	Collective agreements wage rates (social contributions included)	
F	Materials:	Official price indices of materials (BOCCRF) for basics and specific survey based on list prices	Building sector / Civil engineering sector
	Labour:	Official general index of salaries in the construction sector + social expenses	
	Equip.:	Producer price index for machinery (INSEE)	
	Energy:	Price index for gas oil published by INSEE	
	Transport:	Index of road transport cost (DAEI & professional associations)	
	Other expenditures	Weighted average of producer prices published by INSEE	
IRL	Materials:	Price lists + Producer Price Indices	Total construction industry / State house
	Labour:	Hourly wage rates	
I	Materials:	Statistical Offices of the Trade Chamber	A standard new residential building / a standard new non-residential building / a standard new road
	Labour:	Survey on collective agreements for construction sector (ISTAT)	
	Transport:	Regional Supervisors of Public Works	

Table II (cont)
Input price Index
Sources

	Sources		Coverage
NL	Materials:	Producer Price Indices	Rebuilding of new dwellings
	Labour:	Labour cost survey (labour cost per hour actually paid) + Wage rates	
N	Materials:	Wholesale prices	Residential buildings / some civil engineering structures
	Labour:	Collective agreements with and without payments	
	Equip.:	Producer price index for machinery	
A	Materials:	Wholesale price indices	New residential buildings / Bridge construction / Road construction
	Labour:	Collective agreement wages, average hourly wage and overpayment ratio	
	Energy:	Wholesale price indices	
FIN	Materials:	Special survey + Producer Price Indices	Building sector / Civil engineering / Renovation One-dwelling buildings / Blocks of flats / Office & commercial buildings / Warehouses and industrial buildings / Agricultural production buildings
	Labour:	Hourly average earnings + social benefits (5 categories of manual workers + 1 category of non-manual)	
	Equip.	Special survey + other sources	
	Transport:	Special survey + other sources	
	Other expenditures:	Special survey + other sources	
S	Materials:	Price lists from suppliers	New one-dwelling buildings and two-dwelling buildings
	Labour:	Collective agreements with and without extra payments	
	Equip.	Producer Price Index for machinery	
	Energy	Producer Price Indices	
	Transport	Price reported by suppliers	
UK	Materials:	Producer Price Indices	Total construction industry
	Labour:	Index of average earnings covering total wages and salaries for manual and non-manual workers	

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European Commission

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This publication contains the detailed description of the methods of collection and compilation of construction price indices in various European countries. The methodologies used by Denmark, Germany, Spain, France, Italy, the Netherlands, Sweden, the United Kingdom and Switzerland are described in detail. This document also includes the definitions proposed by Eurostat for the different types of construction price indices as well as the terminology used in this field. This publication was made possible thanks to the contribution of the experts of the European Union Member States and is the outcome of the seminar organized by Eurostat on 21 and 22 February 1996 in Luxembourg where all these methodological aspects were presented and discussed.

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