

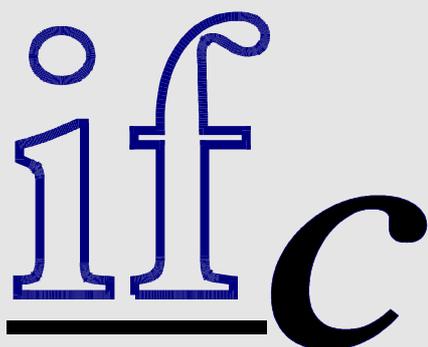
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IRVING FISHER COMMITTEE  
ON CENTRAL-BANK STATISTICS

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*ifc Bulletin*

No. 4 • June 1999



The Irving Fisher Committee is part  
of the International Statistical Institute

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# ifc Bulletin

No. 4 – June 1999

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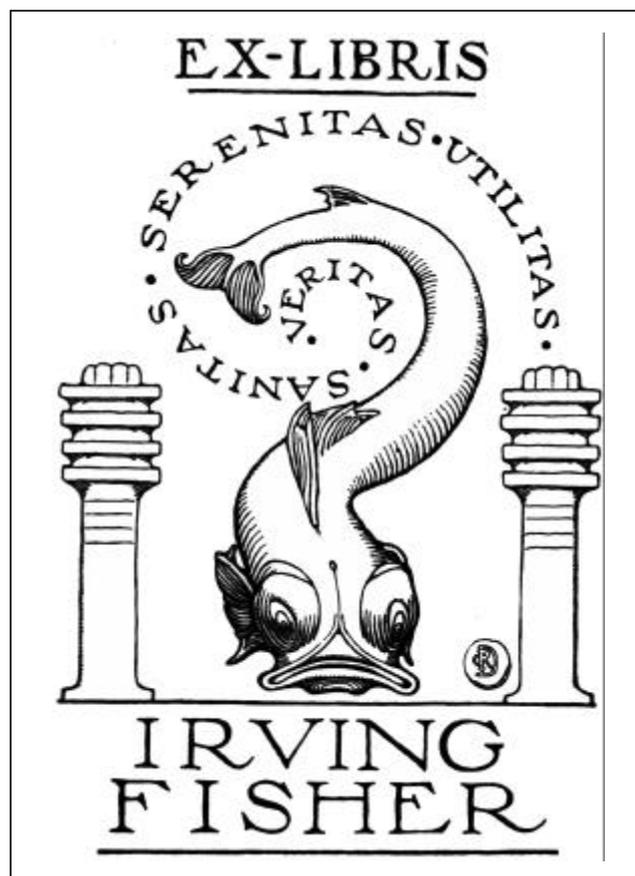
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Short Stories on Wealth .....73

The ISI Session is drawing closer. A letter from the Chairman and the Secretary of the Irving Fisher Committee (printed overleaf) gives some useful information about the event and invites central bank statisticians to participate.

This issue of the IFC Bulletin focuses on the Helsinki Meeting by already publicising the papers – either in full or in shortened form – that arrived in time. The remaining papers will follow in the next issue. A number of abstracts appeared already in numbers 2 and 3 of the Bulletin. The authors of these abstracts are welcome to submit their comprehensive papers for publication.



Dr. Arthur Vogt received a book with Fisher's bookplate from Martha Marbo, the widow of Hans Cohnssen (Cohnssen was Fisher's main collaborator from 1932 to 1942, cf. Cohnssen, H., 1939, *Working for Irving Fisher*, *Cato Journal*, 10, 825-833), and put this bookplate at our disposal. We intend to adopt it as the emblem of the Irving Fisher Committee and to use it on the front page of the IFC Bulletin. The bookplate derives its inspiration from Greek and Egyptian mythology. Its main object is a swimming dolphin, an animal considered in antiquity as a friend of man, bringing victims of shipwreck ashore on its back. The dolphin on the bookplate is flanked by two representations of a *djed*, a pillar-shaped amulet, indicating the vertebral column of Osiris. It symbolizes stability. The *djed* became more widely known after several splendid specimen of the amulet were found in the treasure of Tutankhamen. It is therefore likely that the bookplate was designed in the period follow-

ing the discovery, in 1922, of this pharaoh's burial chambers. The bookplate furthermore displays the Latin words for Truth, Health, Calm and Usefulness, terms which characterise Fisher's everlasting action in support of the common good. The significance of the vignette near the bottom of one of the *djed*-pillars is obscure. It is not known whether Fisher had the bookplate designed himself or whether he had chosen it from existing models.



## IRVING FISHER COMMITTEE ON CENTRAL-BANK STATISTICS

Dear Colleague,

May 1999

This issue of the IFC Bulletin is the last one before the 52nd ISI Session, which will take place from 10 to 18 August in Helsinki. Within the framework of this conference, the Irving Fisher Committee will present a full-fledged programme.

In the first place, there will be sessions for invited papers and for contributed papers:

- Invited Papers Session No. 73: “*Globalisation of Markets and Cross-Border Holdings of Financial Assets*”, with contributions from the Bank of England, Banco de España, the Bank of Japan and the International Monetary Fund.
- Contributed Papers Session No. 43: “*Globalisation of Markets and Cross-Border Holdings of Financial Assets*”, with contributions from De Nederlandsche Bank, Central Bank of Nigeria, National Bank of Belgium, Ufficio Italiano dei Cambi and Bank of Finland.
- Contributed Papers Session No. 42, “*The central banks’ function in the field of statistics*”, with contributions from Oesterreichische Nationalbank, Central Bank of Barbados, National Bank of Belgium, Bank of Botswana, Czech National Bank, Banque de France, Bank Markazi Iran, Bank of Lithuania, Bank of Mauritius, Central Bank of Nigeria, National Bank of Poland, Banque Nationale du Rwanda, National Bank of Slovakia and Banco de España.

Papers for these sessions, received before the copy deadline, can be found in the present issue of the Bulletin, either in a short or in a comprehensive version. The remaining papers will be published in the next issue.

In addition to the scientific sessions, the IFC will have an administrative meeting on Thursday, 12 August, 5.30 p.m., with the following agenda:

- election of a new chairman;
- discussion on the IFC’s operation and strategy;
- preparation of the ISI Session in 2001;
- option for a closer contact with the International Association for Official Statistics (IAOS), one of ISI’s five societies.

During the conference, the IFC will organise, in co-operation with the IAOS, a session on “How to measure deregulation”.

Anybody participating within the framework of the IFC, is allowed to attend any other session of the ISI conference.

In view of the length of the conference, the IFC Secretariat has seen to a clustering of all IFC activities in the first few days (11-14 August). This should make it possible to you to participate in all items of our programme.

Dear Colleague, after a preliminary period, which started four years ago in Beijing, and the initial meeting in Istanbul two years ago, the IFC is entering a decisive stage. Has the IFC a useful role to play? Its viability can only be demonstrated by your active interest in its objective, by your attendance of its meetings and by your preparedness to submit papers to its sessions and articles to its Bulletin.

In our administrative meeting in Istanbul, it was decided that the IFC should be a forum in which central bankers could exchange practical and scientific experience and expertise on matters of common interest. It was welcomed that the IFC would try to attain this objective within the framework of the ISI. Once more, we would like to emphasise the unique facilities the ISI is offering us. Central banks get an opportunity to present their statistical achievements, which are not slight, to statisticians working in other fields. The multidisciplinary character of the conference could incite central bankers to broaden the scope of their knowledge and to take notice of how others have solved common problems, like the impact of globalisation on statistical practices.

If you have not yet decided to register for the Helsinki gathering, we hope we have convinced you that your participation is really highly important. We are sure that the extension of personal contacts among central bank statisticians and between central bankers and ISI members will be beneficial to all parties concerned.

All practical information on participation can be found on Internet site <http://www.stat.fi/isi99> or can be retrieved from

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We would be glad to meet you at the conference in Helsinki.

With best regards,

B. Meganck

Secretary

E. Zautzik

Chairman

# Additive and Multiplicative Causal Analysis

## A Generalisation of Index Theory

*Arthur Vogt and János Barta*

If an instance in which the phenomenon under investigation occurs and an instance in which it does not occur have every circumstance in common save one, that one occurring only in the former, the circumstance in which alone the two instances differ is the effect, on the cause, or an indispensable part of the cause, of the phenomenon.

John Stuart Mill (1806-1873)

*In Vogt and Barta (1997) are treated three generalisations of the index problem. In the following one of these is enlarged with two solutions, the ordered and the total one. A function  $f$  which is investigated in the base situation 0, giving the value  $f(\bar{x}^0)$ , and in the observed situation 1, giving the value  $f(\bar{x}^1)$ . An additive causal analysis of the difference  $f(\bar{x}^1) - f(\bar{x}^0)$  is performed in section 1 and a multiplicative causal analysis of the ratio  $f(\bar{x}^1)/f(\bar{x}^0)$  is performed in section 2. Then follows an example from health insurance. The function  $f$  is treated as a “black box”: It may be very complicated, contrary to the scalar product of the price and the quantity vectors in the context of price indices. Readers may first read section 3.1 and see if they solve the problem described there in the same way as the authors did in sections 1 and 2.*

*The relation between the above quotation from Mill and our theory may be described as follows:*

- *instance means the situations 0 and 1,*
- *phenomenon means the function  $f$  and*
- *circumstance means the “commodity”  $x_i$ .*

### 1 Additive Causal Analysis

Let  $f$  be a given function of  $n$  arguments  $x_1, x_2, \dots, x_n$ .

These arguments have the values  $x_1^0, x_2^0, \dots, x_n^0$

in the base situation and  $x_1^1, x_2^1, \dots, x_n^1$

in the current situation. We want to distribute the difference

$$\Delta = f(x_1^1, x_2^1, \dots, x_n^1) - f(x_1^0, x_2^0, \dots, x_n^0) \quad (1)$$

on the differences  $\Delta_i$  caused by the individual arguments  $x_i$ . Ideally, the sum of the individual effects should equal the global effect, i.e.

$$\Delta = \sum_{i=1}^n \Delta_i \quad (2)$$

The authors stumbled upon this problem when the additional expenses of several legal measures in social insurance had to be estimated. There are  $n$  legal measures, numbered  $1, 2, \dots, n$ , to be investigated. The costs in the base situation are  $f(x_1^0, x_2^0, \dots, x_n^0)$  and in the current situation  $f(x_1^1, x_2^1, \dots, x_n^1)$ , where the present state concerning measure  $i$  is described by the value  $x_i^0$  and the state after the measure was introduced by the value  $x_i^1$ . Formula (1) gives the simultaneous additional costs if all the measures have been introduced. These costs have to be distributed adequately over the individual measures. A distribution according to formula (5) does not necessarily fulfill formula (2), which states that the sum of the additional costs of the individual measures equals the total additional costs (1).

Inspired by the price index problem, we can define the Laspeyrian approach (cf. formula (1.7), (1.18) in Vogt and Barta (1997) or (3.1) in Barta (1997)) as follows

$$\Delta_i^{Laspeyres} = f(x_1^0, x_2^0, \dots, x_{i-1}^0, x_i^1, x_{i+1}^0, \dots, x_n^0) - f(x_1^0, x_2^0, \dots, x_{i-1}^0, x_i^0, x_{i+1}^0, \dots, x_n^0) \quad (3)$$

Accordingly, the Paaschian approach (cf. formula (1.8), (1.19), (3.2)) is

$$\Delta_i^{Paasche} = f(x_1^1, x_2^1, \dots, x_{i-1}^1, x_i^1, x_{i+1}^1, \dots, x_n^1) - f(x_1^1, x_2^1, \dots, x_{i-1}^1, x_i^0, x_{i+1}^1, \dots, x_n^1) \quad (4)$$

As a compromise between the two, we can use their mean, according to the index by Drobisch I (1.11 in Vogt and Barta (1997) or (3.3) in Barta (1997))

$$\Delta_i^{DrobischI} = \frac{\Delta_i^{Laspeyres} + \Delta_i^{Paasche}}{2} \quad (5)$$

Another compromise corresponds to the index by Edgeworth-Marshall (1.9) in Vogt and Barta (1997)

$$\begin{aligned} \Delta_i^{Edgeworth-Marshall} = & f\left(\frac{x_1^0 + x_1^1}{2}, \frac{x_2^0 + x_2^1}{2}, \dots, \frac{x_{i-1}^0 + x_{i-1}^1}{2}, x_i^1, \frac{x_{i+1}^0 + x_{i+1}^1}{2}, \dots, \frac{x_n^0 + x_n^1}{2}\right) \\ & - f\left(\frac{x_1^0 + x_1^1}{2}, \frac{x_2^0 + x_2^1}{2}, \dots, \frac{x_{i-1}^0 + x_{i-1}^1}{2}, x_i^0, \frac{x_{i+1}^0 + x_{i+1}^1}{2}, \dots, \frac{x_n^0 + x_n^1}{2}\right) \end{aligned} \quad (6)$$

Formula (5) is the mean of the differences, (6) the difference for the mean arguments. Often (6) is not defined because the mean of the arguments does not exist. For instance, in the example of section 3.1, a “mean” town between Bern and Geneva and a mean caisse between Artisana and Swica do not exist. (These are so-called nominal scales, not “arithmetic” scales.) – To do the causal analysis so far one only needs  $2(n+1)$  special values of the unknown function  $f$ .

The advantage of the following solution is that only  $n$  values of the function  $f$  are needed. It is used by the Swiss Social Insurance Office.

$$\Delta_i^{ordered} = f(x_1^1, x_2^1, \dots, x_{i-1}^1, x_i^0, x_{i+1}^0, \dots, x_n^0) - f(x_1^1, x_2^1, \dots, x_{i-1}^1, x_i^1, x_{i+1}^0, \dots, x_n^0) \quad (7)$$

The second advantage of this formula is that formula (2) is fulfilled directly without the adaptation (9). The disadvantage of this solution is that it depends on the ordering of the measures which may be arbitrary. Actually,  $n!$  such solutions are possible according to the  $n!$  permutations of the arguments. Thus we recommend the arithmetic mean of all these:

$$\Delta_i^{ordered / mean} = \frac{1}{n!} \sum_{\text{permutations}} \Delta_i^{ordered} \quad (8)$$

To express the above in a general notation we consider a given permutation  $(p(x_1), p(x_2), p(x_3), \dots, p(x_n))$  of the  $n$  factors  $x_1, x_2, x_3, \dots, x_n$ , where  $p(x_j) = x_i$  means, that  $x_i$  goes to the  $j$ -th place in this new ordering. For example if we have 3 factors the permutation  $(x_2, x_3, x_1)$  means that the second component moves to the first place, the third to the second and the first to the third place.

In our problem of causal analysis we can interpret each permutation  $p$  as a given path from the base situation to the end situation: the permutation expresses which factor is changed as first, which as second and so on. For instance  $(x_2, x_3, x_1)$  would mean that we begin by changing the second factor, then the third and at last the first factor.

To compute a causal analysis of the  $i$ -th factor we are interested to the change of  $x_i$  on the considered path, given by the permutation  $p$ . Therefore we need the two points on the path just before and just after the change of the  $i$ -th component.

Components of the first point  $\hat{x}_p^0$ :

$$x_{p(x_1)} = x_{p(x_1)}^1; x_{p(x_2)} = x_{p(x_2)}^1; \dots; x_{p(x_{j-1})} = x_{p(x_{j-1})}^1;$$

$$x_{p(x_j)} = x_{p(x_j)}^0; \dots; x_{p(x_n)} = x_{p(x_n)}^0$$

Components of the second point  $\hat{x}_p^1$ :

$$x_{p(x_1)} = x_{p(x_1)}^1; x_{p(x_2)} = x_{p(x_2)}^1; \dots; x_{p(x_j)} = x_{p(x_j)}^1;$$

$$x_{p(x_{j+1})} = x_{p(x_{j+1})}^0; \dots; x_{p(x_n)} = x_{p(x_n)}^0$$

The variation of the  $i$ -th component on the path given by  $p$  is

$$\Delta_i^p = f(\hat{x}_p^1) - f(\hat{x}_p^0)$$

To get a measure of the variation in the  $i$ -th component, which is independent on the chosen path, we take the arithmetical mean on all the  $n!$  permutations  $p$ , that is on all the possible paths (these can be conceived as the  $n!$  paths leading from the point  $(0,0,\dots,0)$  to point  $(1,1,\dots,1)$  on the  $n$ -dimensional unitary cube):

$$\Delta_i^{ordered\ mean} = \frac{1}{n!} \cdot \sum_{permutations\ p} \Delta_i^p$$

The following “total solution” may be recommended also. It depends on  $2^n$  values of the function  $f$ .

$$\Delta_i^{total} = \frac{1}{2^{n-1}} \sum_{\substack{all\ 2^{n-1} \\ combinations \\ k_j=0\ or\ 1}} f(x_1^{k_1}, x_2^{k_2}, \dots, x_{i-1}^{k_{i-1}}, x_i^1, x_{i+1}^{k_{i+1}}, \dots, x_n^{k_n}) - f(x_1^{k_1}, x_2^{k_2}, \dots, x_{i-1}^{k_{i-1}}, x_i^0, x_{i+1}^{k_{i+1}}, \dots, x_n^{k_n}) \quad (9)$$

Even with a general function  $f$  and the compromise (5), formula (2) in the case  $n=2$  is always fulfilled.

If the “black box”  $f$  happens to be a linear combination  $\sum_{i=1}^n a_i x_i$ , (2) is fulfilled even by both the corner solutions (3), (4).

If there are more than two causes, (2) no longer holds generally. Then we propose to increase or reduce the distribution according to (5), (7), (8) or (9) proportionally on the level of the difference (1):

$$\Delta_i^* = \frac{\Delta}{\sum_{i=1}^n \Delta_i} \Delta_i \quad (10)$$

### Additive Causal Analysis by Linear Regression

Another completely different approach to the causal analysis given by formula (8) is possible: we use the theory of linear regression to derive the above result for the case of 3 factors in a quite clear, geometrical way. At the end of the section our results will be applied numerically to the example of the health insurance funds.

We start from the following simplified situation: let's take the point (0,0,0) with value  $f(0,0,0)$  as base situation and the point (1,1,1) with value  $f(1,1,1)$  as end situation. We also know the values of all the intermediate points, as  $f(1,0,0)$  for the point (1,0,0),  $f(0,1,0)$  for (0,1,0) and so on.

Our problem is to find the optimal 3-dimensional linear space of the form

$$l(x, y, w) = ax + by + cw + d \quad (11)$$

passing through the two points (0,0,0,  $f(0,0,0)$ ) and (1,1,1,  $f(1,1,1)$ ) and possibly near to the other 6 intermediate points. This is a typical problem of linear regression, where the 4 parameters a, b, c and d are to be found out.

First we insert the extreme points into (11):

$$\begin{aligned} l(0,0,0) &= d = f(0,0,0) \\ l(1,1,1) &= a + b + c + d = f(1,1,1) \end{aligned} \quad (12)$$

So we can rewrite (11) as

$$l(x, y, w) = a(x-w) + b(y-w) - w(f(1,1,1) - f(0,0,0)) + f(0,0,0) \quad (13)$$

Now we need the values on the linear space f of the 6 intermediate points:

$$\begin{aligned} l(1,0,0) &= a + f(0,0,0) \quad ; \quad l(0,1,0) = b + f(0,0,0) \\ l(1,1,0) &= a + b + f(0,0,0) \quad ; \quad l(0,0,1) = -a - b + f(1,1,1) \\ l(1,0,1) &= -b + f(1,1,1) \quad ; \quad l(0,1,1) = -a + f(1,1,1) \end{aligned} \quad (14)$$

At this point begins the regression by minimizing the squares of the differences between the values on f and the given values:

$$\begin{aligned} \text{Min} \quad & (a + f(0,0,0) - f(1,0,0))^2 + (b + f(0,0,0) - f(0,1,0))^2 + \\ & + (a + b + f(0,0,0) - f(1,1,0))^2 + (-a - b + f(1,1,1) - f(0,0,1))^2 + \\ & + (-b + f(1,1,1) - f(1,0,1))^2 + (-a + f(1,1,1) - f(0,1,1))^2 \end{aligned} \quad (15)$$

Let us call this function  $F(a,b)$ . The necessary condition for the Minimum of  $F(a,b)$  is that the partial derivatives give zero in that point:

$$\begin{cases} F_a(\hat{a}, \hat{b}) = 0 \\ F_b(\hat{a}, \hat{b}) = 0 \end{cases} \quad (16)$$

The system of linear equations (16) yields the solutions:

$$\begin{aligned} \hat{a} &= \frac{1}{6}(-2f(0,0,0) + 2f(1,0,0) - f(0,1,0) + f(1,1,0) - \\ & - f(0,0,1) + f(1,0,1) - 2f(0,1,1) + 2f(1,1,1)) \\ \hat{b} &= \frac{1}{6}(-2f(0,0,0) - f(1,0,0) + 2f(0,1,0) + f(1,1,0) - \\ & - f(0,0,1) - 2f(1,0,1) + f(0,1,1) + 2f(1,1,1)) \end{aligned} \quad (17)$$

and according to (12)

$$\hat{c} = \frac{1}{6}(-2f(0,0,0) - f(1,0,0) - f(0,1,0) - 2f(1,1,0) + 2f(0,0,1) + f(1,0,1) + f(0,1,1) + 2f(1,1,1))$$

Now that we found the desired linear space, it is straight forward to conclude, that the effects of the 3 factors are equal to the values of the 3 parameters, since

$$\begin{aligned}\Delta_1 &= l(1,0,0) - l(0,0,0) = \hat{a} \\ \Delta_2 &= l(0,1,0) - l(0,0,0) = \hat{b} \\ \Delta_3 &= l(0,0,1) - l(0,0,0) = \hat{c}\end{aligned}\tag{18}$$

The first consideration about this result is that the basic property (2) holds, i.e.

$$\Delta_1 + \Delta_2 + \Delta_3 = f(1,1,1) - f(0,0,0)$$

Furthermore, formulas (17) also hold in the more general situation, when the arguments of the function  $l(x,y,z)$  are not on the unitary cube. (17) remains invariant, because a linear transformation of the arguments (a “horizontal deformation”) doesn’t affect the vertical increasing of the function.

To show that (17) is identical with the arithmetical mean computed in (8), we rewrite  $\Delta_i^{ordered\ mean}$  for  $i=1$  using formula (8):

$$\begin{aligned}\Delta_i^{ordered\ mean} &= \frac{1}{3!}[(f(1,0,0) - f(0,0,0)) + (f(1,0,0) - f(0,0,0)) + \\ &+ (f(1,1,0) - f(0,1,0)) + (f(1,1,1) - f(0,1,1)) + \\ &+ (f(1,0,1) - f(0,0,1)) + (f(1,1,1) - f(0,1,1))]\end{aligned}\tag{19}$$

We can easily verify that (19) is equal to  $\Delta_1$  found in (18). The same holds also for  $i=2$  and 3.

Finally we want to check the solutions (17) on the problem in section 3.1; in the notation used in this section we have

$$\begin{aligned}f(0,0,0) &= 142 ; & f(1,0,0) &= 156 ; & f(0,1,0) &= 225 ; & f(1,1,0) &= 212 \\ f(0,0,1) &= 198 ; & f(1,0,1) &= 184 ; & f(0,1,1) &= 295 ; & f(1,1,1) &= 278\end{aligned}$$

which yields

$$\begin{aligned}\Delta_1 &= \hat{a} = -5.5 \\ \Delta_2 &= \hat{b} = 84.5 \\ \Delta_3 &= \hat{c} = 57.\end{aligned}\tag{20}$$

Comparing these results with the second table of section 3.2 we see that they are identical, as expected.

## 2 Multiplicative Causal Analysis

Formulas (1) to (10) correspond to the additive distribution of the simultaneous effect on the individual causes. Often the multiplicative distribution is more significant. Then one asks not for the amount of additional costs but for the relative rise of the costs. In that case (1) corresponds to

$$\Pi = \frac{f(x_1^1, x_2^1, \dots, x_n^1)}{f(x_1^0, x_2^0, \dots, x_n^0)}\tag{21}$$

Formula (21) has to be split up in the factors  $\Pi_i$ . Formula (2) corresponds to

$$\Pi = \prod_{i=1}^n \Pi_i\tag{22}$$

and  $\Pi_i$  gives the relative contribution of cause number  $i$  to the total factor  $\Pi$ . The formula corresponding to (3) is

$$\Pi_i^{Laspeyres} = \frac{f(x_1^0, x_2^0, \dots, x_{i-1}^0, x_i^1, x_{i+1}^0, \dots, x_n^0)}{f(x_1^0, x_2^0, \dots, x_{i-1}^0, x_i^0, x_{i+1}^0, \dots, x_n^0)} \quad (23)$$

and that to (4),

$$\Pi_i^{Paasche} = \frac{f(x_1^1, x_2^1, \dots, x_{i-1}^1, x_i^1, x_{i+1}^1, \dots, x_n^1)}{f(x_1^1, x_2^1, \dots, x_{i-1}^1, x_i^0, x_{i+1}^1, \dots, x_n^1)} \quad (24)$$

As for two causes the arithmetic mean (5) yields the exact simultaneous effect (2), the geometric mean yields exactly (22) even with a general function  $f$ :

$$\Pi_1^{Fisher} = \sqrt{\Pi_1^{Laspeyres} \Pi_1^{Paasche}} = \sqrt{\frac{f(x_1^1, x_2^0) f(x_1^1, x_2^1)}{f(x_1^0, x_2^0) f(x_1^0, x_2^1)}} \quad (25)$$

$$\Pi_2^{Fisher} = \sqrt{\Pi_2^{Laspeyres} \Pi_2^{Paasche}} = \sqrt{\frac{f(x_1^0, x_2^1) f(x_1^1, x_2^1)}{f(x_1^0, x_2^0) f(x_1^1, x_2^0)}} \quad (26)$$

because

$$\Pi_1^{Fisher} \Pi_2^{Fisher} = \frac{f(x_1^1, x_2^1)}{f(x_1^0, x_2^0)} = \Pi \quad (27)$$

If  $f$  happens to be the product  $\prod_{i=1}^n x_i^{a_i}$ , (22) is fulfilled even by the corner solutions (23), (24).

The mathematical index theory shows that the geometric mean is not the only compromise between the indices of Laspeyres and Paasche which satisfies formula (22) for two factors. This formula is called the “factor reversal test” for  $n=2$  in index theory, and many other indices fulfill this test, e.g. the indices (3.9), (3.12) in Barta (1997).

In the case  $n>2$ , the multiplicative analogon to (5) with Fisher’s index (formula (3.4) in Barta (1997), another index fulfilling the factor reversal test could be chosen instead) reads

$$\Pi_i^{Fisher} = \sqrt{\Pi_i^{Laspeyres} \Pi_i^{Paasche}} = \sqrt{\frac{f(x_1^0, \dots, x_{i-1}^0, x_i^1, x_{i+1}^0, \dots, x_n^0)}{f(x_1^0, x_2^0, \dots, x_n^0)} \frac{f(x_1^1, x_2^1, \dots, x_n^1)}{f(x_1^1, \dots, x_{i-1}^1, x_i^0, x_{i+1}^1, \dots, x_n^1)}} \quad (28)$$

The analogon to (7) reads

$$\Pi_i^{ordered} = \frac{f(x_1^1, \dots, x_{i-1}^1, x_i^1, x_{i+1}^0, \dots, x_n^0)}{f(x_1^1, \dots, x_{i-1}^1, x_i^0, x_{i+1}^0, \dots, x_n^0)} \quad (29)$$

And to (8)

$$\Pi_i^{ordered / mean} = \left( \prod_{\substack{n! \\ \text{permutations}}} \Pi_i^{ordered} \right)^{\frac{1}{n!}} \quad (30)$$

And to (9)

$$\Pi_i^{total} = \left( \prod_{\substack{\text{all } 2^{n-1} \\ \text{combinations}}} \frac{f(x_1^{k_1}, x_2^{k_2}, \dots, x_{i-1}^{k_{i-1}}, x_i^1, x_{i+1}^{k_{i+1}}, \dots, x_n^{k_n})}{f(x_1^{k_1}, x_2^{k_2}, \dots, x_{i-1}^{k_{i-1}}, x_i^0, x_{i+1}^{k_{i+1}}, \dots, x_n^{k_n})} \right)^{\frac{1}{2^{n-1}}} \quad (31)$$

and the analogon to (10)

$$\Pi_i^* = \left( \frac{\Pi}{\prod_{i=1}^n \Pi_i} \right)^{\frac{1}{n}} \Pi_i \quad (32)$$

### Multiplicative Causal Analysis by Non-Linear Regression

Another classical method of regression can be applied to obtain the formulas (29) and (30) of the multiplicative causal analysis. By taking the logarithm of equations (21) and (22) we can reduce them to the equations (1) and (2) of the additive analysis

$$\log \Pi = \log f(x_1^1, x_2^1, \dots, x_n^1) - \log f(x_1^0, x_2^0, \dots, x_n^0) \quad (33)$$

and

$$\log \Pi = \log \Pi_1 + \log \Pi_2 + \dots + \log \Pi_n \quad (34)$$

This linearisation can be done for any number n of factors, however we show it for the case of 3 factors, according to section 1.2.

Now the problem to solve is to find the linear space  $l(x,y,w)$  passing through the points  $(0,0,0, \log f(0,0,0))$  and  $(1,1,1, \log f(1,1,1))$  and near to the other 6 intermediate points with logarithmic values. Let us call  $h(x,y,w)$  the function  $\log(f(x,y,w))$ .

Analogously to the regression in section 1 we get in the multiplicative case

$$\hat{a} = \frac{1}{6} (-2h(0,0,0) + 2h(1,0,0) - h(0,1,0) + h(1,1,0) - h(0,0,1) + h(1,0,1) - 2h(0,1,1) + 2h(1,1,1)) \quad (35)$$

which can be simplified with the rules of logarithms as

$$\hat{a} = \log \left( \frac{f(1,0,0)^2 f(1,1,0) f(1,0,1) f(1,1,1)^2}{f(0,0,0)^2 f(0,1,0) f(0,0,1) f(0,1,1)^2} \right)^{\frac{1}{6}} \quad (36)$$

According to the additive case and to formula (34) we have that

$$\log \Pi_1 = \hat{a} \quad (37)$$

and therefore

$$\Pi_1 = \left( \frac{f(1,0,0)^2 f(1,1,0) f(1,0,1) f(1,1,1)^2}{f(0,0,0)^2 f(0,1,0) f(0,0,1) f(0,1,1)^2} \right)^{\frac{1}{6}} \quad (38)$$

which confirms the result of formula (30).

## 3 An Example from Health Insurance

### 3.1 The Problem illustrated by an example

The following table gives the premia of two health care funds  $x_1$  for two different cities  $x_2$  for the years  $x_3^0 = 1995$  and  $x_3^1 = 1996$  (source: NZZ, October 17, 1995). Instead of these premia in SFR one might think of millions of US\$ and different legal measures in Social Insurance.

Fund $x_1$	Place $x_2$	$x_3^0 = 1995$	$x_3^1 = 1996$
Artisana	Bern	142	198
	Geneva	225	295
Swica	Bern	156	184
	Geneva	212	278

We assume that the insured person, in 1995, lives in Bern and is insured with the Artisana. Thus, he pays a premium of

$$P(c^0 = \text{Artisana}, p^0 = \text{Bern}, t^0 = 1995) = 142.$$

In 1996 he moves to Geneva and changes to Swica. Thus, he pays a premium of

$$P(c^1 = \text{Swica}, p^1 = \text{Geneva}, t^1 = 1996) = 278$$

in 1996. We now distribute the premium increase additively and multiplicatively on the three “factors” fund, place and time.

### 3.2 Additive Distribution

The premium increase according to (1) is  $278 - 142 = 136$ . It can be distributed to the three factors fund, place and time as follows.

	Laspeyres	Paasche	Drobisch I	Ordered/ mean	Total
Formula Nr.	(3)	(4)	(5)	(8)	(9)
fund	$156 - 142 = 14$	$278 - 295 = -17$	$(14 - 17)/2 = -1.5$	-5.5	-7.5
place	$225 - 142 = 83$	$278 - 184 = 94$	$(83 + 94)/2 = 88.5$	84.5	82.5
time	$198 - 142 = 56$	$278 - 212 = 66$	$(56 + 66)/2 = 61$	57	55
sum	153	143	148	136	130

#### Adapted with (10)

fund	12.444	-16.168	-1.378	-7.846
place	73.777	89.399	81.324	86.308
time	49.777	62.769	56.054	57.538

Permutation	Ordered	Ordered	Ordered	Ordered	Ordered	Ordered	Ordered/ mean
	fund	Fund	place	place	time	time	
	place	time	fund	time	fund	place	formula
	time	place	time	fund	place	fund	(8)
fund	$156 - 142 = 14$	$156 - 142 = 14$	$212 - 225 = -13$	$278 - 295 = -17$	$184 - 198 = -14$	$278 - 295 = -17$	-5.5
place	$212 - 156 = 56$	$278 - 184 = 94$	$225 - 142 = 83$	$225 - 142 = 83$	$278 - 184 = 94$	$295 - 198 = 97$	84.5
time	$278 - 212 = 66$	$184 - 156 = 28$	$278 - 212 = 66$	$295 - 225 = 70$	$198 - 142 = 56$	$198 - 142 = 56$	57
sum	136	136	136	136	136	136	136

For the “total” solution the calculation is

fund  
 $(156-142)+(184-198)+(212-225)+(278-295)=$   
 $14+(-14)+(-13)-17=-30/4=-7.5$

place  
 $(225-142)+(295-198)+(212-156)+(278-184)=$   
 $83+97+56+94=330/4=82.5$

time  
 $(198-142)+(295-225)+(184-156)+(278-212)=$   
 $56+70+28+66=220/4=55$

### 3.3 Multiplicative Distribution

The premium increase according to (6.8) is 278/142, i.e. a factor of 1.958. The calculations of the causal analysis are given in the tables, except for the total solution whose calculation is given below.

Formula No.	Laspeyres (23)	Paasche (24)	Fisher (28)	Ordered (29)	Total (31)
fund	156/142 = 1.099	278/295 = 0.942	= 1.017	0.9894	0.9707
place	225/142 = 1.585	278/184 = 1.511	= 1.547	1.5049	1.4838
time	198/142 = 1.394	278/212 = 1.311	= 1.352	1.3146	1.2965
Product	2.428	1.866	2.127	1.958	1.8674

#### Adapted with (32)

fund	1.023	0.957	0.990		0.9862
place	1.475	1.535	1.505		1.5074
time	1.297	1.332	1.315		1.3171

Permutation	Ordered fund place time	Ordered fund time place	Ordered place fund time	Ordered place time fund	Ordered time fund place	Ordered time place fund
fund	156/142 = 1.099	156/142 = 1.099	212/225 = 0.942	278/295 = 0.942	184/198 = 0.929	278/295 = 0.942
place	212/156 = 1.359	278/184 = 1.511	225/142 = 1.585	225/142 = 1.585	278/184 = 1.511	295/198 = 1.490
time	278/212 = 1.311	184/156 = 1.179	278/212 = 1.311	295/225 = 1.311	198/142 = 1.394	198/142 = 1.394

For the “total” solution the calculation is

fund  
 $(156/142) (184/198) (212/225) (278/295)^{1/4}$   
 $(1.0986 * 0.9293 * 0.9422 * 0.9424) = 0.9707$

place

$$(225/142) (295/198) (212/156) (278/184) = (1.5845 * 1.4899 * 1.359 * 1.5109)^{1/4} = 1.4838$$

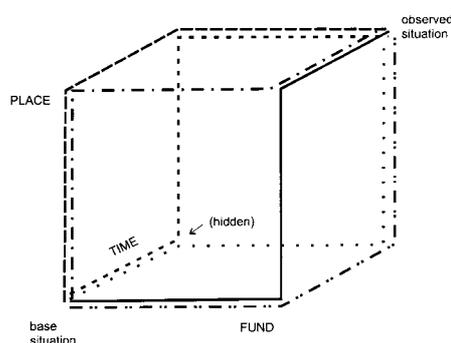
time

$$(198/142) (295/225) (184/156) (278/212) = 1.3944 * 1.311 * 1.179 * 1.311)^{1/4} = 1.2965$$

#### 4. Graphical Representation of Causal Analysis

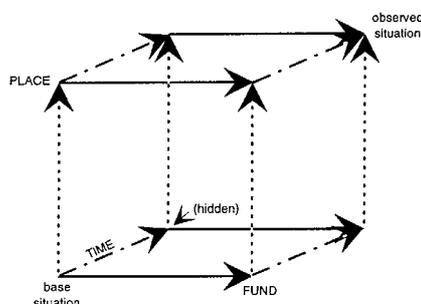
##### 4.1 The “ordered” Solutions

For  $n=3$  factors the problem in section 3 can be illustrated as follows. The  $n!=3!=6$  paths of the “ordered” solutions (7), (29) are



##### 4.2 The “total” Solution

The  $2^{n-1} = 2^{3-1} = 4$  paths (per factor) of the “total” solution (9), (31) are



##### 4.3 Metric Scales: The “straight line” Solution

As we have mentioned in section 1 in the context of Edgeworth-Marshall’s index (6), the 3 factors in section 3 have nominal scales. When the factors correspond to metric scales, the analogon to Divisia’s path-dependent price index is possible (Vogt 1978, Vogt and Barta 1997:section 1.3 , Barta 1997).

A practical example with metric scales (from the second pillar of Swiss Social Insurance) is:

instead of fund

D = Coordination Deduction: Part of the remuneration which is not covered by pension insurance. (23’880 in the base situation, 11’940 in the observed situation)

instead of place

C = Conversion Rate: The annual pension amounts to 7.2% of the accumulated capital. Because of

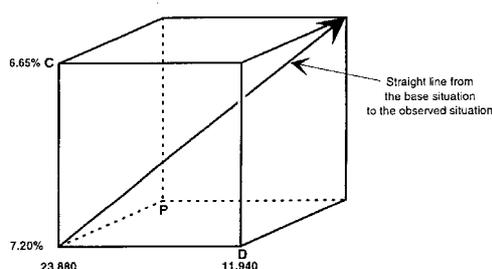
growing life expectation, this rate will be lowered.  
(7.2% in the base situation, 6.65% in the observed situation)

instead of time

P = Degree of pension adaptation: The degree by which pensions are adapted to changes of the price index.

(E.g. a degree of 0 would mean no adaptation (base situation) and a degree of 1 full adaptation (observed situation) with all degrees between 0 and 1 possible.

An analytical integration as with price indices may not be possible in most cases. But a stepwise approximation as performed in Vogt (1986) is always possible. Then the straight line below has to be approximated by steps.



## 5. Conclusion

Methods of (price) index theory are applied to a more general problem with a “black box” function  $f$ . The range of the numerical solutions of this generalised index problem is much wider than those of the original price index problem. This fact makes it more urgent to look for better or the best solution. We recommend as best solutions the “ordered mean”, the “total” and the “straight line” solutions, as well as Fisher’s solution in the multiplicative case.

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# Denomination of time series after the start of European Monetary Union

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With the start of monetary union (EMU), if not before, both analysts and statisticians have been faced with the question as to which currency unit should be used for (“historical”) time series

- of aggregated data for the monetary union as a whole and
- of national data

*running up to the end of 1998* and how these time series are to be denominated *after the start of monetary union*. The only undisputed and unambiguous point appears to be that aggregates for the euro area must be expressed in euros from the beginning of 1999.

## I. Denomination of euro area aggregates

The question as to the denomination of historical time series of euro area aggregates cannot be solved generally, since the solution depends on the analytical purpose for which the historical series are to be used. The issue hinges on the question of whether or not (past) exchange rate fluctuations of the national currencies should be reflected by such an aggregate. For instance, an analysis aimed at showing the past relationship between monetary expansion in euro area countries and the inflation rate will probably eliminate exchange rate fluctuations within the euro area. If exchange rate variations were to be included in the analysis the countries with depreciating (appreciating) currencies would lose (gain) weight. Hence the inflation rate (weighted, for instance, by the national shares in the overall consumption of the euro area) would not reflect the impact of monetary expansion in the individual participating countries. The best solution for this analytical purpose apparently consists in aggregating the national percentage changes in the money stock and the national inflation rates with a weight that does not include the exchange rate (such as the national shares of the individual countries in total real gross domestic product) to form a single euro area aggregate.

Even if a solution suited to *all* analytical purposes should not exist, it may be assumed that there are solutions which can be used for *many objectives*. It is then up to the users to decide whether these standard solutions are appropriate for their analytical purpose. In the first half of last year, the Working Group on Statistics (WGS) of the ECB’s predecessor, the European Monetary Institute, took on the task of finding such solutions for the European Central Bank (ECB) and in particular for its publications. There were three feasible alternatives, i.e. the denomination of euro area aggregates for the period prior to 1998 in

- one national currency, such as the Deutsche Mark or the Dutch guilder,
- ECU, or
- euros (at the conversion rates fixed on December 31, 1998).

Naturally, each of these solutions has pros and cons. It may be assumed that in the majority of cases the users will need euro area aggregates denominated in a “numéraire” which reflects the exchange rate movements of national currencies, while rarely requiring a solution using exchange rates that have not changed over a relatively long period. Therefore, the third alternative – euros at the conversion rates fixed on December 31, 1999 – was *a priori* not suited as a standard solution for specifying euro area aggregates. The discussion of the two remaining alternatives (reflecting exchange rate fluctuations) featured two conflicting arguments:

- The disadvantage of a denomination in the currency of a participating country such as in Deutsche Mark or Dutch guilder was seen in the fact that this method does not meet the requirements of a supranational aggregate.
- The main objection to using the ECU was its relatively minor significance.

**Table 1 – Composition of the ECU basket as from the September 21, 1989**  
(in the respective national currency units)

Deutsche Mark	0.6242
Pound sterling	0.08784
French franc	1.332
Italian lira	151.8
Dutch guilder	0.2198
Belgian franc	3.301
Luxembourg franc	0.130
Danish krone	0.1976
Irish pound	0.008552
Greek drachma	1.440
Spanish peseta	6.885
Portuguese escudo	1.393

However, it was an even greater drawback that the ECU currency basket (Table 1) contained the pound sterling, the Danish krone and the Greek drachma, i.e. currencies of EU member states not participating in monetary union from the outset. After all, the overall weight of these three currencies amounted to roughly one-sixth. In addition, the ECU basket did not include the currencies of two participating countries, the Austrian schilling and the Finnish markka. There was another reason for not using the ECU. Although it reflected the exchange rate fluctuations of the currencies included, the weighting method, which was based on the national shares in the common gross national product, in intra-Community trade and on the respective quota of the short-term monetary support, had remained unchanged since 1989, i.e. for ten years. And finally, the ECU was rejected because it was a rather young currency unit : it was only introduced in 1979, when the European monetary system was established. For the period from 1975 to 1979 it would be possible to use the European Unit of Account, which was superseded by the ECU and corresponded to the ECU's definition and value at the time the ECU was introduced. However, for periods of time before 1975, the ECU cannot provide a solution to the denomination issue.

The conflict between different positions in the WGS was resolved with the following compromise : the user of historical time series of euro area aggregates has a choice between two options. The first option is that the time series are denominated in ECU and hence in the same currency unit used by the Statistical Office of the European Communities when publishing pre-1999 data on the EU or the euro area. This pragmatic aspect has made it easier for the opponents of this solution to accept it after all. The second option involves a statistical currency basket calculated and published (e.g. on the Internet) by the ECB which only contains the currencies of the countries participating in the monetary union. This statistical basket currency into which all data expressed in national currencies can be converted does not only reflect the (past) exchange rate fluctuations of the currencies melted into the euro – like the ECU. Unlike the ECU, the weights of this statistical basket currency will also be subject to changes. This method is designed to mirror the changing economic significance of the participating countries and hence of their currencies. As in the determination of the national shares in the ECB's capital, the weights used in this weighting method consist of the respective shares in the common gross domestic product (GDP) and in the euro area population. These weights (computed as the arithmetic mean of the GDP share and the population share) are adjusted annually on the basis of a five-year moving average (also applied to data which do not span a whole year). At the end of the year 1998 the unit of the statistical basket currency was set equal to one ECU. Such a statistical currency basket can also be calculated for the period up to 1975, for which, as mentioned before, no ECU data are available. It is not yet clear whether the composition of the statistical currency basket needs to be adjusted when new members join EMU. Besides, it must be taken into account that the aggregate itself (such as, for instance, the gross domestic product of an enlarged euro area) will change when new participants enter into monetary union.

*Table 2 – Countervalues of the ECU and the statistical currency basket expressed in Deutsche Mark (DM), French franc (FF) and Italian lira (Lit)  
(annual averages)*

Year	DM		FF		Lit	
	ECU	Statistical currency basket	ECU	Statistical currency basket	ECU	Statistical currency basket
1980	2.524	2.842	5.869	6.607	1189.2	1338.6
1985	2.226	2.329	6.795	7.107	1448.0	1514.3
1986	2.128	2.235	6.800	7.140	1461.9	1534.8
1987	2.072	2.163	6.929	7.235	1494.9	1560.8
1988	2.074	2.151	7.036	7.296	1537.3	1593.8
1989	2.070	2.171	7.024	7.365	1510.5	1583.7
1990	2.052	2.164	6.914	7.290	1522.0	1605.0
1991	2.051	2.157	6.973	7.334	1533.2	1612.5
1992	2.020	2.116	6.848	7.172	1595.5	1570.8
1993	1.936	1.983	6.634	6.792	1841.2	1885.0
1994	1.925	1.952	6.583	6.677	1915.1	1942.3
1995	1.874	1.882	6.525	6.553	2130.1	2139.2
1996	1.910	1.938	6.493	6.591	1959.0	1988.5
1997	1.964	1.961	6.613	6.602	1929.3	1926.2
1998	1.969	1.958	6.601	6.563	1943.7	1932.3

An occasional objection to this two-tier approach, which permits time series to be denominated either in ECU or in the statistical currency basket, is that this would confuse the users. Conversely, one could also argue that confronting users with two options forces them to make a choice which could well draw their attention to the denomination problem for the first time and cause them to think it over.

Table 2 lists the average annual countervalues of three national currencies expressed in ECU and the corresponding equivalents of the statistical currency basket. These figures illustrate the rather substantial difference between the two values for the earlier period.

When trying to find an answer to the practical question of how a euro area aggregate denominated in ECU can be converted into data expressed in units of the statistical currency basket, the above tables are of little use. At least at first glance, the tables seem to suggest that such a conversion requires using the national contributions to the aggregate which are denominated in the national currencies, converting them into statistical currency basket units and re-aggregating them. In actual fact, there is a fixed relationship between the statistical currency basket and the ECU (and vice versa), irrespective of the national currency, which facilitates such a conversion. Let NC denote the national currency of any participating country, and let B denote the statistical currency basket and U the conversion factor, i.e. the relationship between the statistical statistical currency basket and the ECU. Then,

$$U = NC/B: NC/ECU = NC/B*ECU/NC = ECU/B.$$

Table 3 contains the average annual factors used for converting ECU into units of the statistical currency basket over the last twenty years. Naturally, this factor can be calculated for any point in time based on the respective relationship of each euro area currency to the ECU and to the statistical currency basket. The publication of this conversion factor by the European Central Bank would be quite helpful in this respect.

*Table 3 – Conversion factor for converting a time series denominated in ECU into a time series denominated in units of the statistical currency basket*

Year	Conversion factor
1980	0.888
1985	0.956
1986	0.952
1987	0.958
1988	0.964
1989	0.953
1990	0.948
1991	0.951
1992	0.955
1993	0.976
1994	0.986
1995	0.996
1996	0.986
1997	1.002
1998	1.006
End of 1998	1.000

## II. National approaches to the denomination issue

It would certainly contribute – if only slightly – to a positive image of the recently established European System of Central Banks (ESCB) if the individual central banks in the euro area countries were to take a common or at least similar approach to the denomination issue in their national publications. But, as a matter of fact, there was no (timely) harmonisation attempt. At least immediately after the start of monetary union (i.e. as this article was being written) it appears that national approaches will differ.

Of course, in connection with the exchange rate national problems regarding the denomination of current or historic data do not arise prior to or after the start of monetary union. Therefore, the ECU and its changing value for each national currency has no role to play as the currency of denomination at national level for the past; naturally, the same applies to post-1998 data. However, the question arises as to whether these series should be expressed in national currency units or euros for the whole time before and after the turn of the year 1998/99. These options have the following pros and cons:

After the start of monetary union the use of the national currencies can be justified on the ground that the new currency has not been put into circulation and that most euro area residents are not yet familiar with it. This was the line taken by the national statistical offices in the euro area, in particular. They have opted for the corresponding denomination of their published data (up to and including 2001). Similarly, the euro will not be introduced in public sector data for the time being – at least in Germany – (even though debt figures have already been converted into euros and new public debt instruments are being issued in euros). Hence, the usual fiscal data will be published in national currency as before. Of course, the institutions involved here are only putting off the changeover problem until the year 2002, when euro notes and coins will be introduced.

Conversely, one could also argue that the publication of national data in euros from 1999 onwards would foster familiarisation, which is necessary in any case. This was one of the reasons why the Bundesbank decided to use the new currency in its publications as from 1999 – with the exception of a few particularly important time series which are shown both in euros and in DM.

This decision also includes data from other sources which were originally published in DM, as, for instance, data received from the Federal Statistical Office. A key reason for the decision to specify data on money, banking and balance of payments statistics calculated by the Bundesbank in euros was that the German components will thus be treated like the corresponding EMU aggregates, which are also included in the Bundesbank's publications (such as its Monthly Reports).

The question as to the best method to apply to pre-1999 data (at national level) cannot be solved as easily. At first glance, it seems to be the most natural solution to denominate historical time series in euros if the same is done with data for the time after the start of monetary union. Thus, a break in the time series is avoided which would otherwise occur at the turn of the year 1998/1999, and which would make it more difficult for the user, for instance, to calculate the 1999 changes compared with the previous year on the basis of the published data. However, in this approach one should not overlook the fact that using the euro (at the conversion rates irrevocably fixed for each national currency on December 31, 1998) becomes more and more questionable in economic terms the further the respective time series go back. There is no "obvious" answer to the question of back to which date reconverting such series into euros still makes sense. These were the reasons why the Bundesbank decided to continue to publish historical time series in Deutsche Mark. An additional important advantage was that this approach would always clearly mark the "change of regime" even after some years when most users of the data might already have forgotten the exact changeover date. The disadvantage for the user of the data who cannot easily calculate the changes from the previous year on the basis of the 1998/99 data (which are normally specified in these publications anyway) will have to be accepted, unfortunately. Should the users distrust the calculations of the source of the data, they can use the conversion rate specified in the same publication to calculate the changes themselves.

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## HELSINKI MEETING 1999



Particulars of the 52nd ISI Session, which will take place from 10 to 18 August 1999 in Helsinki, can be found on the ISI Internet site <http://www.stat.fi/isi99> as well as in the ISI's Information Bulletins on the conference (Information Bulletin No. 2, containing a time schedule for Invited Papers Meetings and for Administrative Meetings, and a Registration Form, was published in March).

Some additional information with respect to the meetings on behalf of the Irving Fisher Committee can be found in the letter of the Chairman and the Secretary of the Committee on page 2 of this issue.

According to the ISI's Information Bulletin, the Invited Papers Session No. 73: "Globalisation of markets and Cross-Border Holdings of Financial Assets" will be held on Wednesday, August 11, 9.00-11.15 AM. The IFC's Administrative Meeting is scheduled on Thursday, August 12, 5.30-7.00 PM. The exact dates for the two Contributed Papers Sessions (No. 42 and 43) are not yet known, but these sessions will not take place later than Friday, August 13.

Invited and Contributed Papers received before the copy deadline of this Bulletin are published on the following pages (in alphabetical order of the English country names) or will appear in the Bulletin's next issue.

# Globalization: Implications for International Standards in Statistics

*Jan A.J. Bové and Carol S. Carson – IMF*

Globalization, in the context of financial markets, refers to the growing economic interdependence of countries as evidenced by the increasing volume and variety of financial transactions. It reflects a combination of deregulation of domestic financial markets, a sharp reduction of foreign exchange and capital controls, and the creation of new financial instruments (often based on technological advances). As part of a review of country practices on international reserves and external debt statistics in the context of the increased external payments vulnerability associated with financial globalization, the IMF has identified a number of critical data gaps both with respect to international reserves and external debt. From the vantage point of statistical standards, the gaps that have been identified, so far, or still need to be identified, could be broadly categorized as (i) supplementary information outside the existing statistical frameworks; (ii) further enhancements of existing methodologies; and (iii) the development of additional statistical concepts or frameworks.

## **1. Supplementary information outside the existing statistical frameworks**

The need for supplementary information outside (but not replacing) the existing statistical frameworks relates essentially to data on the quality of assets held as reserves, such as encumbrances of certain assets, or various types of guarantees; or gross commitment value (in addition to net market value) of financial derivatives. Indeed, the crisis that began in Asia demonstrated that gross reserves can be a misleading indicator of the monetary authorities' foreign currency liquidity position, i.e., of the foreign currency resources available to meet sudden increases in demand for foreign exchange, and of the potential drains on those resources. The new data template on international reserves/foreign currency liquidity which is now prescribed under the IMF Special Data Dissemination Standard (SDDS) for subscribers to that standard, calls for the supplementation of data on actual financial liabilities with additional instrument categories that may represent either predetermined or contingent short-term net drains on foreign currency assets of monetary authorities. An example of the former would be gross commitments in forwards and futures in foreign currency vis-a-vis the domestic currency; examples of the latter would be undrawn, unconditional credit lines, and collateral guarantees on liabilities falling due within one year, or other contingent liabilities. The methodological issues on guarantees and contingent liabilities are also relevant in the broader context of external debt statistics (as a component of the international investment position (IIP)).

It can be mentioned here, that the SDDS has set higher standards for the frequency and timeliness of international reserves data in view of the increased volatility of capital flows. An important issue that has arisen in this connection is the perceived asymmetry when higher requirements are imposed on the official than on the private sector, which may put the official sector at a disadvantage as a market participant (e.g., central bank operations in the foreign exchange market in relation to the SDDS data category for international reserves).

## 2. Enhancements of existing methodologies

Some concepts covered in fifth edition of the *Balance of Payments Manual (BPM5)* may need amplification in the form of operational definitions, to assist compilers to apply the concepts and to help users to assess the quality of the data. This is the case for official reserves, both with regard to reserve assets and drains upon reserves (see above). An important issue is the definition of reserve assets, which may need to be complemented by a clarification of the conditions under which foreign currency deposits of monetary authorities held with domestic banks are part of reserve assets. In this area, where comparability of data across countries is particularly important, there could be great value in an internationally agreed understanding that such deposits should be treated as reserve assets if the commercial bank holds a counterpart foreign currency claim on a nonresident entity that is itself available to meet balance of payments needs, and if that claim, by mutual agreement, is readily available to the monetary authorities. In connection with external debt statistics, there may be a need for operational definitions regarding the valuation of debt that is not readily tradable and for which the principle of market valuation espoused by *BPM5* has no practical meaning. Here too, there might be value in adopting an internationally agreed operational definition valuing such debt, e.g., at the net present value of the associated future payments streams.

Some other concepts may also need amplification in the form of additional guidance to be provided to compilers and users. This may be the case for the provision of additional details/classifications on the currency of denomination or the holders of financial instruments. The Asian crisis demonstrated that some countries were holding part of their reserve assets in branches abroad of banks headquartered in the reporting country, and those assets became illiquid during the payments crisis. Such assets could, therefore, usefully be broken out under the broader foreign asset concept – as an alternative to a more fundamental approach, involving the adoption of a nationality – consolidating transactions of units on the basis of the ownership and nationality of its headquarters (see below).

With respect to external debt, there has been increasing interest in defining the concept squarely in the context of the IIP. This could improve the comparability of data between countries, and between debtor and various creditor sources. Some important definitional issues will need to be resolved with regard to the coverage of instruments (e.g., are financial derivatives part of external debt?). At the same time, demands from policy makers point to a possible need for different (or additional) classifications, including (i) debt as a data category within the IIP; (ii) a new debtor classification (government, financial, and corporate sectors; or alternatively, the government sector, monetary authorities and banking corporations, and the rest of the private sector); and (iii) a classification by type of creditor.

Additional guidance may be required for instruments for which no clear or explicit standards were developed so far, such as reserve-related liabilities and gold loans, or where the standards need to be changed (or work is in train to change them), such as for financial derivatives. For gold loans, the issue is whether they should be considered to be transactions at all (which might in practice lead to asymmetrical recording of international reserves), or whether (or not) they should be treated either (a) as a sale/purchase of gold to be recorded in the financial account if both transactors are monetary authorities, or, (b) if only one party is a monetary authority, a demonetization of official gold accompanied by an export of merchandise gold. As to financial derivatives, agreement has been reached at the international level on several changes, including the recording of net cash settlements payments of interest rate swaps and forward rate agreements (the most important derivative types) in the financial account, instead of in the current account. (The new agreements are expected to be reflected in a revision of the *BPM5*, probably later in 1999.)

With respect to external debt, the treatment of cross-border intrabank liabilities is known to be the subject of diverse national recording practices. Additional guidance for this critical data category would be useful.

### 3. Development of additional statistical concepts or frameworks

The question has also arisen whether some statistical concepts outside existing frameworks may need to be considered further. Two alternative concepts are considered below, namely, data based on the nationality principle, and data based on residual maturity.

Data based on a *nationality principle* may need to be developed. Presumably these would supplement data based on the residency (of transactors) criteria, because other macroeconomic data sets use a residency basis. The issue of nationality-based data is related to work being done on “foreign affiliates statistics” to develop additional statistical standards and compilation methods to meet the needs of the globalization phenomenon – with most of the work, so far, focusing on Foreign Affiliates Trade in Services (FATS). FATS statistics measure selected host country activity of enterprises that are controlled by an enterprise or enterprises resident in some other economy. These statistics may be approached from the point of view of both the host and controlling economies. This statistical measurement, relating primarily to the production of services, might be extended to activity involving both merchandise and financial transactions. It should be noted that foreign affiliate statistics deviate not only from the residency principle espoused by *BPM5*, but also from the concept of “lasting interest” used to define affiliates for direct investment purposes, as foreign affiliate statistics follow the 50 percent ownership guideline of the *System of National Accounts 1993 (1993 SNA)* rather than the 10 percent ownership guideline of *BPM5*.

From the point of view of the financial markets and the financial accounts, the transposition from FATS would (at least) require the introduction of balance sheet concepts (as in the IIP), in addition to the transactions concept. As is the case for FATS, nationality based financial accounts need to identify and measure a complex array of transactions/positions falling outside the scope of current balance of payments standards. These transactions/positions can then be presented either in a consolidated form, by way of a possible correction to the balance of payments of the recording country, or, unconsolidated, as individual types of transactions having specific analytical or policy interests (e.g., trade of foreign affiliates in their (foreign) home countries).

At present, an example of the foreign affiliate statistics approach in the context of financial accounts can be found in the consolidated “ultimate risk” international banking statistics that the Bank for International Settlements (BIS) is developing. These data are particularly relevant to gauge bank “exposure.” They also add an element to the foreign affiliate statistical framework – namely transactions/positions of affiliates abroad are consolidated only to the extent that they are denominated in foreign exchange. In addition, in order to help assess external payments vulnerability, interest has recently focussed on other nationality-based data series, such as domestic positions in derivatives for inclusion in official international reserve assets. With respect to external debt, interest in the nationality concept has been aroused especially with regard to the treatment of offshore financial centers and banking units.

Data based on *residual (instead of original) maturity* may need to be developed with a view to getting better insights into the liquidity risk associated with globalization and the volatility of capital flows. Alternatively, proposals have been under consideration for assessing liquidity risks on the basis of statistics on repayment schedules or debt service schedules. Both the residual maturity and the schedule approaches can potentially generate analytically useful (future) payments profiles. For the residual maturity approach such profiles could be in the form of time series that could range, for example, from one month upward, with intervals extending as far as needed into the future (but probably not further than one or a few years). Neither approach has a priori methodological superiority over the other. However, if only one cut off point is required (e.g., one year), the residual maturity approach could have advantages from a compilation and presentational point of view. As to forward schedules, the debt service approach (comprising redemption of principal, and possibly also interest payments) may have greater analytical value than that of simple repayment schedules since it is a more comprehensive concept from the point of view of potential drains on official reserve holdings. But it may be more complex. Also, all the alternatives mentioned above are more difficult for compilers (especially for private sector debt) than the original maturity approach espoused in *BPM5*. Moreover, widespread use of put options in international bonds and syndicated loans tend to diminish somewhat the value of statistics based on residual maturity or repayment schedules, especially in the event of acute payments difficulties. Therefore, consideration should probably be given to the collection of data on positions subject to put options.

### 4. Conclusions

The debate on implications of globalization for statistical standards has intensified, and many questions are yet to find answers. Some questions, which follow from the above review, are: (i) in what

way can adaptations of statistical standards meet the needs of policy makers (and what are trade-offs on resource costs)?; (ii) which definitions, treatment of financial instruments, or classifications, need to be updated most urgently, and in what sense? How can the time dimension – maturities and schedules – be adapted to be more useful for general as well as stress analysis? Is there, in the longer run, a need to replace existing statistical frameworks, beyond the suggested enhancements?

### **Résumé en français**

*Cet article examine les principales lacunes statistiques identifiées lors de la revue des méthodes d'estimation des pays effectuée dans le cadre de l'accroissement de la vulnérabilité extérieure associée à la globalisation financière. L'article identifie diverses avenues possibles pour l'amélioration des statistiques, soit: (i) de fournir de l'information supplémentaire comme complément au cadre statistiques actuel (par exemple, sur les avoirs grevés); (ii) d'améliorer les méthodologies existantes (par exemple, sur la définition et la classification des statistiques reliées à la dette extérieure); et (iii) de développer de nouveaux concepts statistiques ou cadres méthodologiques (par exemple, la compilation de données fondées sur le principe de la nationalité plutôt que de la résidence et mettant en évidence l'échéance résiduelle des avoirs et engagements plutôt que l'échéance à l'origine).*

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# Distinction between Capital Gain and Income Gain

*Satoru Hagino – Bank of Japan*

## 1. Revision of Flow of Funds Accounts

The Bank of Japan (BOJ) has been compiling Flow of Funds Accounts statistics (FOF) since 1958. In view of recent changes in financial structure, BOJ started a project in 1996 to review FOF and is about to publish the data on a revised basis. The project has been also motivated by the revision of a System of National Accounts (93SNA) and the compilation of the Manual on Monetary and Financial Statistics (MMFS) by the IMF. We have tried to adopt as much as possible the recommendations of 93SNA and MMFS.

In the process of the project, we have co-ordinated with the Economic Planning Agency (EPA) that compiles Japan's National Accounts. The co-ordinated work was aimed at realizing a consistent revision of FOF and National Accounts. However, the distinction between income gain and capital gain is left unclear. Here, I would like to discuss a few conceptual issues on which we have not reached a clear conclusion.

## 2. Distinction between income gain and capital gain

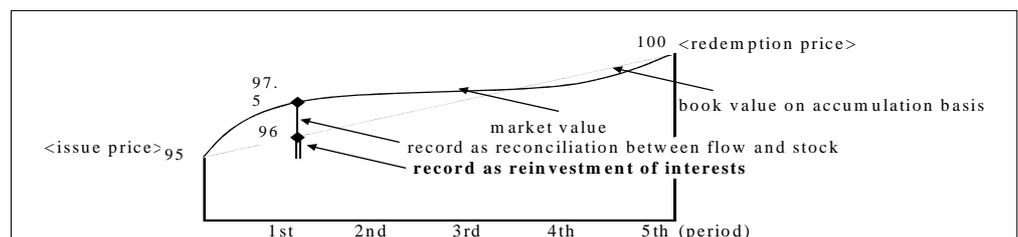
Concerning the treatment of interest-related financial derivatives, modification of 93SNA recommendation is under discussion. The point is whether market value of interest-related financial derivatives should be recognized on accrual basis and cash payments should be recorded not as interests but as realization of holding gains/losses. Proposed treatment means that volume changes of financial assets should be treated as revaluation if they are caused by the changes in the present value of a future cash flow. Taking account of this point, we must reconsider the treatment of reinvestment of property income.

Do interests really accrue from discounted bonds? If we recognize changes in market value of discounted bonds as revaluation, they do not bear interests. Since the market value is decided by present value of cash flow at the time of redemption, this treatment seems theoretically appropriate.

93SNA recommends the accumulation method. By this method, we can avoid a practical problem that bonds do not bear interests. However, the distinction between interest and revaluation is blur at any rate because reinvestment of interests can be estimated in various ways. In the case of interest-bearing bonds issued at a discount, it is much more difficult to distinguish reinvestment of interest from changes in market value.

Let us say that a bond of 100 yen was issued at 95 yen, and its maturity is 5 years. 1 yen is recorded as interest income and reinvestment each period until the redemption if we adopt the simple interest method of accumulation method. The difference between changes in market value and estimated amount of reinvested interests is recorded as revaluation. By the compound interest method, the estimated amounts of reinvested interests increase period by period and the amount of revaluation, accordingly, does not equal to that by the simple interest method.

**Graph 1. Value of discounted bonds**

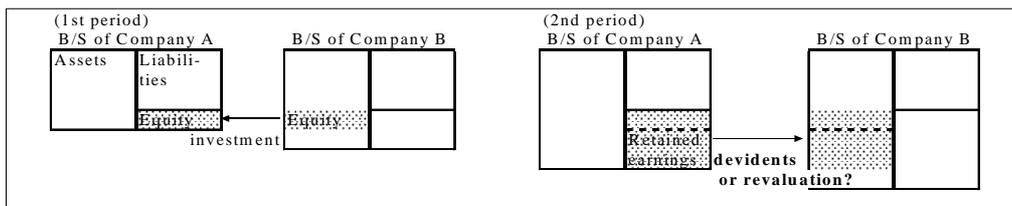


Accrual of dividends is much more controversial. Reinvested earnings were introduced in the Balance of Payments Manual (BOPM) 5th edition. Its concept is to regard retained earnings of a company as payments of dividends to equity holders and reinvestment by equity holders to the company. In the financial market, however, retained earnings can be measured as a change in market value of equity. Measuring reinvested earnings and mark-to-market valuation are incompatible with each other.

Let us think of company A. Its equity is held by Company B. Introducing the concept of reinvested earnings, B records retained earning of A as dividends from A and reinvestment to A. This treatment may be appropriate unless the equity of A is traded on the market. If the equity of A is held by many investors including B and traded on the market, the increase of retained earnings in A is appreciated by market participants. The equity of A would gain value. In this situation, B would record the value-up of the equity as holding gains.

How should we record if the situation is as follows? A is domestic company and its equity is traded in the market. B is nonresidents and holds 60% equity of Company A. 40% of the equity of Company A are held by residents. To be consistent with IMF BOP Manual, 60% of retained earnings of Company A is treated as reinvested earnings because they are recognised as cross-border transaction. At the same time, 40% of retained earnings are recorded as stock fluctuation because those earnings inflate the value of Company B and the value-up is recognized as holding gains in the side of resident equity holders.

Graph 2. Value of equity



### 3. Treatment in revised FOF, BOP and National Accounts

Faced with above-mentioned problems in the process to revise Japan's FOF statistics, we adopted the following treatments. They are different from treatments in National Accounts and BOP.

We have applied the accumulation method only to discounted bank debentures. They are evaluated on market value basis and changes in stocks are recorded either as revaluation in the flow-stock reconciliation table or as reinvestment of interests in the flow table. Other discounted bonds and interest bearing bonds issued at a discount are evaluated at market value and changes in value are recorded in flow-stock reconciliation table only.

The above-mention treatment of discounted bank debenture is related to FISIM. Since FISIN is calculated only by interests in National Accounts, we have to estimate reinvestment of interests as far as discounted bank debentures are concerned.

The accumulation method is applied to foreign-issued deep discounted bonds in Japan's BOP. In National Accounts, the accumulation method is applied for discounted bonds of which interest accrual is estimated in FOF and BOP.

Concerning equities, we have not adopted the concept of reinvested earnings. Listed shares and OTC shares are evaluated at market value and changes in value including the changes in retaining earnings are recorded in the flow-stock reconciliation table. Other equities are evaluated at book value of issuers and retained earnings are not recorded in any tables in FOF.

In contrast, reinvested earnings are recorded in BOP. National Accounts combine the FOF approach and the BOP approach. Concretely, changes in equity value are recorded as reinvestment of dividend for cross-border equity holdings and as revaluation for domestic equity.

**4. Future problem**

Recent financial innovation has facilitated the conversion of many types of cash flow to capital. In Japan, a new type of bonds might be issued that are issued based on future interest income. If this type of bonds is issued, we might have to record normal interest payments as realization of holding gains/losses.

If financial markets give “marketability” to formerly non-traded instruments, we can measure their market value or fair value. Market participants that hold the instruments would regard the changes as revaluation in the same way as traded financial instruments such as listed shares. In Japan, trading of unlisted shares is becoming active and securities firms that estimate their price are increasing.

Why capital gains are not included in income in the SNA framework? In the circumstances that the distinction between transaction and revaluation becomes more and more blur, is it possible and meaningful to put capital gains out of the production frontier of the SNA framework? In this connection, is it appropriate to measure the production of financial intermediaries only by interest income despite the fact that many intermediaries allocate their resources to dealing activities?

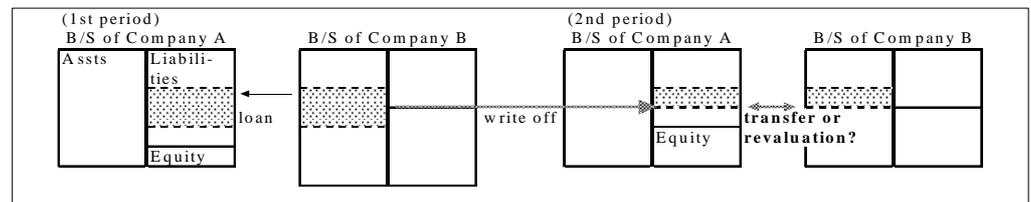
**5. Distinction between transfer and revaluation**

Similar problem occurs in the evaluation of loan claims. The distinction between transfer and revaluation is blur in this case. According to 93SNA, volume changes in loans should be recorded as other changes in assets if creditors recognize that a financial claim can no longer be collected. On the other hand, cancellation of debt by mutual agreement between debtors and creditors should be recorded as a capital transfer from the creditor to the debtor.

In recent year, many Japanese banks are faced with financial difficulties by the increase of bad loans. Many bad loans are evaluated on a discounted cash flow basis and assigned to third parties. Loans are now traded instruments. On the other hand, there are cases that cancellation of claims is notified on a legal basis from creditors to debtors under corporate reorganization schemes. It is true that those cases have a different character from mere accounting treatment of writing-off. But those cases also should not be treated as transfer but as revaluation because creditors trying to overcome financial difficulties would like to collect their claims as much as possible.

Forgiveness of debts as capital transfer, accordingly, would be executed only by public institutions. Some public institutions extend loans with contracts to forgive their debts under specified conditions. The conditions normally meet their policy purposes. In this case, however, what if public loans decrease their value due to debtor’s insolvency? Should we suppose that public loans with debt forgiveness contracts never decrease their value?

*Graph 3. Value of loan claims*



In principle, changes in value of loans are recorded as revaluation in revised FOF. The changes include increases of provision for loans and removal of loans from the balance sheet. As an exceptional case, we treat the removal of student loans by a public institution as capital transfer.

**6. Relationship between Flow-of-Funds and Balance of Payments**

Flow-of-Funds and Balance of Payments should be more consistent with each other on a conceptual basis. In accordance with the discussion of interest-related financial derivatives, the treatment of reinvested earnings, at least, should be reconsidered.

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Balance of Payments Manual Fifth Edition, 1993

### **Résumé en français**

*La Banque du Japon est en train de publier le compte financier basé sur 93SNA. Au cours de la révision, nous avons trouvé que la distinction entre le principal et les intérêts est très difficile. Comme les produits dérivés en relation avec d'intérêts, est-ce qu'on doit traiter les intérêts courus des obligations et les rendements retenus dans les entreprises comme les plus-values? Nous devons choisir l'évaluation au prix du marché ou l'estimation de reinvestissement d'intérêts et des dividendes. Dans le cas de l'évaluation du crédit, on voit le même problème. Concrètement, il est difficile de distinguer les transferts de capitaux et les changements de valeurs.*

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# The effects of the Globalisation of Financial Markets on the obtaining of Cross-border transactions statistical information: the Spanish experience

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## 1. Introduction

The abolition of exchange controls and the development of information technologies and telecommunications have given rise to an extraordinary increase in the number of cross-border transactions. In larger and more transparent markets, with lower transactions and information costs, economic agents react more rapidly to changes in the profitability of their assets – including those derived from their tax treatment and tax opacity – and in their perception of the risks of the different instruments and borrowers. In this context, the financial account of the balance of payments is of vital importance, provided that it can furnish frequent, rapid and reliable information. If the rapidity of reaction of investors is the main feature of financial and foreign-exchange markets, then only statistics that are capable of reflecting these changing flows will be of any use to monetary and foreign-exchange authorities.

In other words, the response of current and capital account transactions to the “fundamental” macroeconomic variables which determine them may be expected to display some stability in the medium term. And consequently, the possible erraticness of their monthly behaviour may be addressed, without a serious loss of informative content, using the usual statistical techniques for analysing and estimating the trends of time series. However, in the case of financial account transactions the aim is to capture as reliably as possible the frequent changes that may be expected in their behaviour, so that distinguishing measurement errors from true but rapid responses of economic agents becomes a crucial task.

In view of the growing complexity of the web of macroeconomic and microeconomic relationships explaining cross-border transactions, it should be borne in mind that, if the producers of these statistics are facing growing difficulties in obtaining the data, the validation of the results through economic analysis – the definitive test of the relative reliability of any macroeconomic statistic – is, if that is possible, even more difficult. The financial integration of economies with different tax regimes, including very varied degrees of fiscal opacity, which compete for limited world savings is doubtless one of the decisive factors in the explanation of financial flows. There are, however, other economic and socio-political factors at least as important as direct profitability, net of taxes, which have a bearing on the expectations of investors and the risk premium demanded for the different assets and borrowers, with rapid adjustment of portfolios.

## 2. Cross-border capital mobility: the Spanish experience

The financial account of the Spanish balance of payments since the abolition of exchange controls at the beginning of 1992 has reflected the general features of international financial markets. These have included a massive increase in gross financial flows; growing banking disintermediation, with a decline in the relative importance of traditional credit institutions in the settlement of cross-border transactions; larger flows of direct financial transactions between firms belonging to the same economic group; notable diversification of financial instruments and rapid incorporation of market innovations; and, above all, broad substitutability of instruments and institutional sectors, with rapid changes in the claims and liabilities outstanding vis-à-vis the rest of the world.

A few figures on the behaviour of the Spanish balance of payments in the 1990s can be illustrative, because the economy was still very closed at the beginning of the decade. Gross flow data (receipts plus payments) should be used to illustrate the growth in recorded flows. Between 1990 and

1998, total recorded gross flows, excluding reserves, grew by almost 6,500 per cent. If reserves and currency transactions are included in these calculations, the figure for this period is considerably higher.

These figures are certainly spectacular, but they only give a rough idea of the phenomenon. In fact, it was highly complex, differing according to the instrument and institutional sector concerned. The growth was most striking on the assets side, not only due to the lower starting figures, but also because the decline in Spanish interest rates has been conducive to capital outflows, an alternative for domestic savings in the search for greater profitability and risk diversification.

In fact, the gross asset flows of the non-credit private sector grew by almost 27,000 per cent between 1990 and 1998. This has certainly been the most spectacular development in the Spanish balance of payments in the 1990s, and it has also been marked by frequent changes in the sign of the net flows, precisely in the institutional sector in which the obtaining of data is most difficult.

It is notable that this volatile behaviour occurred across the board. Although it was obviously most striking in "other investment" and portfolio investment, it was also observed in direct investment. Indeed, the development of complex financial relationships between firms belonging to the same economic group is another of the challenges facing the data producers. Multinational groups dispose of very significant financial resources, normally using a specialised firm to manage the entire group's cash, which means, in this case too, that the search for higher profitability introduces greater mobility.

Thus, the greater breadth and liquidity of financial markets and their lower transaction costs has made it easier for firms to reduce, or expand, their equity holdings, including when these investments are defined as direct. The result has been an increase in the relative volatility of the item "equity capital", usually considered to be the most stable, with frequent changes in the complex web of cross-holdings that characterises multinational groups.

It is, however, the other component of direct investment, that which reflects loans and financing between firms belonging to the same economic group, which has posed the greatest challenges to data producers. Cash pooling systems mean that funds are transferred daily from firms with excess liquidity to the treasury manager, which redistributes them according to the needs of the group, seeking the most profitable investments for any overall excess. Indeed, it is increasingly common for all the receipts and payments of the firms of a group, and not just their cash, to be centralised.

Measurement difficulties are even greater in the case of portfolio investment and "other investment". In the face of the cuts in the profitability differentials on Spanish assets, these have sought more profitable markets, but also with higher risks, including foreign exchange markets, with the consequent development of derivatives. It is not necessary to point out the difficulties involved in measuring derivatives transactions. Although they are essential for covering risks adequately, they are also potentially highly destabilising.

A detailed description of the growing complexity of the flows recorded by the Spanish balance of payments is beyond the scope of this paper. However, it should be pointed out that, on the liabilities side, the growth of gross flows has been significant, especially in the case of transactions involving Spanish government debt. The tax treatment of the latter has led to large outflows and return inflows connected with coupon washing. In addition, this debt has been widely used as collateral for repo operations. In fact, non-residents have, on a massive scale, financed their purchases of Spanish government debt by selling it under repurchase agreements to resident banks, with the cost saving deriving from cover of the currency risk which they would have incurred had they financed such purchases with their own currency. Moreover, repos and deposits are seen to be substitutes in the financial transactions of resident credit institutions, depending on differentials in profitability that are sometimes minimal, explained in part by the greater or lesser availability of collateral in domestic markets.

### **3. Error detection with ARIMA models: the TERROR program**

In sum, the huge increase in recorded gross flows, in their complexity and in their mobility, have led to growing measurement difficulties, which the Banco de España has been addressing in two ways: through new data collection mechanisms, with direct reporting for transactions not settled through resident credit institutions; and by making systematic comparisons using alternative sources of information, essentially bank balance sheets.

However experience shows that, precisely due to the extraordinary mobility of capital, it is not possible to obtain the information needed to monitor these changing flows on the basis of stock data, even in cases in which monthly bank balance sheets are rapidly available. Moreover, banking disintermediation means that the same type of information must be obtained from non-financial

firms, and from the wide range of financial institutions which play a crucial role in intermediation, including insurance companies, pension funds, mutual funds, etc.

The Banco de España has therefore maintained a system of direct collection of flow data, but the removal of errors has become increasingly difficult. As a result it has instituted, for the time being purely on an experimental basis, a system based on the use of a program which automatically identifies ARIMA models and detects and corrects outliers. The program used is called TERROR (Tramo for Errors), an adaptation of the program TRAMO (Time Series Regression with Arima noise, Missing observations and Outliers). It is designed to be applied wholesale to a large number of time series.

The program is based on the automatic identification of an ARIMA model in which the regression variables are outliers, also identified automatically, of three possible types: additive outliers, level changes and transitory changes. The program computes the model's prediction for each new period, excluding the observation for that period, which is then compared with the prediction. Habitual comparison of the prediction error with its limit value specified a priori determines whether the model considers the new observation to be a possible error. The model is controlled by a parameter which determines the degree of sensitivity in the detection of errors: low, medium or high.

The program is designed to be used completely automatically by users who, although lacking any theoretical knowledge of the treatment of time series, can contribute first-hand knowledge of the possible nature of the outliers. However, interaction between modelling experts and persons familiar with the series analysed opens up extensive possibilities, depending on the human resources available, for its flexible use, ranging from "blind" and wholesale use of the TERROR version, to selective use of all the possibilities of the program TRAMO.

Nonetheless, it is precisely the TERROR version, used automatically and wholesale, that offers the most promising possibilities in the Spanish case. This is because thousands of time series are available (monthly series from 1990), which combine the heading of the transaction with other data collected: the country, currency, institutional sector and branch of activity, where appropriate. Wholesale application to all these series enables errors, which when occurring in a single observation reinforce the error hypothesis, to be detected by cross-checking which, in turn, enables a selective analysis of the most probable cases of error to be made. This is thus a powerful automatic preliminary detection mechanism, which enables the cases to be studied to be prioritised. And this when, for the reasons given above, data producers are having greater difficulty distinguishing, in an intrinsically volatile phenomenon, the apparently anomalous values which are a consequence of measurement errors from those which reflect the rational behaviour of investors.

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## Résumé en français

*L'abolition du contrôle des changes et le développement des technologies de l'information et des télécommunications ont donné lieu à une extraordinaire augmentation du nombre des transactions transfrontalières dans le cadre de l'innovation financière et de la croissante désintermédiation bancaire. Sur des marchés plus vastes et transparents, les agents économiques réagissent plus rapidement aux variations du rendement attendu de leurs actifs, y compris les changements découlant de leur traitement fiscal et de leur perception des différents risques.*

*L'augmentation du nombre des transactions et de leur complexité provoque des erreurs importantes de mesure. Cependant, ce que les analystes peuvent percevoir comme des erreurs importantes peuvent ne pas l'être, reflétant au contraire le comportement rationnel des agents. L'expérience espagnole des opérations du compte financier de la Balance des Paiements nationale, décrite dans cet article, illustre cet aspect de la question.*

*Une des conclusions de cet article est l'intérêt que peut présenter, dans le contexte d'une plus grande volatilité des phénomènes certains, l'exploitation des possibilités d'utilisation des techniques statistiques de détection des erreurs basée sur le comportement stochastique des séries temporelles correspondantes.*

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# Internationalisation of Financial Markets and Implications for Data Collection and Statistics

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*The past three decades have seen far-reaching changes to financial markets the world over. This paper reviews market developments in the UK, and illustrates some of the associated statistical measurement problems. Examples are based on work undertaken within the statistics division of the Bank of England.*

## **Introduction**

Sound, efficient and liquid financial markets are essential for all market participants. Statistics provide a key role in the functioning and monitoring of these markets and new or revised data requirements arise as they evolve. Section 1 reviews the developments that have created such highly internationalised markets and identifies some of the associated challenges to data compilers. Section 2 reviews some of the recent work conducted within the UK to address these issues.

## **1. Issues Arising Out of the Internationalisation of Markets**

### ***(i) Growth and internationalisation of the UK financial market***

The size of the UK banking sector's total balance sheet footings has increased by a factor of over twenty in the last thirty years and as at end 1998 was around £2000bn. This rapid growth has been driven by domestic, international and market developments. Domestic developments included the deregulation of the domestic banking markets in the early 70s and the abolition of exchange control in 1979. International developments have included the financing of the US (and other countries') Balance of Payments deficits, the growth of the Eurobond market – which is largely serviced in London, the recycling of oil producers' funds, the growth of many East Asian and Latin American economies and the geopolitical transformation of Eastern Europe and Central Asia. Market developments in the 80s included the rapid growth of financial intermediation as newly liberalised banking systems greatly increased the range of financing facilities provided to customers, whilst the 90s has seen huge growth in the use of derivatives – which transfer risk and encourage portfolio diversification and expansion – and in the collateralisation of exposures – which help reduce credit risk and encourage activity.

The UK is a highly internationalised market with roughly a quarter of UK registered banks' business being conducted abroad, whilst one third of the UK banking sector's balance sheet is made up of branches and subsidiaries of non-resident owned banks. In addition, over fifty percent of financial institutions' holdings are now denominated in foreign currency. The internationalised nature of the financial markets creates new challenges to both data compilation and analysis, and also means that most issues that affect domestic markets also have cross border significance.

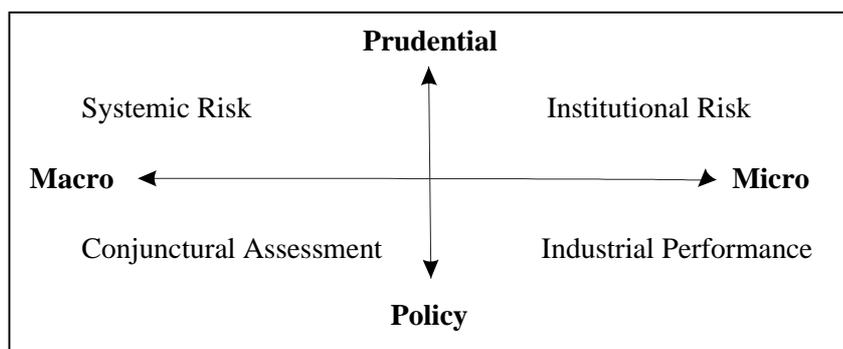
### ***(ii) Increased demand for statistics***

The demand for statistics has grown rapidly over recent years. Statistics have contributed to the ability of markets to operate efficiently: for example, they are vital for institutions challenging for

market share in new or changing markets. In addition, for capital and technology to move freely between countries, participants need to have data on the available risks and opportunities.

The figure below presents a stylised account of the main uses of financial statistics. Twenty years ago statistics were mainly used for macro policy purposes, but since then there has been rapid growth in their use for supervisory – micro prudential – purposes. Recent financial crises have focused attention on both macro prudential and micro policy statistics – including country risk data, sectoral breakdowns and greater information on the operations of institutions – themes that run throughout this paper.

**Figure 1. Principal uses of financial statistics**



### **(iii) Increased complexity of analysis**

Whilst the demand for statistics has grown over recent years, a number of factors have increased the complexity of data analysis. These include:

- Market de-regulation, leading to the blurring of sector boundaries. For example, there has been a growth in multi-functional financial conglomerates (e.g. banks offering insurance and pension products).
- Financial innovation, leading to the blurring of product boundaries. For example, derivatives enable institutions to trade risk without requiring transactions in the primary instrument.
- Radical advances in IT, enabling institutions to trade and manage risk centrally. For example, many institutions are now able to monitor market risk from a single global location, changing the way they manage (and therefore record) their portfolios.
- Political change, modifying geographical and economic boundaries. This has included greater integration within Europe, which has increased intra-European trade.

## **2. Practical examples of work recently conducted in the UK**

The remainder of the paper considers some of the practical work that has recently been conducted within the UK to improve its statistics in response to these market developments.

### **(i) Risk based data**

The growing internationalisation of financial markets, and the recognition that financial crises have global effects, have led to an increased emphasis on country risk data (for example, G22, 1998). Like many other countries, the UK collects BIS banking statistics which record consolidated non-resident exposures of resident owned banks by maturity and sector of counterparty. However, there is no single measure of exposure and there are a number of modifications that can be made to simple cross-border lending figures. For example, local currency lending by non-resident subsidiaries can be included because it increases the cross border exposure of the consolidated institution, whilst data can also be collected on the basis of the ultimate rather than immediate counterparty.<sup>1</sup> User demands in the UK have also led to the use of other adjustments, including ones for local currency deposits and portfolio investments. Local currency deposits (up to the value of total lending) may in some instances be subtracted from total exposure because depositors are often economically related to the borrowers. Liquid portfolio investments can be subtracted

1) *BIS reporting guidelines stipulate that local currency lending should be collected. Data on the basis of ultimate, in addition to immediate, counterparty will be required from September 1999.*

from total exposure because they can be readily on-sold – although their value is likely to plummet in times of crisis and the adjusted exposure when the economy is healthy may underestimate the consequences of an economic downturn.

It is essential that users are educated in the alternative methods for calculating exposure as the different measures can produce very different figures. For example, compiling information on the basis of ultimate, rather than immediate, counterparty reduces UK banks' exposure to Russia by one third, whilst the inclusion of gross local currency lending increases UK banks' exposure to Malaysia by a factor of five. There are also potential credibility problems if users do not understand the reasons for differences between the alternative measures.

### ***(ii) Calculating accurate non-resident figures***

Financial intermediation is increasingly moving from the banking sector to the capital markets – making accurate recording of non-resident holdings of securities vital to measures of external debt. Like other countries, the UK has difficulties in establishing the current holders of domestically issued debt securities when they are tradable on secondary markets because the issuer may only be aware of the total value of debt outstanding, and not its current holders.

In the UK, financial institutions' holdings of securities are measured by surveys but accurate information is not available on the asset holdings of the household<sup>1</sup> sector, nor of liabilities to non-residents. Because of this, it is common to assign the residual value of securities, once the holdings of directly surveyed institutions have been deducted from total issues, between these sectors. However, assigning the residual element between the household and non-resident sectors is problematic because the split between the two fluctuates and because data from other sources might be approximate – running the risk of large errors in these sectors.

An alternative approach is to survey the institutions that either register the securities (registrars), make coupon payments (paying agents) or hold securities on behalf of the end investor (custodians). Registrars and custodians know the legal owner of registered instruments at all points in time, whilst, in many cases, paying agents only know the owner of bearer instruments at coupon paying times. These surveys reveal the legal owner of securities, which does not equate to the beneficial owner if the beneficial owner holds the securities in a nominee account – the beneficial owner can only be established if the nominee institutions are also surveyed. The UK conducts regular surveys that give full economic and geographical breakdowns of holdings of shares and British Government Securities (BGS), which are both registered instruments. Some custodial business on behalf of non-resident institutions is also monitored. However, using paying agents to compile information on bonds (bearer instruments) issued by UK institutions is currently considered unfeasible both because of the large number of paying agents and because many are non-resident based – where the UK would have no legal jurisdiction for data collection. In addition to being costly, the turnover of many securities is high and the composition of portfolios can change rapidly: further research needs to be conducted into the optimal frequency for these surveys. The IMF's Co-ordinated Portfolio Investment Survey is a good example of the international co-operation that is required if improved non-resident holdings are to be calculated.

The results of surveys of registrars and custodians are affected when the security can be used as collateral in repurchase (repo) agreements because surveys reveal the legal owner of securities, which changes during a repo, whilst the UK is interested in the beneficial owner, which remains unchanged. This problem led to the postponement of the 1996 and 1997 BGS surveys, but the end 1998 survey was reintroduced with the introductions of estimates for this activity. These estimates are based on data from the major players in the UK BGS repo market – banks and other large financial institutions. Data from these institutions are collected on a beneficial ownership basis and, as they include detailed counterpart sectorisation, can be used to adjust the survey to produce overall results on this basis. (Note that the vast majority of repos involve these major institutions on at least one side of the contract.)

### ***(iii) Problems associated with residency – issues raised by derivatives***

The use of financial derivatives has increased rapidly over the last decade,<sup>2</sup> posing new challenges to data compilers. The derivative markets are highly internationalised with core contracts being

1) *Strictly speaking, NPISH and household.*

2) *For example, figures from the International Swaps and Derivatives Association indicate that the total notional value of all swap and interest rate options contracts increased by a factor of over 30 between 1987 and 1997.*

traded in all the major markets and cross border activity making up roughly fifty percent of transactions (BIS, triennial survey). Interest in these instruments is important because they can lead to capital flows in their own right, and because they can reduce the value of traditional cross border statistics for risk analysis purposes (Garber, 1998).

The UK has recently started collecting information on the marked to market value of institutions' gross asset and liability derivative positions on a residency basis. Gross reporting of levels is essential because it gives an indication of exposure of the reporting institutions and is feasible because it is consistent with institutions' accounting systems. Transactions in derivatives are also collected, but on a net basis because gross figures are not compatible with market practices.

The location of booking of outstanding contracts creates issues that may, for the moment, be unique to derivative contracts. Several multinational banks operate a single global book where all or most derivatives are recorded to a single office's balance sheet – irrespective of where they were arranged. Fortunately, contracts specify the exact details of the counterparty, for example, Bank X in Country Y: the counterparty should know whether it is dealing with a resident branch or a non-resident parent and accurate reporting should naturally fall out of institutions' reporting systems.

However, there are a number of unavoidable consequences of global booking that affect data analysis. The use of counterparty data (from, for example, the banking sector) as the main source of information on other sectors in a country would lead to incomplete figures if institutions book contracts to a non-resident country. Analytical interpretation of figures is also affected because the aggregate might exclude some contracts organised in that country and include others organised elsewhere. A related issue arises when multinational institutions monitor risk centrally but book certain types of contracts in one location and other types elsewhere – figures on a residency basis would then be highly susceptible to the booking practices of institutions. It is also possible for an institution to have large net figures in one office being hedged out by equally large net figures of the opposite sign in another office located in a different country.

#### ***(iv) Issues raised by repurchase agreements***

The use of repurchase agreements (repos) has also increased rapidly over recent years,<sup>1</sup> and the accompanying demand for data has been driven by a number of factors:

- 1 Repos provide liquidity to the financial markets and are used by many countries to conduct monetary policy.
- 2 The scale of repos involving government securities may have an impact on government debt operations and the cost of government funding.
- 3 Repos can be used to influence an institution's short-term risk profile and can also be used to create highly leveraged positions.

Data for end 1998 indicate that over 50% of outstanding repo transactions involving UK banks were with non-residents and that UK banks were net lenders of cash to non-residents via repos of around £30bn. This reflects the highly internationalised nature of this activity; consistent reporting of repos across countries would help both in understanding these markets and in the reduction of world-wide balance of payments discrepancies.

The debate about the relative merits of the collateralised loan versus change of ownership methods of recording repos is ongoing. The collateralised loan approach would appear to be more able to meet the data needs outlined above, although this approach would also need to be supplemented by information on the collateralisation of other types of exposures to provide a full indication of leverage and liquidity. (Hamilton et al).

Although not currently collected by the UK, there is also some interest in information on repos where the currency of the security and the currency of the cash are different. These transactions enable institutions to swap their exposures into that of a different currency, and can be used to raise finance in one currency, and lend it on in another.

#### ***(v) Spread Earnings***

Whilst the primary concern of global market surveillance is related to the scale and direction of capital flows and risk exposures, there is also interest in valuing the economic role of financial in-

1) *Although long runs of data on international repo activity are unavailable, the level of outstanding contracts has roughly trebled in the UK in the last two years.*

intermediaries. The growth of trading volumes, in the UK and elsewhere<sup>1</sup>, prompts the question “how do intermediaries benefit from these activities and how can the effects be measured?” In particular, the growing volume of cross border transactions raises the issue of how these contributions could be measured within the balance of payments.

The services provided by financial corporations are viewed within the statistical framework as falling into one of two broad product types. Intermediation services, such as market making and credit granting, require the intermediaries’ use of its own balance sheet as the means of delivering the product. By contrast, auxiliary services, such as broking, fund management and financial consultancy, deliver the product in a directly comparable way to that for most non-financial services. Whilst auxiliary services are normally provided in return for an explicit fee or commission, the precise nature of financial intermediation is less transparent and the service provided by the intermediary is typically paid for through an embedded charge which need not be directly measured, or even measurable, by either party.

The System of National Accounts draws a clear conceptual distinction between income derived through the application of dealing spreads and holding gains/losses that result from changes in the external market environment. Dealing spreads should be reported in the current account whilst holding gains and losses should be reported in the financial account. BPM5 defines the spread earnings (also sometimes called service earnings) of forex dealers as the spread between the mid point rate, and the buy/sell rate for each transaction.

In practice, market makers typically calculate their earnings through the daily marking to market of their trading book positions and so have no operational need to maintain individual transaction data – direct observation of the spread earnings would therefore be impossible. Estimates of cross border spread earnings have therefore required the use of supplementary information on representative dealing spreads and market turnover – areas that the UK is currently investigating further.

#### ***(vi) Financial Market Data for International Financial Stability (hosted by Bank of England)***

The recent international crises, like others before them, have given prominence to the need for good quality and timely economic and financial data. A view has emerged that better data provision allows investors to make better informed investment decisions, leading to improved resource allocation, as well as highlighting potential problems at an early stage so reducing the likelihood of sudden shocks to the economy.

Following a weeklong workshop at the Bank of England, a group of three participants researched into these issues and have produced a report of their findings (Hamilton et al). This report contained a list of data requirements that were requested by users; examined existing frameworks to see the extent to which they meet these needs; and investigated issues related to banking indicators, derivatives and repos. Inter alia, the report recommended improved data on: external debt, banking indicators, capital markets and risk type data. It also highlighted the need for continued harmonisation of frameworks and the value of a web page containing all data sources.

### **3. Conclusion**

The internationalisation of markets has increased the complexity of data production and analysis, generating a number of problems for data compilers. This paper has identified a number of these problems and outlined some of the UK’s practical solutions. This includes work related to: risk based data, the calculation of non-resident positions, problems associated with residency of booking of derivative contracts, issues raised by repos and spread earnings and the increasing need for data for financial stability purposes.

There are also some fundamental questions that will need to be addressed in the next few years: with the globalisation of markets, should data be aggregated according to the location of the immediate or ultimate counterparty? Should and can there be greater international co-operation to assist in data production? Should statistics reveal the legal or beneficial owners? Should there be more data on risk based measures?

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1) *For example, FX turnover in the UK increased by around 40% between April 1995 and April 1998 (BIS, 1998).*

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### Résumé en français

*Pendant les trente dernières années, les marchés financiers du monde entier ont connu des changements d'une portée considérable. Le présent document fait le point sur les principaux développements des marchés financiers du Royaume-Uni et illustre certains des problèmes de mesure statistique associés. Les exemples ont été tirés des projets en cours au sein de la division Statistiques de la Bank of England.*

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# GLOBALIZATION OF MARKETS

## CONTRIBUTED PAPERS

### The organisation of a first Portfolio Survey in Belgium and the problem of the Household Sector

*Guido Melis – National Bank of Belgium*

#### 1. General context of the survey

For the purpose of the IMF Co-ordinated International Portfolio Survey, Belgium conducted for the first time a survey on investments as at the end of 1997 held by its residents in foreign equity securities and short- and long-term debt securities.

Since neither we nor the respondents had any experience in this matter, it seemed appropriate to aim at simplicity as well as completeness. We therefore opted for the largest possible population of respondents, both final investors and custodians, and the simplest possible forms. This implied that our computer application could be developed in-house.

By including both final investors and custodians in the survey, we tried to find out about foreign investments by both institutional investors and large enterprises (via forms for final investors), as well as ascertaining indirectly (via forms for custodians) the foreign investments of other, smaller enterprises and individuals (households) not included in the survey.

It is clear that, at this stage, the ownership of securities by the household sector was recorded only in so far as those securities were entrusted to resident custodians.

#### 2. Specific problem of the household sector

However, the use of bearer securities in Belgium and the fact that people commonly keep these themselves made it very difficult to achieve a full inventory of securities held by the household sector. In fact, although registered securities are becoming steadily more common, bearer securities are still widely used, especially by individuals who often insist on holding the actual securities anonymously, for tax reasons.

The proximity of the Luxembourg financial centre is a great attraction for the individual investor and encourages the use of bearer securities.

Bearer securities were automatically included in the survey results only if they were entrusted to domestic custodians on open deposit. It was therefore necessary to make estimated additions for securities kept by the owners themselves or entrusted to foreign custodians.

#### 3. Estimated macroeconomic additions for the household sector

First we examined the possibility of estimated additions based on global comparisons with other sources such as the International Investment Position, the cumulative flows from the balance of

payments and an annual study of the financial assets of individuals (breakdowns used: due dates, currencies, investment channels and fiscal status). But all these sources have their limitations, including as regards the choice of breakdowns and the level of detail, so that they could not be used as a basis for estimated additions. The use of macroeconomic models also proved impossible for the same reasons.

#### 4. Estimated semi-microeconomic additions for the household sector

On examination, estimated semi-microeconomic additions proved the most reliable and also provided the necessary breakdowns for reporting to the IMF. As a rule, they were made only where it was sufficiently certain that residents held foreign securities totalling this amount. The survey results are therefore bound to be partly underestimated.

As regards equity securities, we first ascertained – via financial intermediaries selling these products – almost the complete total for Luxembourg “Sicav”-funds held by Belgian residents. Since we were unable to establish to what extent these securities were already partly included in the survey figures (under equity securities, country: Luxembourg), the amount of these funds was simply added in respect of the part in excess of the total equity securities already included under Luxembourg. This is presumably an underestimate.

We also found out from the Stock Exchange Committee the amount of bearer depositary receipts for foreign shares issued in Belgium. In accordance with the IMF guidelines, such bearer receipts must be treated in the same way as all other equity securities. Since it was not possible to find out what amount of bearer depositary receipts was already included in the survey figures, and inquiries revealed that a large number of respondents actually held such certificates, we decided not to use this element for an estimated addition, especially as the absolute figure was marginal in relation to the total amount recorded (less than 2%).

With regard to long-term debt securities, we knew from the publications of the Grand Duchy of Luxembourg Insurance Supervisory Service the total amount of Luxembourg insurance notes subscribed to by Belgian residents: there was also a very small amount of external information available on Luxembourg savings notes. Since all these securities bear interest and it is most probable that they are all for the account of individuals (certainly where insurance notes are concerned), we can assume that these are not usually held on open deposit for tax reasons. These amounts were therefore added in full.

As regards other euro bonds, there was insufficient reliable information available, so that no estimated addition could be made.

#### 5. Survey results and final conclusion

Altogether, 99.7% of respondents replied. Their investments, respectively safekeeping, represented 62% and 23% of the total results. The balance, namely 15%, came from estimated additions (12% for equity securities and 3% for debt securities).

After these estimated additions, 80.4% of the ownership of foreign investment securities had been recorded, in comparison with the International Investment Position of Belgium. We assume that the gap is due mainly to euro bonds held and kept by individuals themselves.

#### **Résumé en français**

*L'enquête belge sur les investissements en valeurs mobilières étrangères couvrait aussi bien les investisseurs finals que les dépositaires, qui pris ensemble, apportaient 85% des résultats totaux.*

*Néanmoins, l'utilisation fort répandue de titres au porteur constituait un obstacle majeur pour recenser le secteur des ménages. Pour cette raison, nous étions obligés de procéder à des estimations supplémentaires. Seules des estimations semi-microéconomiques s'avéraient réalisables: elles représentent 15% des résultats totaux.*

*Globalement, les résultats de l'enquête couvrent 80.4% de la position extérieure globale.*

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# Accruals Methodology: Statistical problems in the Estimation of Interest for new Financial Instruments in the context of Globalisation of Financial Markets

*Aureliano Gentilini and Valeria Pellegrini – UIC*

## 1. The Issue

The recording of accrued interest on the basis of the rules defined in the 5<sup>th</sup> Edition of the IMF Balance of Payment Manual has raised specific methodological problems with regards to BoP and Financial account Compilers, still outstanding to date.

The international guide for national accounts compilers (SNA 93 and ESA 95) are not sufficiently detailed and introduce different criteria from those set out in the BPM5 and the BoP compilation Guide.

In this respect, the studies issued by the national Central Banks and panel of experts have shown a lack of consensus on a common theoretical framework related to the full accrual recording. At present a common accounting framework gathering the general consensus does not exist for the BoP compilers seeking to implement the standard.

In 1998 the Ufficio Italiano dei Cambi (hereafter referred to as UIC) planned to change the interest recording system, formerly based on settlements, and moved to an accrual basis system. The UIC planned to implement the new system with reference to debt securities and money market instruments when come to drafting the Balance of Payments for the year 1999. The accrual basis recording methodology will be extended to all the other financial instruments by taking a step by step approach.

In this paper, just a synthesis of the entire analysis, we intend to give an overview of our experience in implementing the new recording system and to set out the conclusions drawn up as a starting point for further debates. Finally, we tried to quantify the impact of the methodological change on each debt security category with reference to the Italian Balance of Payments.

In order to implement an efficient and consistent statistical methodology for the calculation of the accrued interest we had to:

- define a consistent theoretical framework capable of treating all the financial instruments categories, regardless of their relative importance in the foreign assets portfolio;
- define the information to be included in the databases built up to support the accrual recording system.

New financial instruments, typically equity/index-linked issues, have highlighted the inadequacy of the traditional definition of interest to represent the complexity of the financial markets. In particular, financial innovation has demonstrated the difficulty of distinguishing between interest and capital gain/loss without adopting complex and innovative theories. The pros and cons discussion of the debtor approach versus the full market approach shows the impossibility to have a definition of interest income capable of satisfying all the constraints imposed by the accrual recording criterion. The choice between the debtor and the full market approach should be based on both the data collection system and the information available on securities. Furthermore, BoP compilers, once they selected one of the two recording criteria, will have to give up the idea of distinguishing between interest and capital gain/loss in a way that could be relevant for both issuers and investors.

## 2. The database structure.

In our analysis we focused on Italian foreign portfolio assets, since Ufficio Italiano dei Cambi has built on occasion of the IMF Portfolio Survey a complete security-by-security database describing how portfolio assets were composed at the end of 1997. Portfolio assets have been updated with 1998 data flows collected on a security-by-security basis. Furthermore, in order to revise the assets periodically a new portfolio survey will be launched with reference to 1998. The information on financial instruments used to derive our statistics on BoP, supporting both creditor and debtor approach, can be listed as follows:

- ISIN code (as defined by the Standard ISO 6166);
- issue description;
- nominal value;
- date from which interest starts to accrue;
- maturity date;
- coupon frequency;
- coupon interest rate;
- market price (ex-coupon);
- issue price;
- redemption price.

## 3. The comparison exercise of the different interest recording approach

In order to quantify the net effect due to the different recording methodologies on Italian BoP, a joint analysis of both assets and liabilities should be carried out. The present paper represents just a theoretical exercise on foreign assets. We have classified the securities portfolio into the following main categories: fixed rate bonds, zero coupon bonds, variable interest bonds, equity/index-linked bond with coupon payments, other equity/index-linked bonds. We have tried to test how much each of these categories is sensitive to the change in the interest recording methodology by analysing their main features (i.e., reference parameter of the coupon, coupon frequency, and residual life to maturity). Furthermore, we have attempted to define for new financial instruments (typically structured securities) the income component versus the capital gain component, the former being defined as the securities' running yield.

Even though the analysis is mainly based on the framework and database currently in use for the compilation of Italian BoP, the views expressed here are those of the authors and not necessarily those of the UIC.

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# Changes in the Finnish International Investment Position 1985 – 1998, a brief statistical analysis\*

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## 1 Introduction

This paper aims to describe and study by main component the fluctuations in the Finnish IIP. These components are the Balance of Payments flows by institutional sector as well as the valuation changes induced by asset prices and exchange rate movements. Large structural and institutional changes of the Finnish economy are highlighted by dividing the sample period 1985-1998 into two subperiods (1985Q1-1992Q2 and 1992Q3-1998Q2).

The period before autumn 1992 can be characterised by a fixed exchange rate regime leading to continual credibility problems. A cyclical and monetary bubble ballooned in the last years of the 1980s, bursting into a deep recession and a banking crisis. The international capital markets became increasingly volatile, but Finland remained largely outside.

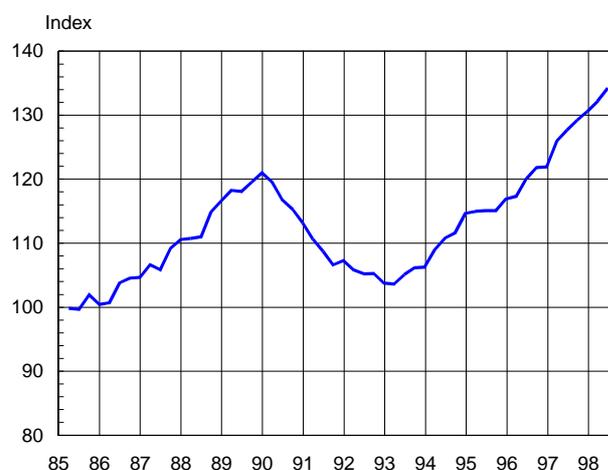
In September 1992, the Finnish markka was allowed to float. The following year, the markka started to appreciate, and a few years later the stability of the exchange rate was regained. The recession and banking crisis greatly reshaped financial markets, production and institutional structures. The internationalisation of Finnish enterprises accelerated, and participation in international capital markets vastly expanded. Following membership in European Union and the EMU, the Finnish economy has been restructured to meet the new competitive conditions ushered in by the Economic and Monetary Union.

## 2 Growth, exchange rate and current account

After a long period of economic growth, the Finnish GDP decreased nearly 15 per cent during 1991-1993, experiencing the most severe economic recession of the 20th century. Total output began to revive 1993, and GDP reached the pre-recession level during 1996, with growth continuing thereafter.

**GROSS DOMESTIC PRODUCT**  
Volume index, 1985 = 100

*Chart 1*



\* We thank Ritva Laine, Riitta Repo and Maria Sorsa for their invaluable help in preparing the paper to its final form.

The Finnish economy has been label led as a small open economy with a high propensity to export and import. The share of exports of GDP has exceeded 30 per cent at its highest. The export industries have traditionally been energy and capital intensive, such as the pulp and paper industries, as well as the metal engineering industries. The recession was felt most severely in the consumer goods and service industries. After the recession of the 90s, the traditional export industries have strengthened their position in worldwide competition through mergers. The high tech industries have recently gained the position of major exporters.

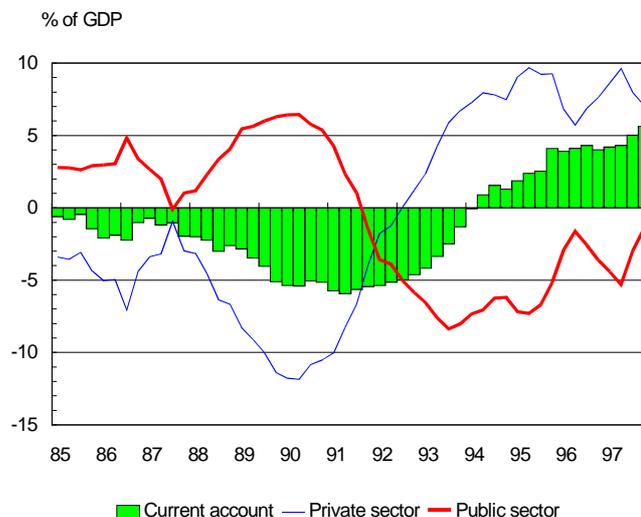
After an era of credibility problems and pressures against the fixed rate, the Finnish markka was devalued in November 1991 and allowed to float in September 1992. In all, value of the markka depreciated some 30 per cent before it started to strengthen in spring 1993, regaining most of its value by mid-1995, after which it has been stable. Finland entered the EU exchange rate mechanism (ERM) in October 1996.

**Chart 2** **The trade-weighted currency index**  
**1982 = 100**



Over most of the post-war period, the Finnish economy has suffered from problems in foreign stability. Even as recently as from 1989 to 1992, the current account deficit amounted annually to some 5 per cent of GDP over four consecutive years. The deficit decreased to one fourth in 1993, while in the following year a surplus was achieved. The subsequent years have shown a continuing surplus, and in 1998 the current account surplus exceeded six per cent of GDP.

**Chart 3** **NET LENDING BY SECTOR**



### 3 Decomposition of the Finnish IIP into flows by sector and valuation changes

The flow identity of the IIP is of the form<sup>1</sup>

$$A_t = B_t + C_t + D_t + E_t + F_t + G_t + H_t,$$

where

A = Net IIP, *liabilities less assets*, total change (inflow +)

B = Banks, *liabilities less assets*, net change (inflow +)

C = Corporate sector, (and other sectors), *liabilities less assets* excluding shares and other equity items, net change (inflow +)

D = Corporate sector, (and other sectors), *shares and other equity items*, *liabilities less assets*, net change (inflow +)

E = Central government, *liabilities less assets*, net change (inflow +)

F = Net IIP *liabilities less assets*, *valuation changes*, excluding portfolio investment liabilities,

G = Portfolio investment, *liabilities*, *valuation changes*

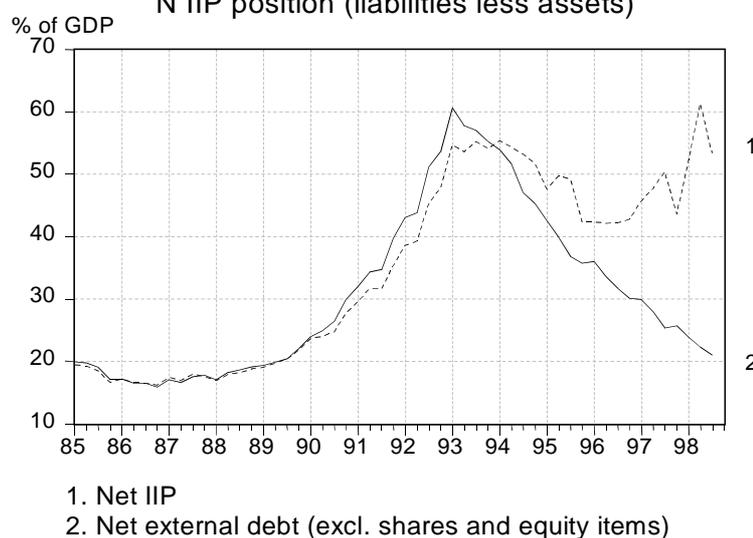
H = Reserve assets, net change (increase -)

All variables are expressed in percentage of the nominal GDP.

The sample period is 1985Q1 – 1998 Q2 and the subperiods 1985 Q1 – 1992 Q2 and 1992 Q3 – 1998 Q2.

The mean and the standard deviation are presented below describing the development of the Net IIP (position and total change) and its components (also see Charts 4–10). The aim is to compare the size and variation of the quarterly sector flows and valuation changes both between variables in various subperiods and between the two subperiods. Ordinary statistical equality tests of mean, median and variance have been carried out for the total set of the Net IIP components. Tables I and II clearly reveal that the null hypothesis is rejected (all variables have equal value of a statistics). As shown below, carrying out the robust variance tests in pairs is of importance<sup>2</sup>, however.

**Chart 4** N IIP position (liabilities less assets)



1) *The review of the Finnish Net IIP, see Kariluoto (1996, Section 5)*

2) *See Brown & Forsythe (1974) and Levene(1960). Robust tests protect against the effects of outliers and other anomalies in data. Often it is important to carry out both robust and classical test and to compare the results. The first study conducted of the robust variance test is by Box (1953), who first used the word robust as a statistical meaning.*

Chart 5

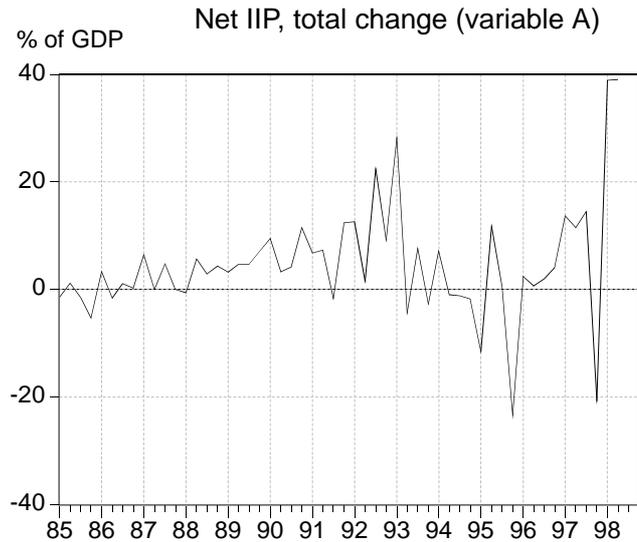


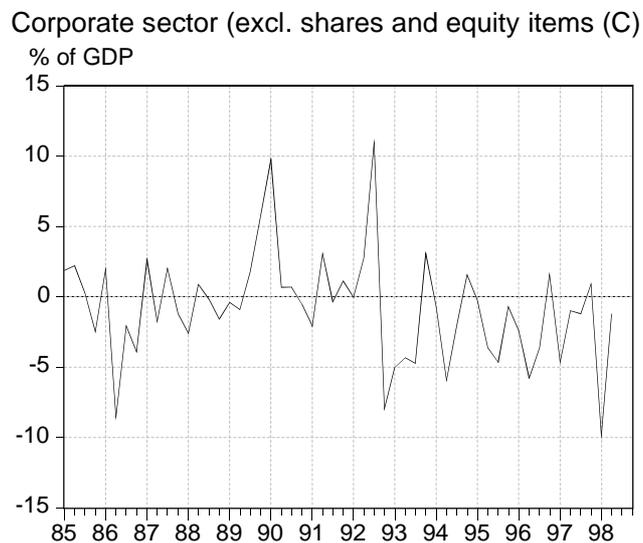
Table I Mean value

A	B	C	D	E	F	G	H	
Quarterly:								
3.55	=	3.04	+ 0.29	- 0.75	+ 1.31	- 0.00	+ 0.04	- 0.38: Period I 1985Q1 – 1992Q2
6.11	=	- 4.04	- 2.15	+ 1.16	+ 3.71	+ 1.47	+ 6.52	- 0.56: Period II 1992Q3 – 1998Q2
4.70	=	- 0.11	- 0.46	+ 0.10	- 0.11	+ 0.65	+ 2.93	- 0.46: Total 1985Q1 – 1998Q2
Monthly:								
4.58	=	- 3.21	- 2.72	+ 0.90	+ 3.12	+ 0.90	+ 6.27	- 0.68: Period 1992:M10 – 1998:M10

3.1 Private sector interest-bearing debt

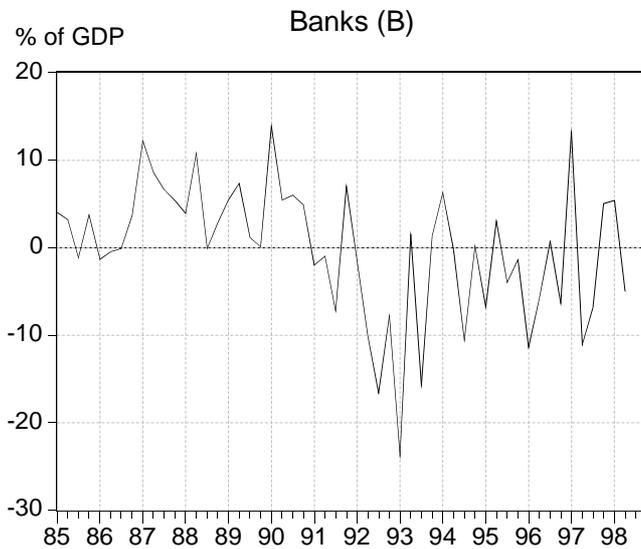
According to Table I, the foreign financial flows of both the banks and the corporate sector were reversed when moving from period one to period two. The current account deficits had caused high levels of foreign indebtedness in Finland during the 80s. Banks have had a prominent position in conveying foreign finance via their balance sheets to the enterprise sector in a small country with a persistent shortage of capital. Only large international enterprises were able and allowed to acquire finance from global capital markets or had direct ties to foreign banks. After the mid 80s, the liberalisation of financial markets made substantial capital imports possible. This foreign finance was fatal to both domestic sector enterprises with limited risk-bearing ability as well as to banks when the recession hit in 1990. The repeated devaluations of the markka made foreign finance very expensive and many bankruptcies resulted.

Chart 6



Having survived the deep recession of the early 90s, enterprises and banks quickly paid back the bulk of their foreign loans and amortised most of their bonds issued in foreign currencies. The banking crisis caused by the recession resulted in major mergers between commercial banks and in the partial demolition of the savings bank system. Today, the largest commercial bank has a market share of some 40 per cent. After the recession, the foreign borrowing and the issues of bonds abroad by the private sector have remained fairly modest.

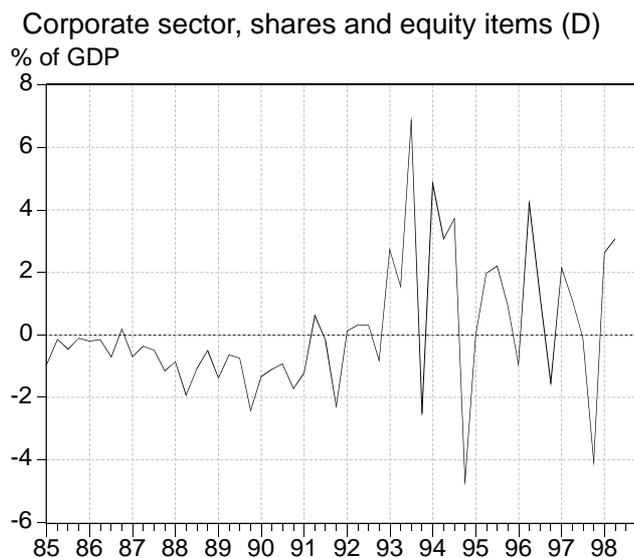
Chart 7



### 3.2 Equity items and asset prices

After 1992, foreign liabilities in the form of shares and equity grew in Finnish enterprises (D) as a result of Finnish shares becoming more interesting as an object of investment. The most dramatic change since 1992 is revealed in item G, the valuation changes of portfolio liabilities (mainly stocks)<sup>1</sup>. Currently, the major part of the liabilities in the Finnish Net IIP consists of Finnish shares in foreign ownership, the value of this stock representing almost 70 per cent of GDP. Most of the increase in this stock, in 1998 some 80 per cent, is attributed to the rise in equity prices. The boom on the stock market and a consequent rise of equity prices has contributed most to the liability side of the IIP, while Finnish residents have displayed only passive interest in foreign equities.

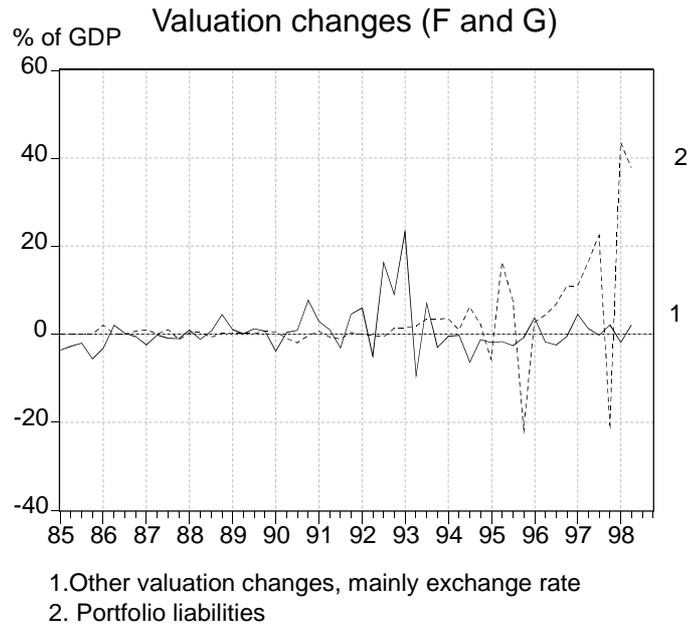
Chart 8



Swings in the exchange rate have been apparent in the data after September 1992, when the Finnish markka was allowed to float (see item F).

1) See also chart 9

Chart 9

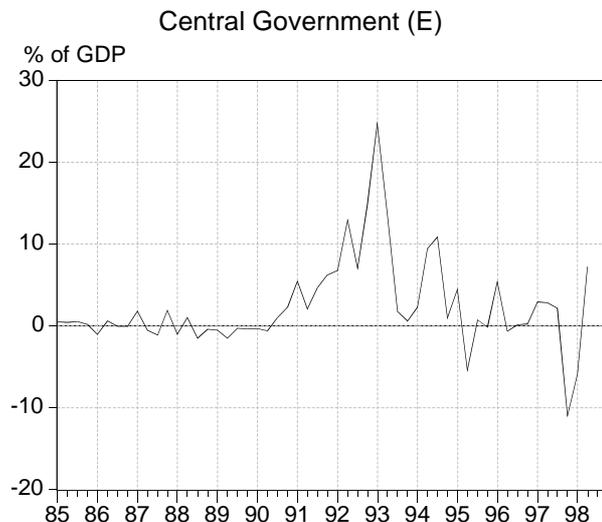


In the IIP, direct investments abroad and in the domestic economy are a considerable part of foreign assets and liabilities of the non-bank sector. Large-scale mergers both in banking and in export industries have recently led to vast single transactions. The direct investment abroad stock, being some 20 per cent of the GDP, is twice the level of foreign direct investment in Finland.

### 3.3 Central government capital movements

The strong growth of the net foreign debt of a central government in deep cyclical recession with shrinking tax revenue and growing unemployment outlays is depicted in item E in Table I. During the 1980's, the debt of the public sector was negligible in Finland. However, the net borrowing requirements of the central government were annually some seven per cent of GDP on average from 1992 to 1995, and accordingly, the central government debt rose over a few years to about 70 per cent of GDP. The balance between central government income and outlays was restored in the 1999 budget. During the first half of the 90s, the central government acquired substantial amounts of foreign finance, but more recently borrowing has taken place from domestic sources. The central government foreign debt currently stands at some 25 per cent of GDP.

Chart 10



Summing up, the role of banks has been dominant especially in the first period as shown in Table I. Banks contributed on average to over 85 per cent in the change of the net IIP. In addition to banks,

central government and asset prices (mainly equity prices) were important factors for change in the IIP during the second period, the effect of the asset prices being the largest.

### 3.4 Variability of components

*Table II Standard deviation*

A	B	C	D	E	F	G	H	
Quarterly:								
4.43	5.23	3.17	0.74	3.12	3.11	0.86	3.77:	Period I 1985Q1 – 1992Q2
15.44	8.39	4.20	2.73	7.39	6.92	4.37	5.88:	Period II 1992Q3 – 1998Q2
10.76	7.62	3.83	2.11	5.52	5.16	10.58	4.78:	Total 1985Q1 – 1998Q2
Monthly:								
27.93	12.07	6.28	4.48	10.92	9.29	26.45	10.18:	Period 1992.10 – 1998.10

Table II shows that the variability of most items is markedly larger in the second period than in the first. Totally, the coefficient of variation of the change in the IIP has grown from 1.25 to 2.53 from period one to period two. The valuation changes of portfolio liabilities (G) show the most striking increase of the variability, see Table II (rows 2 and 4). The coefficient of variation was in *monthly* case 6.10 in period two, almost three times that of the quarterly time series.

Monthly time series have, in general, considerably larger variability than the same time series with a quarterly frequency. This holds true especially when the flow data of the Balance of Payments are considered. However, the stock data studied do not display a similar increase of variability when the quarterly series are replaced by the monthly data. The larger variability of the monthly series obviously decreases their analytical relevance. When the monthly national flow data with large variability are aggregated, for example, to the Euroarea level, the statistical quality of the data is difficult to assess.

The equality of the value of the variances has been tested by comparing the key variables in pairs. Banks (B) and central government (E) are considered together as are banks (B) and corporate sector (C) and corporate sector (C) and central government (E). In addition, the two different valuation items, mainly exchange rates (F) and equity prices (G) are studied. The robust variance test<sup>1</sup> result strengthens the inference that banks' contribution has varied remarkably more than that of central government. A similar result emerges from the comparison of the variation between banks and corporate sector. As expected from earlier conclusions, the equality of the variance hypothesis is not rejected in the test between corporate sector and central government, as is the result between the two different valuation items.

## 4 Conclusions

This paper has endeavoured to describe and compare the development of the components of the Finnish Net IIP. The data consisting of sectoral flows and valuation items cover the period 1985 – 1998 and for analytical purposes two subperiods, being before and after the floating of the Finnish markka. The study focuses on the main sectors; that is banks, corporations and the central government. Additionally, the valuation items (exchange rates, equity prices) have played an important role in the Net IIP decomposition, and particularly equity prices in recent years. The mean and variability of each item has been estimated, and for some items also bivariate robust variance tests were carried out.

The results above confirm the fact that the Finnish banks still prominently contribute to the variation of the Finnish BoP flows. During the late 80s and early 90s, this can be inferred from the very bank-oriented structure of Finnish financial markets, but the same holds true during the 90s as well, even though it is argued that the role of banks has generally declined. Moreover, the pervasive crises of the banking sector is reflected in both subperiods. Even if enterprises have recently been more in a position to exploit the opportunities on the international capital markets, the banks' role was dominant when the economy was recovering from the recession, and both banks and the corporate sector made efforts to improve their balance sheets.

The second major feature of the Finnish BoP is the increased interest in Finnish equities as an object of investment. This phenomenon in hand with the price boom on the stock market has in recent years increased the equity holdings of foreigners to become the most significant item in Fin-

1) *Brown-Forsythe (1974)*

land's IIP. At the same time, the globalisation of the major Finnish corporations has accelerated. A third feature is the rapid growth of the central government's foreign debt due to the deep recession and high unemployment from 1991 to 1994.

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## Annex 1 Balance of payments statistics survey system

The total number of entities in the official register of enterprises and establishments is around 250,000 in Finland. The major export firms are large in relation to the size of the economy, but their number is limited and thus only a few firms are able to act in the international capital markets. In the early 90s, the Board of Customs reported that there were 6500 exporters and 10,300 importers in Finland having more exports or imports than some 16,500 ecu (1993). The register of exporters and importers can be used as a frame for financial flow and stock surveys. The financial flows and stocks by enterprises can be made up with even smaller group of enterprises. For example, by surveying 80 – 90 consolidated enterprises some 70 per cent of exports can be covered but the same enterprises make up almost 100 per cent of the foreign assets and liabilities.

The total number of banks relevant for the BoP statistical reporting is ten, including in addition to commercial banks all savings- and co-operative banks reporting collectively via their central organisation, respectively, and the number of other financial institutions is 29. Other financial institutions constitute mainly of insurance companies and pension funds. In Finland, the domestic securities brokers carry on an important part of the securities trade of the residents with foreign papers as well as function as middlemen when nonresidents are trading with Finnish papers.

The statistical system employed in Finland can be characterised as eclectic. Many sources for information can be used in compilation of the balance of payments statistics in a country with statistical tradition of good basic registers and a functioning collaboration between statistical authorities. This holds especially true in the current account where commodity trade, transport, travel and insurance can be based on special statistics not collected only for the balance of payments. The financial account surveys in turn serve the flow of funds statistics compiled by the Bank of Finland and Statistics Finland in collaboration. The consistency between the National Accounts and the Balance of Payments has always enjoyed high priority.

The system was built in the early 90s after the liberalisation of the exchange controls. Then the current account deficit and the growing indebtedness were major concerns of the economic policy. It was clear that the monthly information on these economic fundamentals were requested. The main invention of the system was to combine the stock and flow data as well as the income data to a single survey. In negotiations with banks and major enterprises the respondents informed that, in fact, the stock data were more readily available than the flow data. In addition, the combination of both made it easier for the respondents to be consistent in their reports.

For the monthly system a small non-probability sample on enterprises (less than hundred) was selected. The sample is updated annually and occasionally, like every fifth year, a 'census' survey is conducted. All banks are surveyed and only a few of the other financial institutions are exempted. All 26 securities brokers are surveyed for balance of payments purposes in order to cover the international financial activities of the households and small enterprises.

The monthly survey system is completed with annual surveys of direct investments abroad and in Finland. These surveys include more structural information and the sampling is more complex

than in the monthly system. Additionally, nonrepetitive sections like the IMF survey on the geographical breakdown of portfolio assets can easily be included in the system in order to acquire more structural information.

## **Annex 2 What is a robust variance?**

The basic distinction between a classical (non-robust) and a robust variance estimator is that instead of the mean, some robust location estimator like the median is applied in the variance formula. Levene (1960) used the absolute difference from the mean. Brown and Forsythe (1974) developed the Levene test statistic by replacing the absolute mean difference with the absolute median difference. In the literature, this test is also known as the modified Levene test. This test appears to be superior in the robustness and power, i.e. it is robust against departures from assumption of statistical distribution (often normal) (see, eg Neter et al., 1996, p. 766). These departures occur for instance together with outliers in data. The modified Levene test does not require equal sample size.

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### The Role of the Central Bank of Barbados in the field of statistics

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#### 1. Introduction

Like most central banks, the Central Bank of Barbados has a regulatory function in respect of the financial system and a legislative mandate to undertake continuous economic research. To this end, the Bank has assembled and maintains, on a current basis, economic data with a primary focus on, financial, fiscal, foreign trade and real sector variables. The Barbados Statistical Service (BSS) has the legal authority to collect statistics in Barbados but because of inadequate human and financial resources, it has been unable to provide certain types of data and has even stopped disseminating some types of socio-economic data. The Bank therefore finds itself filling the breach by getting involved in the dissemination of not only banking and financial data but non-financial and other socio-economic information as well.

The Bank is also a major user of statistics to the extent that it conducts research on all facets of the economy. In that regard, it is constantly looking for avenues to improve data availability, coverage and quality. This article outlines the Bank's role in collecting, processing and disseminating economic information in Barbados.

#### 2. Data Collection and Processing

The Central Bank of Barbados collects and processes information from both primary and secondary sources. Virtually all the information on the operations of financial institutions are obtained as primary data from these institutions. These are collected through a set of weekly and monthly schedules which detail the nature of the aggregates, how they are to be categorised and the periodicity required. The integrity and consistency of the data so collected is verified by cross checking the weekly against the monthly reports. The Bank publishes the consolidated information. The bulk of secondary data reaches the Central Bank from the BSS. Others are collected from key Government Ministries such as Finance, Trade and the Accountant General's Office. The Bank's role in these types of data is mainly that of a disseminator, since much of the data is already processed.

The processing of data has gone through a number of phases. Initially the source data were tabulated with calculators before typing. The typed data were stored on typewriters with electronic memory (e.g. IBM Mag Card) and then updated monthly before publication. With the acquisition of a Central Purchasing Terminal (CPT) in the early 1980s, which allowed data to be stored on large floppy disks, the production of the Bank's statistical publications were facilitated a great deal as the tedium of manually manipulating data was reduced.

The introduction of personal computers in the Bank in the late 1980s allowed a gradual shift from the manual processing of data to a fully automated process. The data were processed on *Lotus 1-2-3 spreadsheets* whose printouts were used to update the required tables before publication. The acquisition of the Advanced Retrieval Econometric and Modelling System (AREMOS)

software in the early 1990s allowed for a full system-wide database to be created. This database stores all the financial data collected by the Bank's statistical unit and it enables the tables in the Bank's publications to be updated, processed and printed without re-keying. It is ultimately intended to have all economic and statistical data to be stored in the database from which users can tap directly for whatever analysis is required.

### 3. Information Dissemination

The Bank disseminates its statistical information mainly through three publications. They are the monthly Economic and Financial Statistics (EFS), the Annual Statistical Digest (ASD) and the annual Balance of Payments (BOP) publication. The quarterly Economic Review (ER) and the Bank's Annual Report (AR) are also good sources of information, carrying data that usually support the analytical orientation of these publications.

The EFS at present carries a total of sixty-five (65) tables of which 41 (63.1%) are tables on the financial sector, 10 (15%) on foreign trade, 9 (13.8%) on public finance and 5 (7.7%) on general statistics of the real sector. The ASD carries all the information in the EFS but provides data of longer periodicity (quarterly and annually) and longer series of past data. It also carries basic macroeconomic data on other Caribbean Community countries. As expected, the Balance of Payments publication contains detailed information on Barbados transactions with the rest of the world. This is based on primary data collected through annual surveys, managed entirely by the Central Bank.

The dissemination of information to the public through formal publications is supplemented with other instruments such as the press releases that accompany the Governor's quarterly press conferences on the performance of the Barbados economy. The contents of the press releases are based on information from the Bank's *Economic Outlook*, an internal document which reports data on the short to medium term forecasts derived from the Bank's quarterly forecasting model.

In keeping with new trends in information technology, the Bank has set up a website which carries general information on the Bank's operations, along with recent updates on the Barbados economy. A voice menu system also gives the general public access to recorded information via the telephone.

### 4. Main Challenges and Future Plans

One main goal is to develop systems that would enable the Bank's computerised database to be made available to all users while ensuring data integrity and security. It is also planned to set up a system of electronic data interface (EDI) that makes it possible to have data transferred electronically from external and internal suppliers into a data sub-directory.

The main challenges involve finding effective means of dealing with problems that affect data quality, timeliness and the effectiveness of the data collection process. The concern with data quality extends to both routine data that the Bank collects, processes and disseminates and its own estimates of indicators for national accounts statistics.

Monetary accounts are derived from fairly reliable sources but their quality is often affected by incorrect classification of accounts. Sometimes the Bank is forced to delay the publication of monetary accounts beyond the normal two month lag period in situations where inaccuracies arising from misclassifications cannot be resolved quickly. The Bank plans to deal with such delays by expediting the introduction of the EDI system which would enable such inaccuracies to be detected and dealt with quickly.

The Bank currently makes estimates of real GDP. However, the base year (1974) is too old for these estimates to adequately account for possible structural changes in the economy. The Bank is therefore collaborating with the BSS to expedite the necessary surveys that would allow 1994 to be used as the base year and to put mechanisms in place to have the base year changed every 5 to 10 years, as is the usual practice. The Bank is also collaborating with a private sector agency to initiate a quarterly survey of business intentions. The results should facilitate the production of a series of leading economic indicators which should help to improve GDP estimates and enhance the forecasting capabilities of the Bank.

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# Function of Central Banks in the field of statistics: the case of Belgium

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1 The statistical powers of central banks, certainly in the industrial countries, are generally confined to the financial sphere of the economy, particularly the monetary, financial and balance of payments aspects. In contrast, central banks have little if any involvement in the real sphere. In Belgium, however, the central bank has long had a greater role in statistics, and that role has expanded further in recent times.

As well as being responsible for monetary, financial and balance of payments statistics, back in the 1950s the Bank was requested to organise business surveys. These surveys, which result in “sentiment indicators”, allow economic developments to be assessed much sooner than in the case of quantitative statistics. Then in the 1970s the Bank set up a “Central Balance Sheet Office”. All Belgian enterprises must, by law, submit a standardised balance sheet to the Bank. Since these balance sheets are more or less exhaustive, they are a valuable source of information on business in Belgium. Finally, in 1995 the statistical activity of the National Bank of Belgium’s Statistics Directorate was expanded once again when the Belgian Government decided to reorganise public statistics. The aim was to improve the efficiency of the public statistical system, partly in view of the impending economic and monetary union in Europe. That was the reason for creating the National Accounts Institute (NAI). As the NAI has no staff, it calls on three associate institutions to carry out its work, namely the National Statistical Institute, the Federal Planning Bureau and lastly the National Bank. Thus, the Statistics Directorate of the National Bank has been responsible since 1995 for two major areas in the real sphere of the economy, namely the compilation of the national accounts and the collection and production of foreign trade statistics.

2 This transfer of powers and the advent of European monetary union have undoubtedly brought about fundamental changes to a number of aspects of the work of the Statistics Directorate. First, the Directorate had to meet new statistical requirements, namely for new data and more detail in existing data, more harmonised data, greater frequency and much stricter delivery deadlines. One effect of this is that the traditional working method of the Statistics Directorate, based mainly on exhaustive book-keeping, is gradually being replaced by a more statistical approach. The Department is increasingly specialising in new statistical techniques such as sampling, supplementary estimates, missing data, etc. It is therefore a tricky task to arrive at a trade-off between quality and speed. To find an answer to this challenge, a think tank was set up a year ago which led to the widespread introduction of quality controls. These quality controls relate to the whole chain from production to dissemination of the statistics.

This chain, which formalises the statistical approach, can be broken down into nine stages, each divided into three phases. Each of these phases has one or more associated quality criteria, as may be seen from the table below:

STAGES	QUALITY CRITERIA
<b>Preparation</b>	
1. Definition of the product and the client	Relevance
2. Preparation of the collection of data	Representativeness
3. Collection of the data	Cost optimisation, communication

**Production**

- |                                     |                                     |
|-------------------------------------|-------------------------------------|
| 4. Processing of individual answers | Accuracy, internal consistency      |
| 5. Statistical processing           | Accuracy, expertise                 |
| 6. Check on results                 | Harmonisation, external consistency |

**Dissemination**

- |                                 |  |
|---------------------------------|--|
| 7. Preparation                  | Presentation, usefulness to the customer |
| 8. Dissemination of the results | Accessibility, punctuality               |
| 9. Review of the results        | Regularity                               |

Compliance with these criteria at each stage will determine the resources and methods to be used. It is not possible to fulfil all the quality criteria mentioned at once, even if the ultimate objective is “total” quality. Furthermore, the standard of quality achieved in the directorate is not constant throughout the process, and it also varies according to the statistics. In general, we find that greater attention has hitherto been paid to the middle of the chain, while there are some weaknesses at either end.

For the immediate future, the department has opted to give priority to the following criteria:

- Punctuality, by the general adoption of schedules of delivery dates and the use of cut-off dates, and by developing an automated delay monitoring system.
- Communication with both customers and suppliers, by conducting prior surveys among declarants, paying attention to the presentation of the questionnaires and the results, co-ordinating some of the surveys and keeping contact files up to date.
- Statistical expertise, by systematising the compilation of metadata and methodological documentation, and improving the standard of statistical training of all members of the department.

3 The greater role than that which a central bank might traditionally be expected to play in economic statistics may raise questions about the independence of a central bank, because it now has to compile macro-economic policy data which may influence government policy. When reforming the statistical system in 1995, the legislature was aware of this problem and therefore entrusted these new powers to the National Accounts Institute: although these activities are delegated, as we have said, the Institute supervises them. The NAI is run by an Executive Board, which is chaired by the secretary-general of the Ministry of Economic Affairs and also comprises two board members from each of the associated institutions. The main duties of this board concern co-ordination and outlining policy for the statistics assigned to the Institute. At the NAI a Scientific Committee for the National Accounts is also being set up. This Scientific Committee consists of two representatives from each of the associated institutions and six university professors. The committee gives its opinion to the Executive Board on the scientific value and objectivity of the methods used and the results. In this way, the Statistics Directorate is able to continue performing its role as an independent data producer.

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# What is a Central Bank's function in the field of statistics?

## The case of Botswana

*Dr. D Cowan and M Radipotsane—Bank of Botswana*

### **1. Introduction: A brief overview of the statistics that the Bank of Botswana currently collects and publishes**

The Bank of Botswana, like most other central banks, produces three main sets of statistics. These are monetary aggregates, financial sector statistics (interest rates, banking sector statistics, etc.) and balance of payments data. In addition, the Bank collects statistics related to the exchange rate on a daily basis (the Bank is responsible for calculating the exchange rate and implementing exchange rate policy) and on foreign exchange reserves. In many ways, this data is part of, and a complement to, the balance of payments data it compiles.

Much of the information on the financial sector is used internally, but the Bank of Botswana has two main publications, the *Botswana Financial Statistics* and the *Annual Report*. In addition, statistics provided by the Bank of Botswana are published by other institutions such as International Monetary Fund (IMF).

### **2. General Economic Data versus Specific Financial Data**

Casually glancing through the array of annual reports from various central banks which are in the Bank of Botswana library, what is immediately obvious is that, unlike most developed countries, the statistics published by central banks in developing countries cover a much wider range of data.

The Bank of Botswana is no exception to this general trend. For example, there are tables on mineral and crop production in the Bank's *Annual Report*. In other words, the Bank of Botswana's statistical publications provide much more than the "normal" statistics that one would expect to be provided by a central bank, such as inflation and interest rates. In fact, for most people interested in the economy of Botswana, the Bank's statistical publications are their first, and sometimes even their only, source documents.

Some of the reasons why central banks in developing countries adopt this wider role are:

- if they were to concentrate entirely on financial and exchange rate market data, most of them would have very little to write about. In most developing countries financial markets are not well developed, and central bank activity in the markets is limited;
- in many developing countries government departments are over-stretched and have staff constraints. In contrast, a central bank often has adequate skill complement; and
- in contrast to developed countries, there is a lack of specialised institutions dealing with specific areas of an economy. Such institutions also compile detailed statistical databases in their areas of specialisation, which reduces the need for the central bank or the central statistics office to collect or collate such data.

A major benefit of the central bank adopting a wider statistical role, or at least having one institution in a country that is able to collect most statistics, is that it is in a position to know not only which data are available, but also which are the most up to date. The information can then be made available to other users, saving them considerable time and effort searching for the information.

### 3. Other Roles currently carried out by the Bank of Botswana in the field of statistics

Since many central banks in developing countries have adequate skill complements and are major users of statistics, they are also able to provide input into the type of statistics which should be produced and in helping ensure the quality of the statistical data.

In this regard, the Bank of Botswana has:

- assisted the Central Statistics Office to improve the quality of its statistics; and
- monitored statistical information available in the country, and where possible, provide input and advice to ensure that the data are as accurate as possible.

### 4. Future Directions: What function should a Central Bank provide in the field of statistics?

Ultimately, the Bank of Botswana would probably like to remove itself completely from the production of balance of payments statistics. Its role in this area, as in the case of many countries, remains very much a legacy of exchange controls, which were traditionally processed at the central bank.

Instead, a central bank should be compiling statistics in areas in which it has specialist knowledge and the necessary input data. In addition to the normal areas such as monetary and financial market statistics and exchange rates, the Bank of Botswana is examining the possibility of producing statistics in the following areas:

- *An index of forward economic indicators* — The Bank of Botswana, like many other central banks is gradually moving towards using indirect instruments to conduct monetary policy instead of traditional direct instruments. Yet, without a well developed financial market, and often a substantial delay in the production of key economic data such as inflation, the Bank will need to develop its own statistics which will assist in monitoring economic and financial trends. Without such statistics it is difficult to make timely appropriate monetary policy decisions.
- *Debt monitoring* — At present, Botswana is one of very few developing countries with very low external debt. The recent crisis in Asia, however, shows that there is need for central banks to monitor the external debt situation of many developing countries. This includes not only official debt (which is often monitored by the Finance Ministry), but also private sector debt. Since a central bank's responsibilities include supplying the foreign exchange to meet external debt obligations, the Bank may need to develop capacity for external debt monitoring and collection of statistics in this area.

### 5. Conclusion

The provision of good quality and timely economic statistics in any country is crucial in ensuring that the decisions made by policy makers are based on the best "facts" about the economy. The provision of monetary aggregates, balance of payments statistics, exchange rate and financial market data, by central banks, including the Bank of Botswana, is a crucial component of the policy formulation process.

However, central banks in developing countries tend to have a much wider role relating to statistics than in developed countries. Yet, it should not be forgotten that while central banks currently perform this wider role, many would probably like to shed some of these broader functions. However, in most developing countries it is unlikely that this will occur in the foreseeable future. Instead, central banks should progressively concentrate their resources on producing statistics in which they have specialist knowledge and important input data.

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# Quel est le rôle d'une Banque centrale en matière statistique?

*Jacques Pécha et René Isnard—Banque de France*

Cette contribution donne un aperçu général des statistiques dans les Banques centrales en général et dans celles de l'Union européenne en particulier.

## 1. Trois raisons pour les Banques centrales d'exercer une fonction statistique importante

- Parce qu'elles sont souvent mieux placées que les Offices statistiques pour accéder à certaines données. Le rôle d'émetteur et de gestionnaire de la monnaie fiduciaire des banques centrales, leurs interventions sur les marchés de capitaux à court terme (change, escompte, interbancaire) leurs rôles réglementaire en matière de stabilité des marchés de capitaux et surtout leur activité prudentielle à l'égard des banques sont à la base de la plupart des statistiques financières au sens large (statistiques monétaires, bancaires, comptes nationaux financiers, centrales de bilans et, à l'exception des pays anglo-saxons, balance des paiements et position extérieure. Dans la sphère réelle, leur rôle est plus limité. On ne doit pas oublier cependant le développement des enquêtes de conjoncture dans certains pays, leur responsabilité en matière de compte courant (balance des paiements) du moins dans les pays non anglo-saxons.
- Parce que leur indépendance s'en trouve ainsi nécessairement renforcée. Les banques centrales peuvent collecter l'information qui leur est nécessaire si les Offices statistiques ne peuvent le faire.
- Parce que les Offices statistiques ne disposent pas toujours des ressources suffisantes pour faire face aux demandes particulières des utilisateurs en statistiques macro-économiques, au premier rang desquels se trouvent les Banques centrales.

## 2. Trois limites à l'activité des Banques centrales dans le domaine statistique

- La déontologie: responsables d'une politique, les banques centrales doivent bien séparer statistiques et études.
- Les choix méthodologiques sont souvent, notamment en matière de comptabilité nationale et de balance des paiements, déterminés par les organismes internationaux aux réunions desquelles elles participent (FMI, ONU, OCDE, Eurostat, BCE)
- Une activité des banques centrales prioritairement tournée vers leurs besoins opérationnels à la différence des Offices statistiques qui assurent avant tout une fonction de service public de la statistique.

## 3. Cependant, l'importance et la place de la fonction statistique à l'intérieur des Banques centrales est variable

Dans les pays industrialisés, importance forte de cette fonction dans les banques centrales du continent européen (le maximum étant atteint par la BNB) et à la Banque Centrale Européenne, mais moindre dans les pays anglo-saxons.

La place de la fonction statistique dans les organigrammes des Banques centrales de l'Union monétaire européenne se situe généralement dans l'un des deux schémas suivants :

- un seul Département statistique, mais sans compétence donc en matière d'analyses, c'est le modèle le plus fréquent dans les banques centrales d'Europe continentale et à la BCE

- trois Départements économique-statistiques (Balance des paiements, statistiques monétaires et bancaires, statistiques économiques générales). La fonction statistique est éclatée mais les analyses et les statistiques sont traitées dans la même unité. C'est le schéma français notamment.

#### **4. Les relations des Départements statistiques des Banques centrales nationales avec les Offices statistiques sont excellentes au plan européen, ce qui rejaillit au plan national**

Deux systèmes statistiques officiels co-existent au niveau européen: celui de la Commission de Bruxelles (Eurostat à Luxembourg) et des Offices statistiques nationaux et celui du Système Européen de Banques Centrales (Banque Centrale Européenne à Francfort) et des banques centrales nationales qui se retrouvent essentiellement au Comité des Statistiques monétaires, financières et de balance des paiements (CMFB), dont les résultats sont particulièrement positifs.

#### **English Abstract**

#### **STATISTICS: WHAT IS THE ROLE OF A CENTRAL BANK?**

##### **1. Central Banks have three reasons for playing an important role in statistics**

- They often have easier access to information than Statistical Institutes, because most statistics (money and banking, national financial accounts, companies' balance sheets and, except in Anglo-Saxon countries, balance of payments and international investment position) are derived from CBs' intervention in markets (forex, money, interbank), and CBs' regulatory and supervisory power. In the real sphere, CBs' role is growing with the development of short-term surveys to companies in some countries, and the current account data collection (b.o.p.),
- Collecting the specific information they need enhances their independence,
- Statistical Institutes do not always have adequate means to meet users' (in particular CBs') requirements.

##### **2. However, Central Banks' statistical role is limited in three respects**

- By their rules of conduct,
- By international methodological choices,
- By their domain of competence.

##### **3. The importance and place of statistics within Central Banks vary:** importance is great in Continental Europe, at the European Central Bank, lower in Anglo-Saxon countries.

The place of statistics in the European Union Central Banks' organisation charts comes under one of the following structures:

- one Statistics Department without research activity: this is the most common pattern in Central Banks of Continental Europe and at the ECB,
- three Economic and Statistics Departments (Balance of Payments, Monetary and Banking Statistics, General Economic Statistics); the statistical function is split but analyses and statistics are made by the same unit: this is the French system, in particular.

##### **4. Relations between National Central Banks' Statistics Departments and Statistical Institutes are excellent at European level, which reflects well on the national level**

In Europe, two systems exist for statistics:

- the European Commission in Brussels (Eurostat in Luxembourg and National Statistical Institutes);
- the European System of Central Banks (ECB in Frankfurt + NCBs).

They make up the Committee on Monetary, Financial and Balance of Payments Statistics (CMFB), whose outcome is particularly fruitful.

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# National Statistical Offices: Their Place in a Changing World

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The ideas that statistics are indispensable for a well-governed state and that to serve their intended purposes they must be honestly reported and, in a democratic society and/or market-oriented economy, widely disseminated have a long history. See Kelman (1985), Johansson (1990), and Porter (1995). These ideas underlie the mandates of some of the oldest national statistical offices (NSOs).

This paper explores the landscape to look for new or emerging developments affecting official statistics in a democratic society and market-oriented economy—especially in an increasingly globalized market economy. As the organizer of the session requested, it considers the role of the NSOs in a setting where the boundary between public and private in statistical information, at least in some parts of the world, is less clear-cut than in the past. First, it attempts to gauge the health of the idea that official statistics play a crucial role. Next, it considers a sample of recent events to see whether there are implications for NSOs, particularly about the public-private boundary. Finally, the paper makes three points that focus on the challenges facing NSOs in the changing world.

## 1. The Role of Official Statistics

The idea that reliable and accessible official statistics are indispensable in a democratic society and market-oriented economy seems to be alive and maturing well in many countries. In other countries, where the idea is younger, it is being nurtured. Within the statistical community, various activities related to the Fundamental Principles of Official Statistics can be taken as representing the maturing process and, especially, the nurturing process. At one level, an increasing number of countries, in updating their underlying statistical legislation and public outreach, specifically refer to the Fundamental Principles. Inter- and supra-national organizations have kept the Fundamental Principles in the forefront. The IMF, for example, drew on the Principles in identifying elements to be included in its data dissemination standard initiative begun in 1995 and refers to them in its *Manual on Fiscal Transparency*.

Affirmation of the role of official statistics is also coming from policy officials, notably at the global level. In laying ground for a new architecture for the international financial system, the report of the so-called G-22 Working Group on Transparency and Accountability made an especially cogent statement. The report concluded with respect to macroeconomic statistics as follows:

Information has a public good element because its use by one agent does not preclude its use by others. Moreover, the provision of information has positive externalities, such as better informed investment and policy decisions. Owing to these factors, the public sector is best positioned to provide information about the activities of firms, households, and governments on an aggregated basis. This includes national accounts, price indices, government finance statistics, labour market information, external accounts, monetary aggregates and financial sector indicators.

## 2. Clippings from a statistician's scrapbook

The following clippings might be found in a scrapbook of the last 5 year's noteworthy events in official statistics.

*A private not-for-profit organization took over the production and dissemination of what had often been described as the government's leading forecasting tool.* For decades, the composite indexes of leading, lagging, and coincident indicators had been prepared by the U.S. Bureau of Economic Analysis (BEA). In order to focus its resources more fully on its core economic accounting programs, BEA decided to end its indicators program. Formal announcements were made soliciting proposals from organizations to which preparation of the indicators might be transferred. The

Conference Board, to which the transfer was made in late 1995, now presents a monthly press release and its monthly Business Cycle Indicators Report, drawing on the same publicly available data sources that BEA had used.

*A private profit-making firm took over the data collection underlying the highest profile measure of inflation.* Until 1995, local price collection for the retail price index prepared by the U.K. Office of National Statistics was done by staff of the local offices of the Employment Department. In that year, as part of a Quality Management System, a competitive tendering was conducted, and Research International Ltd. won a 5-year contract for this work. This out-sourcing involved a complete changeover of the field force with introduction of new technology and arrangements to ensure quality controls. See Fenwick and Beaven (1998).

Less eye-catching perhaps, clippings from the scrapbook would mark the extensions of the partnerships between NSOs and private organizations to distribute electronic products and the contracting out of the management of the inventories and data shops to private firms.

The motives for these and other shifts along the public-private boundary in statistics differed from case to case. However, variant forms of pressures to reduce the size of the government workforce and to bring market forces to bear often were at play. As well, the time was ripe in that the private information industry had grown tremendously and was testing its strength.

These shifts to the private sector of parts of what had been official statistics seem to have gone well, at least on the basis of commentary to date. Reflection on these specific cases and in the abstract suggests that the answers to four questions could help distinguish between the functions and products, such as the cases above, that can be privatized and those that should be reserved to official statistics.

*Does the function or product call for the protection of the confidentiality of individually identifiable responses?*

*Is the product reproducible or verifiable by an informed user?*

*Is the function or product dependent on the authority of government to collect data and thus to generate enough truthful responses to ensure data quality?*

*Can the product or function be audited for adherence to quality standards?*

Aside from protection of confidentiality, the common element in these questions is data quality—confidence in quality, ensuring quality, and protecting quality. The cases above may be used to illustrate. The leading indicators could be privatized because they are based on publicly available data and a methodology that permits verification of the results. Indeed, in some countries these indicators are prepared by private research organizations. The data-collection function underlying the retail price index could be out-sourced because quality could be audited and because collection of prices does not require the authority of government to ensure responses or call for the protection of confidentiality.

To whatever extent that the boundary between public and private in providing statistical information is at issue in industrial countries, it seems to be less so in developing countries. One possible explanation is that the information industry, at least in the form seen in industrial countries, is less advanced. As it has grown up in the developed countries, the information industry is dependent on the public sector for plentiful raw material; uses up-to-date technology to collect, store, and—especially—distribute data; and markets to users who want relevant information fast. See Starr and Corson (1987). These conditions are less likely to exist in developing countries.

A few more clippings from the scrapbook, admittedly selective, suggest where some other issues might lie:

*Two official sets of national accounts data gave decidedly different pictures of the national economy.* The two sets were produced and published by the NSOs and by another government agency. A revision of the GDP growth rate from 5.2% to 0.8% and from 5.0% to 2.7% for 1996 and 1997, respectively, was implied by the slower-to-be-published NSOs figure. An article in *The Economist* drew worldwide attention to the situation and raised questions of *credibility*.

*Two national agencies prepare three different monthly consumer price indexes, but none is widely accepted as useful.* All three have limited geographic coverage, a restricted reference population, and other methodological problems; the index most often referred to as the “official” index uses expenditure weights from 1949/50 data. Consolidation of efforts on one improved index—as *sound management* would seem to call for—is made difficult by outdated legal requirements and lack of trust between the two agencies.

*A bureau of transportation statistics provided a profusion of statistics, but inadequate documentation.* The newly formed bureau, created within an executive department, quickly assembled diverse data from public and private sources and harnessed technology—e.g., opening an early Website and marketing a CD-ROM—to make them widely available. However, documentation was sparse and shed little light on the quality and appropriateness of the data for various uses. An outside panel urged the bureau to begin to focus on data quality and improved documentation consistent with an emphasis on the responsibilities associated with *professionalism* as a statistical agency. See Citro and Norwood (1997).

### 3. Reflections on the scrapbook's clippings

It may seem presumptuous to attempt once again to distill points for NSOs' consideration. The wide experience of the IMF's Statistics Department, on which I will draw, emboldens me however. Further, the continuing pressures that statistical agencies are under suggest that we need to remain alert to the need for rethinking. Therefore, even if I only regroup points or provide a different emphasis, and by so doing stimulate some rethinking, I might serve a useful purpose. Finally, in reflecting on the clippings from the scrapbook, there would seem to be a confluence of messages that would serve NSOs well in monitoring the public-private boundary in statistics and in strengthening NSOs. In this spirit, I offer three interrelated points—about coordination within a national statistical system, dissemination, and the need for a legal basis for statistics.

1. *Coordination among the agencies that produce official statistics is a key to establishing and maintaining a reputation for credibility, sound management, and professionalism of a national statistical system.* Challenges to these inter-related characteristics arise in many contexts, as sampled above. Often, data users do not distinguish among the government agencies that produce statistics, and with more and more users from abroad, the distinctions among agencies are becoming even more blurred. As a result, it may be said that the reputation of a country's statistical system is collectively gained or lost by the agencies within the system. Perhaps, a system's reputation is only as good as its weakest link. Thus, coordination—as short-hand for not duplicating each other's efforts, using common classifications, working together to educate decision-makers about the importance of quality statistics, etc.—is a key. Often, the NSO is best positioned, from a substantive point of view, to take the lead in such coordination.

2. *Dissemination is increasingly recognized as a key function of a statistical system and one that faces considerable change.* The dissemination of comprehensive, reliable, and timely data is increasingly viewed as an issue of transparency and thus crucial to a globalized market economy. On the demand side, NSOs face a spectrum of data users, including those beyond the national borders, whose varying needs should be identified and satisfied. On the supply side, technology is making it possible to make data available in a range of products. Especially to the extent that the private sector produces and markets statistical products, it will be useful to make it easy to identify the products that are “official statistics”—e.g., by a logo. This title could apply not only to the products of NSOs but, as a result of inter-agency coordination, all the products of public agencies that meet standards of credibility, sound management, and professionalism.

3. An up-to-date statistical law is necessary (but of course, not sufficient) infrastructure for a vigorous NSO. A statistical law or its equivalent can be quite useful to an NSO in specifying its mandate, in laying the ground for its coordination role (including provision for it to be the major point of contact with international organizations) and providing the framework for the dissemination of products identified as “official statistics.” However, it is imperative that there be a legal mandate for the protection of confidentiality of individually identifiable responses. Further, a statistical law can equip statistical agencies with the authority needed to collect data. This authority, including legal enforcement, has become especially important as liberalization and deregulation associated with globalization have meant the loss of some traditional data sources.

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## Résumé en français

*Cet article explore les développements nouveaux ou émergent dans les sociétés démocratiques ainsi que dans les économie de marchés qui peuvent avoir des conséquences sur les offices nationaux de statistiques (ONS), particulièrement dans le contexte de la globalisation des économies. L'article examine la proposition que les statistiques officiels jouent un rôle crucial; offre des réflexions sur les événements récents et leurs conséquences potentiels pour les ONS, surtout en ce qui concerne les rôles respectifs des secteurs publics et privés; et, finalement, fait trois propositions concernant la coordination au sein des systèmes statistiques, de la dissémination des données et de la base juridique des statistiques, pour permettre aux ONS de faire face au nouveaux défis.*

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# The Role of the Economic and Monetary Statistics Department at the Bank Indonesia

*Ending Fadjar and Soekowardojo—Bank Indonesia*

## 1. General

The Economic and Monetary Statistics Department (EMS) is one of 22 departments in Bank Indonesia as a central bank which has main tasks in (1) managing, and (2) developing the monetary and economic statistics. The term of “managing” has broad meanings, such as collecting, maintaining, reporting, and also disseminating the existing data or the information. The other task “developing” also has some meanings, as searching and creating some new information to improve the statistics itself or to support other departments in analyzing some issues.

The coverage of the data which have been managed consist of monetary, external and real sector data and therefore the EMS organization has four main divisions; monetary statistics division, balance of payment statistics division, real sector and government finance division, as well as Economic and Monetary Data and Information Processing Division. The other supporting division is administration division which help another division in daily administrative works.

## 2. Data gathering

The commercial banks' financial statements are the most important source in constituting the money supply. This information is sent to Bank Indonesia by monthly on-line commercial bank reporting system during the first week after the reference month. The number of commercial bank offices involved in the system are 2500 offices nation wide. The dispatching and processing are held in Electronic Processing Center Division of Bank Indonesia. The results together with base money data bring out money supply data and its differentiation which are then passed to Monetary Division as a main and first user. For the time being, the money supply data only covers commercial banks as an institution which is able to create demand deposits and credits. The extending coverage will take place in the near future by adding cash, deposits and credit of retail banks, insurance and postal services. This will make the reporting system more comprehensive.

Other core information in the EMS department is the Indonesian balance of payment. In order to produce this BOP, the division has been doing some cooperation and surveys to fulfill the need of data. The estimation of capital movements is basically based on monthly investment approval report obtained from the Investment Coordinating Board. The trade balance data is gathered by compiling the export and import documents in cooperation with the Custom Agency. These documents accounting for one hundred thousands per month are collected weekly by the private service agent and then processed by Economic and Monetary Data and Information Processing Division before passed to BOP Division. The other services data are monthly estimated using some surveys of which tourism survey in cooperation with Ministry of Tourism and transfer payment survey which is solely done by BOP Division in some major countries.

For the real sector data are mostly collected from other government and private institutions as Bureau of Statistics, Ministry of Agriculture, Ministry of Trade and Industry and associations as well. Yet there some prompt information collected by the Real Sector Division itself through quarterly and monthly surveys of which are business expectations and monthly production index. The all real sector data become some indicators regarding to the monetary policies so that its timely availability is required.

### 3. Data Dissemination

The data and information are disseminated into two groups, internal and external users. The board of directors and other departments are included in the first group. The data of base money and factors affecting are informed to the board and other department within monetary sector in weekly basis during the open market committee and special meeting. The other information as BOP and production developments as well as other special issues can be also informed when necessary in steering committee forum. The external users consist of national institutions, like banking institutions, ministries, research and educational institutions, bureau of statistics etc while international institutions cover IMF, ADB, World Bank, SEACEN etc.

The ways of data dissemination mostly are in printed reports, such as Weekly Report, Monthly Indonesian Financial Statistics, Annual Report. The Weekly Report contains monetary data ranging from base money to money supply and factors affecting, domestic and international prices. The broader information are published in monthly report. Besides national productions, BOP and international developments, the report also covers money supply, credits, funds, as well as domestic and international interest rates. The number of items in this monthly IFS are more than one thousand.

The other way to disseminate data and information are through electronic information system. Some information are published in intranet, MEIS (macro economic information system) and also internet. All these information are prepared and provided by Economic and Monetary Data and Information Processing Division. Intranet usually shows general information about monetary, external and real sector developments and can be retrieved by all departments while MEIS delivers more strategic and important information only to the Board. The last media, internet is the broadest one and not only highlight the contains but also have to meet other IMF standards since Indonesia committed to involve in the Special Data Dissemination Standard. In this program, the EMS department on behalf of Bank Indonesia acted as country coordinator.

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# Statistical activities of the Central Bank of Iran

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## **Introduction**

The Central Bank of Iran has a major role in the collection and production of vital macroeconomic statistics. The Central Bank is responsible for the balance of payments, banking, financial and monetary statistics, as well as the quarterly and annual national accounts and monthly price indices. Most of the data is collected from the general public by periodically administered surveys, while the rest which are mainly registered data are collected from various government departments and banks. In addition in some areas, especially in the services sector, where there is no data available, estimates are made by the Bank.

The Central Bank itself is a major user of the statistics. So, being a producer and a user at the same time, the quality of the data, its coverage, reliability, timeliness and credit worthiness have been of major importance.

This paper deals with the responsibilities of the Central Bank in the area of statistics, methods of data collection, publications and dissemination by the Bank.

## **Responsibilities of the Central Bank in the Area of Statistics**

Since its foundation in 1960, the Bank has been responsible for the balance of payments, financial, monetary and banking statistics, the national accounts and the price indices. The Bank has a central role in providing information to the government and other policy makers. It also provides information to international institutions such as the International Monetary Fund and the World Bank.

The Bank is in close contact with the Statistical Central of Iran and other statistical offices in Iran.

The general directorate of economic statistics of the Bank which consists of the research and surveys department and the economic statistics department is in charge of the collection, presentation and dissemination of data.

In addition, the Nation Accounts Department is in charge of compiling and analysing the national accounts statistics and the Economic Research Department is in charge of the balance of payments and the money and banking statistics. These two departments are under the auspices of the general directorate of economics.

## **Methods of Data collection**

Most of the data are collected from the general public through periodically administered surveys.

The research and surveys department is in charge of the design of questionnaires and surveys, updating frames and evaluation of the projects. The economic statistics department is in charge of data compilation, presentation and dissemination.

The data is collected in 72 cities, which include the provincial capitals, by direct call on statistical outlets.

The system of data collection and processing has gone through a major change over the past several years. The data are being sent on diskette rather than paper form and the computations are more heavily computer oriented. This has facilitated the dissemination of statistics to a minimal lag.

Along with the revision in the base year which usually takes place every 7-8 years, all different projects are evaluated, the latest techniques are employed, and new surveys are laid out.

Quality and precision of data is among the major tasks of the general directorate of economic statistics. In this regard, the Bank tries to establish a close contact with the statistical outlets and provides its publications to the public.

The general directorate of economics prepares various economic reports for the Bank authorities and other policy makers.

The economic research and the national accounts departments receive the necessary data from the general directorate of economic statistics and various government organisations, such as the Statistical Center of Iran, the Ministry of Agriculture, the Customs Office and banks, on a regular basis.

### **Publication and Dissemination**

The number of publications of the Central Bank in the area of statistics runs over 40, which range from daily to annual. About 30 of these publications are produced by the general directorate of statistics. They include the household budget survey, various price indices (CPI, WPI, PPI), economic indicators, and surveys of large manufacturing establishments, construction, housing and a number of private sector services. While the Annual Review, the Bulletin, the Economic Report and Balance Sheet of the Bank and the Economic Trends are published by the general directorate of economics.

Hardcopy of the reports are made available to different government agencies and regular subscribers through the public relations department of the Bank. News or press releases are also used for monthly, quarterly or annual data. In addition data are provided to individuals upon request, free of charge.

There is a close co-operation between the general directorate of economic statistics and research groups in research institutions and universities. In addition to the regular publications, with the permission of the Bank authorities, special statistical needs of the researchers are met.

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# Information infrastructure of central banks as an integral segment of official statistics

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## **1. Consequences of virtualization of information environment for official statistics**

In modern developed economies increasing areas of the information sector of economies, in particular the national and supranational infrastructural information systems, operate in a virtual IT environment. Administrative records of infrastructural information systems might and should be used as basic or – of possible – entire source of input data for official statistics. That means that in a virtual IT environment all infrastructural information systems of national economies may be considered as integral segment of official statistics. The effect of “virtualization” of information infrastructure will be a new role of official statistical institutes (NSOs) in national or supranational economies. NSOs should be less involved in conducting surveys, and more involved in development and co-ordination of methodology.

In the modern IT environment the priority should be given by NSOs to the co-ordination of information infrastructure of national economies by designing, implementing and monitoring the use of *information standards* (e.g. statistical concepts, terminology, classifications and codes, statistical units, methods of measurement of social and economic phenomena, algorithms of compilation of aggregates), organization and scheduling of official surveys, compilation and dissemination of aggregates. Direct involvement of NSOs in data capture and production of statistics should be limited to those areas for which reliable administrative records do not yet exist. This means that official statistics in the modern IT environment shall not be the sets of surveys, but should be considered as the complex of integrated infrastructural information systems of governments, non-government public institutions and businesses producing statistical data according to adopted information standards and programmes of official statistics. The central bank is one of them.

## **2. Role of non-statistical official institutions in modern system of statistics**

Competencies of co-ordination of modern official statistics are distributed between the NSOs and the non-statistical official agencies that are empowered by law to supervise, control or co-ordinate businesses and non-profit organizations. Those are government agencies e.g. tax service, custom service, social insurance service, offices of supervision of insurance sector, offices of supervision of pension funds, labour offices, environment protection offices, specialized agencies of local governments etc. Those agencies are collecting and storing detailed data on individuals, households, businesses, contracts etc. in standardized formats. Many of them have the right to access directly administrative records of businesses and other organizations. The information systems of those agencies may – under certain conditions – be considered as an integral segment of the information system of official statistics. A special role is played by information systems of budgeting of central and local governments. Also national central banks (CBs), supranational banks and international official financial organizations (IFOs) have the sources and flows of many important data at their disposal.

From the point of view of information contents, organization and technology, they should be considered as an integral segment of official statistics. However in practice for CBs, as for many other official agencies, their contribution to official statistics is of secondary importance. For NSOs it is difficult to convince the governments and other public institutions managing infrastructural information systems (e.g. taxes, customs, social insurance, financial supervision, bank supervision etc.), that statistical requirements are of the same importance as other operational functions of those systems. In many countries statistical laws allow NSOs to use administrative records for statistical purposes, but the possibility of an active influence of public statistics on the national and supranational information infrastructure is not sufficiently effective or underrated in practice.

## **3. Outline of the layer-model of information infrastructure of CBs**

The information infrastructure of CBs should be considered as an integral segment of official statistics. From that point of view the following “layers” may be identified:

- 1<sup>st</sup> layer: internal information systems of the CB,
- 2<sup>nd</sup> layer: statistical information systems of the banking sector and balance of payments, controlled and maintained – as a rule – by the CB,
- 3<sup>rd</sup> layer: information system of national and settlement institutions (clearing houses) and central securities depositories,
- 4<sup>th</sup> layer: the segments of information systems of commercial banks, which are standardized by law or by regulations of the CB,
- 5<sup>th</sup> layer: information systems of public finances (central and local), and of other financial institutions, supervised by special government agencies or offices.

The 1<sup>st</sup> layer: internal information systems of the CB contain i.a.: RTGSs of the CB, its bookkeeping system, information systems for open market operations, registers of government bonds and obligations, specialized information systems for bank supervision, systems supporting international operations of the CB, etc. Those systems store many data, which are used in principle for internal analytical needs of CBs. They may and should be more opened for other official statistics.

The 2<sup>nd</sup> layer is – as a rule – the part of public statistics. It is the area of co-operation between CBs and NSOs. In several countries surveys of the 2<sup>nd</sup> layer are included to the programme of official statistics.

The 3<sup>rd</sup> layer contains huge amounts of important source data for statistical analyses. However, they often cannot be used directly for statistical compilations, because classifications and concepts used in those systems are not coherent with statistical needs. Coherence could be reached by common information standards developed and introduced jointly by CBs and respective institutions.

The 4<sup>th</sup> layer is now a potentially, but not effectively used, direct source of data for official statistics. In many countries CBs are authorized by law to influence information standards used by commercial banks in their internal systems (e.g. via requirements for bank supervision). Although from a technological and an information point of view many interesting statistics could be produced directly from that layer (not only via the 2<sup>nd</sup> layer), in practice this source of data is used incidentally and exceptionally. The coherence of classifications and data structures in the 4<sup>th</sup> layer with statistical requirements is limited. Common standards for classifications, concepts and data structures (e.g. via EDI standards) are the prerequisite of its adjustment to statistical needs.

The 5<sup>th</sup> layer should be developed by respective government institutions in co-ordination with CBs. In many countries the CBs are entitled by law to participate in defining information systems and standards for any public information systems relevant for CBs. However, these legal possibilities are used in principle for the 1<sup>st</sup> and 2<sup>nd</sup> layers only. In practice there is a propensity of government institutions and CBs to develop systems functionally specialized and organizationally independent. In the modern IT environment this tendency is not justified. Governments and CBs are able to control the coherence of the 5<sup>th</sup> layer by establishing information standards. International (e.g. BIS, UN/EDIFACT) and supranational (e.g. ECB, Commission of EU) institutions play an important role in stimulating homogenization processes of information systems of governments and CBs.

#### 4. Conclusions

(1) An active role of central banks in developing information infrastructure on national economies may stimulate the integrity of statistics and better use of administrative records for statistical purposes. (2) The *independence* of central banks should not mean *splendid isolation* from other information systems. (3) Modern, particularly virtual, IT environment enables the CBs to create a 5<sup>th</sup> layer information infrastructure providing full accessibility of all data relevant both for CBs and official statistics as well, with full control of confidentiality. (4) The IFC may play an important role encouraging CBs, governmental institutions, NSOs and respective supranational bodies to co-ordinate their efforts in adjusting administrative records (i.a. of the banking and financial sector) for statistics.

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# The Function of the National Bank of Slovakia in the field of statistics

*Gregor Bajtay and Branislav Sodoma – National Bank of Slovakia*

The National Bank of Slovakia (NBS) was established simultaneously with the establishment of the independent Slovak Republic on 1 January 1993. The bank's role was to take up fully the position of successor to the former Czechoslovak State Bank. The NBS was established under a special act as a legal entity seated in Bratislava. Besides meeting the tasks provided by the act for the central bank, it represents an important part of the statistical system of the Slovak Republic.

The NBS has been established as a bank of issue and its priority is to maintain currency stability. As the result of this, the NBS sets primarily the monetary policy, supervises the banks' activities and regulates the healthy functioning and development of the banking sector. The NBS performs these tasks independently of the government. The bank is obliged to report on monetary development to the National Council of the Slovak Republic once every half-year and to publish the monetary development information at least once a quarter. In order to meet this task, the NBS needs statistical information and data on banks, as well as non-banks.

The Banking Act stipulates the obligation of banks and foreign branches to produce and submit to the NBS information, documents and explanations. For this purpose, the NBS publishes a decree providing the list of report forms, their contents, form, structure, deadlines and the manner of submission. The decree's issue is announced in the Collection of Laws of the Slovak Republic, on which announcement the decree becomes the generally binding legal rule. Banks and foreign branches are obliged to observe the NBS decree, and in case of failure to comply with the provisions of the decree, they can be subject to sanction under the Banking Act.

The NBS is provided with the data on non-banks necessary mainly for the preparation of the balance of payments. This is determined by the Act on State Statistics, the Foreign Exchange Act and the Ministry of Finance of the Slovak Republic Decree exerting certain provisions of the Foreign Exchange Act. The State Statistics Act obliges the non-banks to submit to the NBS information as to their foreign assets and liabilities. The form, manner and periodicity in which the information is submitted are published annually in the State Statistical Records Programme announced by the Statistical Office of the Slovak Republic. The Programme is published in the Collection of Laws of the Slovak Republic and is generally binding. The Foreign Exchange Act and decrees of the Ministry of Finance create a legislative back-up for the reporting requirement of the businesses to the NBS. After a partial liberalisation of the foreign exchange regime in Slovakia, the reporting requirement substituted for the NBS permission granting procedure.

The main tasks performed by the Department of Statistics of the NBS are the collection and processing of statistical documentation of the banking sector and selected enterprises; the methodological regulation; ensuring the complexity, quality and exactness of banking and foreign exchange statistics data in the documentation of the banks; and ensuring the complex linkage of the statistical documentation inside the banking sector and its connection with other systems. A new operational system of collection, processing and saving data from commercial banks is being tested in the NBS at present. By introducing this system into everyday operation, the bank will have an on-line connection with the commercial banks which will replace the old system of data collection in the form of diskettes and paper. The new system will enable the saving of data in databases, and better analyses of commercial banks' data for the needs of the individual units of the NBS, while using the up-dated information.

Currently, there are three sections within the Department of Statistics, i.e. the Banking Statistics, Foreign Exchange Statistics and General Statistics Sections.

The Banking Statistics and Foreign Exchange Statistics Sections ensure collection and processing of statistical report forms from banks and branches of foreign banks active in the Slovak Republic. The processed data are used for preparation of different surveys and published materials both for internal use of the NBS and for external users. As regards the NBS, these data serve, above all, for monetary policy management, compiling of the balance of payments, monetary analyses and prognoses and for the execution of banking supervision.

Besides data from the banking sector, the Department of Statistics carries out the collection and processing of data from other statistical systems which are vital for the activity of the NBS. This refers namely to collection and processing of data for report forms regarding foreign assets and lia-

bilities of the business sector report form which contains information on the inflow and outflow of capital to and from the Slovak Republic and the information on foreign direct investments.

With liberalizing of certain foreign exchange operations on current and capital accounts of balance of payments the permission granting procedure of the NBS was in certain instances substituted by a reporting requirement. Mainly this concerns the reporting of collections and payments related to foreign direct investments and financial loans, issue of domestic securities abroad and reporting of payments related to a purchase of employee shares and other financially favoured shares issued by non-residents. Information processed from the reporting requirement serves for prediction of debt service and as a source of additional information for compiling of the balance of payments. General Statistics Section staff also process data which are provided for the NBS by the Statistical Office of the Slovak Republic (SU SR) and Stock Exchange Bratislava.

NBS, being part of the statistical system in the Slovak Republic, has an irreplaceable position in the area of cooperation with both domestic and international statistical institutions. Within the country this is, above all, co-operation with the Statistical Office of the Slovak Republic (SU SR). This co-operation is guaranteed by the agreement on co-operation between NBS and SU SR signed by Governor of the NBS and Chairman of the SU SR. In the agreement, each party has committed itself to free mutual exchange of information.

The NBS provides the SU SR with statistical information from the area of banking and foreign exchange statistics. These are namely data on assets and liabilities for banks and branches of foreign banks in the SR, deposits, credits and interest rates, foreign exchange rates, inflow and outflow of capital, foreign direct investment and aggregated data for The Statistical Yearbook. Next, the NBS provides the SU SR with the detailed balance of payments, all statistical materials published by the NBS and all data vital for compiling national accounts with regard to financial institutions and corporations.

At the international level, the NBS closely co-operates with the IMF, World Bank and Eurostat. Data on interest rates, monetary aggregates, official reserves and exchange rates are sent to Eurostat as questionnaires. Data on the long-term foreign debt of the business sector are compiled for the World Bank. Data on assets and liabilities of the banking sector, of the NBS, data on interest rates, exchange rates and international liquidity are regularly sent to the IMF. Data are sent with the structure and observing the methodology required by the IMF following the IMF Manuals in effect.

The Slovak Republic has adopted the Special Standard for disclosure of information elaborated by the IMF. The Slovak Government adopted a resolution by which the SU SR was assigned a national co-ordinator. The NBS, which is responsible for 7 selected data categories, closely co-operates with a national co-ordinator in filling metapages with required information and the data therein described, which is disclosed on its internet web-site.

### **Résumé en français**

*Dans le premier part de la contribution il s'agit de rôle et de fonction de la Banque Nationale de Slovaquie et de cadre législative pour lui fournir les données des sujets bancaires et non-bancaires. Ensuite il y a une description de l'activité des sections individuelles du Département de la statistique et de la groupe des répondants envoyants des données a la Banque Nationale de Slovaquie. En conclusion on parle de la coopération entre La Banque Nationale de Slovaquie et les sujets intérieurs et étrangers dans le domaine de la statistique.*

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## Fisher's Short Stories on Wealth 13 – 21

On the following pages we continue Irving Fisher's Short Stories on Wealth. After the series in the previous issues, which dealt with capital, income and money, and with the determination of the general price level, the stories in this issue, numbered 13-21, focus on the determination of relative prices.

In Story No. 13 Fisher introduces the concepts of demand and supply and describes the characteristics of *perfect competition*. In Story 14 the schedules of total demand and total supply for a good under perfect competition are presented and in No. 15 the consequences of shifts in these schedules are discussed, especially those caused by changes in the general price level. Turning to the individual demand schedules behind the total demand schedules, Fisher describes in Story 16 the "schedules of wants" – one for the good in question and one for money – which determine how a purchaser balances his want for one more item of that good against his want for the amount of money he has to give up for the additional item. From a didactical point of view, it is interesting that Fisher skips the traditional first step of comparing the marginal utilities of two particular goods – e.g. carrots and cabbages – and starts immediately with comparing the marginal utility of a good (chairs) to that of money. This analysis is extended in No. 17, where differences in the want for money, resulting from differences in income, are introduced as an explanation for differences between individual demand schedules. The reader will note that Fisher wrote these stories without making use of either graphical representations or technical terms like marginal utility or marginal rate of substitution.

In Story No. 18 Fisher shows that individual supply schedules of a good are also based on "schedules of wants", by which the supplier balances his efforts (and outlays) of producing one more item of that good against his want for the amount of money he receives for the extra item.

In No. 19 Fisher describes how prices are determined under conditions of *monopoly*. He emphasises that under monopoly costs are normally much lower than under competition, which means that prices may also be lower than in the case of competition. No. 20 introduces *cut-throat competition*, which arises when suppliers produce under decreasing costs per unit. In Story 21 Fisher shows that cut-throat competition, if left to its own, is a temporary phenomenon: prices are lowered until there is only one producer left. He concludes that industries operating under deas-

### *Fisher's Short Stories on Wealth, 1926-1933*

*Dr. Arthur Vogt has drawn our attention to a series of simple explanations of elementary principles of economics which Fisher wrote in an agreement with the Worker's Education Bureau. Fisher called them "Short Stories of Wealth". The bureau issued them monthly for publication in any union newspaper that desired to print them. They appeared in the "Brotherhood of Locomotive Firemen and Enginemen's Magazine", "Trade Union News", "Labor Herald" etc.*

*The stories had never been reprinted and had not been included in "The Works of Irving Fisher" (General Editor W.J. Bates, Consulting Editor J. Tobin), which was published in 1997. However, the Stories are worth to be read up to the present day. Besides the scientific and historical interest they are of didactical use as they are models of explaining economic phenomena to the public. The IFC Bulletin decided to publish all these "Short Stories of Wealth"*

ing costs need some protection – by allowing trusts and trade agreements or by patents—to make them capable of attracting capital. At the same time, however, they are to be regulated to keep their prices reasonable.

As a prelude to the new stories, Dr. Vogt has put to our disposal a few anecdotes, which are printed below. Furthermore, he has gathered several complementary texts from Fisher's works. These texts, as well as a picture of Fisher's price level mechanism, are shown in boxes among the Short Stories.

## Never mind the silver. Save my books!

The higher the want for something, the higher the price you are ready to pay for it. (At least under “old-fashioned” competition, cf. Story No. 20.) In extreme situations you are ready to pay a very high price. Shakespeare: Richard II: “A horse! a horse! my kingdom for a horse!” – In 1904 Fisher's villa was on fire. A neighbour helped him to save things from the fire. His library was the most important private library in town. He said to the neighbour: “Never mind the silver. Save my books!”

## Why *The Nature of Capital and Income* appeared in 1906

There is a thing more valuable than a printed book: a book in process. – In 1905 when Fisher was making a call from a telephone booth, he put his briefcase down between his legs. While he was talking on the telephone, someone stole the briefcase. It contained the only copy of the full manuscript of *The Nature of Capital and Income*, nearly ready to go to press. It took Fisher nearly a year to rewrite the manuscript...

# Short Stories on Wealth

*Irving Fisher*

## XIII – Supply and Demand<sup>1</sup>

THESE short stories are in three groups. The first group of eight was on “Economic Anatomy.” They merely described the economic machinery. The next group, which has not yet been finished, is “Economic Physiology” explaining how that machinery works. The third, and last group will be on “Economic Remedies.”

In the second, or middle, group we have finished our study of the purchasing power of money. Our next subject will be individual prices. Prices, as we find them in the market, are facts of everyday experience. As students of economics, we are seeking the explanation of these facts. We want to know, for instance, why the price of sugar is six cents a pound at one time and seven or five at another? Now the price of sugar, or any other price is expressed in dollars and cents and so depends on what a dollar or a cent is worth.

Any one who buys sugar balances, in his mind, the importance of the sugar to him against the importance of the money which he has to pay for it. In making this comparison, the money stands in his mind for the other things which it might buy if it were not spent for sugar. If this general purchasing power of money is great, money will seem precious in his mind, and he will be less willing to part with a given amount of it than if its purchasing power is small. Before the purchaser of sugar can decide how much money he is willing to exchange for it, he must have some idea of what else he could buy with his money. This explains why a traveler feels at first so helpless in a foreign country when he is told the prices of goods in terms of unfamiliar units. If the traveler has never heard before of kroner, gulden, rubles, or milreis, a price, say, of a certain fraction of a “gulden” or of a “milreis” for a pound of sugar will mean nothing to him. He can not say how much in gulden, milreis, rubles, or other of these units he is willing to pay for a pound of sugar until he knows how the purchasing power of that ruble or other unit compares with the dollar, or unit to which he is accustomed. There must thus always be in the minds of those who use money some idea of its purchasing power.

### **Price Levels**

As already stated, the greater the power of money to purchase things in general, the less of it will be offered for sugar in particular, and the lower the price of sugar will therefore become. In other words, the lower the general price level, the lower will be the particular price of sugar. In still other words, the price of sugar tends to sympathize with other prices. If they are high, it will tend to be high; if they are low; it will tend to be low. So we see that the purchasing power of money is always, tho unconsciously, assumed in any price.

The words “supply” and “demand,” say, of sugar; thus imply a concealed reference to the purchasing power of money, that is to prices in general, as well as to the price of sugar in particular. As we have, thru several previous stories, already studied the subject of prices in general, or the general purchasing power of a dollar, we shall now assume the general level of prices and the purchasing power of a dollar to be fixed.

A market for sugar, or for any other goods, is any assemblage of its buyers and sellers. The buyers and sellers may be, and usually are, physically near each other, as in a city market or the New York Stock Exchange, or the New York Produce Exchange; or they may be merely connected by telegraph, telephone, or other means of communication, as in the stock market as a whole; for the stock market as a whole includes not only the members of the stock exchange, but also all other buyers and sellers of stock both in and out of New York City. It is in the market that “supply and demand,” which we are about to discuss; work out their effects.

1) *Brotherhood of Locomotive Firemen and Enginemen's Magazine, Vol. 82, No. 2, February 1927, p. 114.*

## Competition and Monopoly

Our study of how any price is explained will fall under two heads, according as there is competition or monopoly.

For the present, we shall assume a condition of perfect competition; that is, we shall assume that there are a number of buyers and sellers in the market, each of whom offers to buy or sell *independently of the others*. Thus, if self-interest leads him to do so; a buyer will bid a higher price than others, irrespective of their wishes in the matter, and likewise a seller will ask a lower price if his independent self-interest so leads him.

When there is perfect competition, there is (in a given market) only one resultant price of a commodity for all buyers and all sellers. This is evident. For, suppose more than one price were asked. One seller asks ten cents a pound for sugar and another eleven cents. Evidently no buyer would buy at eleven cents when he could buy at ten. So the eleven cent price would disappear. Or suppose that more than one price were offered. One seller offers sugar at eight cents and another at nine. Evidently no seller would sell at eight cents when he could sell at nine. So, the watchfulness of one competitor toward the others will eliminate differences in price. Even tho not all buyers and sellers are careful to note slight differences between prices, the more watchful bring about the same result by the operation of what is called "arbitrage." They buy at the lowest prices and sell at the highest. So their buying raises the lowest prices, and their selling lowers the highest until all the prices are leveled out into one – or very nearly so.

It is true that, in practice, there often remain slight differences in price, even in the same, or closely associated markets. This fact merely means that competition is not perfect. I shall not here take account of those cases, but consider only the simple case where competition is supposed to be perfect.

## XIV – Supply and Demand – Continued<sup>2</sup>

THE words "supply" and "demand" are often used carelessly; but in economics they have definite and technical meanings.

In any market there is a different demand for sugar at different prices. We may define the demand at a given price as the amount of sugar which people are willing to buy at that price. In the same way the supply at a given price is the amount which people are willing to sell at that price. If the price of sugar is eight cents a pound, the demand for sugar in a given community at a given time may be, let us say, 900 pounds a week. But if the price falls to seven cents, the demand would increase. It might then be, say, 940 pounds. If, on the other hand, the price falls to six cents, the demand would rise still further. It might become, say, 1000 pounds; and so on.

The supply of sugar, we shall suppose, changes in the opposite way. At eight cents it may be 1100 pounds; at seven cents, 1050 pounds; at six cents, 1000; and so on. The following table shows these figures and others, and constitutes what are called "schedules" of demand and supply in relation to various prices.

### Schedule of Demand

The "schedule of demand" (the second column) shows the largest quantity which will be taken at each price (shown in the first column). For instance, the table shows (in it's first line) that at eight cents a pound the largest amount that sugar buyers are willing to take is 900 pounds:

The supply schedule (third column) tells us the largest quantities which will be supplied at stated prices. For instance (second line) at a price of seven cents a pound the largest amount of sugar offered will be 1050 pounds.

Running the eye down the table, we see that, at eight cents the supply exceeds the demand; and also at seven cents, altho less so; but at six cents, supply and demand are equal. For prices lower than six cents we find the reverse conditions, demand exceeding supply.

2) *Brotherhood of Locomotive Firemen and Enginemen's Magazine*, Vol. 82, No. 3, March 1927, p. 204.

Price	Schedule of Demand	Schedule of supply
.08	900	1100
.07	940	1050
.06	1000	1000
.05	1100	900
.04	1250	750

If the foregoing figures represent the demand and supply schedules showing the amounts that buyers are willing to take and sellers to offer at different prices, it is clear that there is only one price that will make supply and demand equal. That price is six cents, and that is the price that supply and demand will tend finally to fix. The price cannot long be above six cents, for then supply would exceed demand, and the price would tend to fall. Nor can it be long below, for then demand would exceed supply, and the price would tend to rise.

### How Price Fluctuates

For instance if the price were eight cents, the supply (1100 pounds) would exceed the demand (900 pounds) by 200 pounds. Those wishing to sell this extra amount would then be unable to do so except by offering it at a lower price, and their competition would tend to drive the price down. On the other hand, if the price were four cents, the demand (1250 pounds) would exceed the supply (750 pounds) by 500 pounds, and those demanding this extra amount would be unable to get it except by bidding a higher price, and their competition would tend: to drive the price up.

Since then; the price cannot really be either above or below six cents, without being driven back toward six cents, it must always tend finally to be fixed at six cents. A price which thus makes supply and demand equal is said to "clear the market." The only way that any other price than six cents can be reached, and still have supply and demand equal, is thru a change in the demand schedule or a change in the supply schedule, or both. As a matter of fact, of course, these schedules are changing every day. In this way supply and demand operate everyday in every market to "clear the market" and change the prices for sugar, wheat, cloth, lumber, land, houses, rent, interest, stocks, bonds, wages, and every other sort of price.

## XV – Changes in Supply and Demand<sup>3</sup>

WE HAVE seen how supply and demand tend to fix a market price. The process was shown by means of supply and demand "schedules."

If, for any reason, either schedule changes, there is a tendency to change the market price. This is shown by the following schedules where the supply schedule is exactly the same as that shown in the last story, but the demand schedule is changed (the figures of the old schedule are within parentheses, the new figures without).

Price	Demand		Supply
.08	(900)	1000	1100
.07	(940)	1050	1050
.06	(1000)	1100	1000
.05	(1100)	1200	900
.04	(1250)	1300	750

The figures show that the demand for sugar at 8 cents per pound has increased from 900 pounds to 1,000 pounds; the demand at 7 cents, from 940 to 1,060; at 6 cents, from 1,000 to 1,100; and so forth. *At every price* people are willing to take more sugar than before. The effect is to raise the market price at which demand equals supply from 6 cents per pound (which it was in the last story

3) *Brotherhood of Locomotive Firemen and Enginemen's Magazine, Vol. 82, No. 4, April 1927, p. 304.*

and at which both supply and demand were 1,000 pounds) to 7 cents at which both supply and demand are now 1,050 pounds.

### Price Changes

We see that the six cents price will no longer clear the market, because at 6 cents people are willing to take 1,100 pounds, which is more than the 1,000 pounds which suppliers are willing to supply at that price. So the price rises.

The cause of this change in price from 6 cents to 7 cents has been an increase in demand in the sense of an increase of the amount demanded at any particular price – an increase of the whole demand *schedule* all along the line.

There has been no change in the supply schedule. It consists of the same figures, 1,100, 1,050, 1,000, 900, etc., for the same prices, .08, .07, etc. The only sense in which the supply has changed is that, because the market price has risen from 6 cents to 7 cents, the supply has increased from 1,000 to 1,050. But the supply which suppliers will offer at 6 cents is 1,000, the same as before, and the supply at 7 cents is 1,050, the same as before. There has been no shift *of* the supply schedule as a whole, though there has been a shift *in* the supply schedule of the market price.

There can never be a change in the market price which will clear the market unless either the demand *schedule* changes, as here supposed, or the supply *schedule* changes, as the reader can readily illustrate for himself. A shift *of* either schedule causes a shift *in*, but not *of*, the other schedule.

In the last few years an increase *of* the demand schedule for works of art increased prices and so brought about an increase of supply *in* the supply schedules of works of art. On the other hand, during the last twenty years an increase *of* the supply schedule of automobiles decreased their market prices and so brought about an increase of demand *in* the demand schedule for automobiles.

To take another pair of examples, motoring has increased the demand schedule for fur coats, and has, therefore, raised their price; while improved machinery has increased the supply of shoes and has consequently lowered their price.

The causes which shift the schedules are innumerable. Changes in taste or fashion, as in the case of works of art, will affect demand schedules, while changes in methods of production, as in the case of automobiles, will affect the supply schedules.

One cause of shifting demand and supply schedules needs special emphasis. This cause is a change in the purchasing power of the dollar. Suppose the purchasing power of a dollar to be cut in two, or that the level of prices is doubled; then both the demand and supply schedules of sugar will have been affected so as to double every price in them. If previously people were willing to take 1,000 pounds at 8 cents per pound, they are now willing to take 1,000 at 16 cents per pound, because this double price, 16 cents, means, in purchasing power, exactly the same thing as the original price, 8 cents. And so, as to supply, if, before, 1,100 pounds would be supplied at 8 cents, now it will be supplied at 16 cents.

### How Price Levels Fluctuate

When the two schedules are thus changed it is evident that the new price which will clear the market will be 14 cents, or double the 7 cents which cleared it before. Simply the doubling of the general price level carries with it a doubling in the price of sugar.

In actual fact, the supply and demand schedules are constantly being changed – sometimes by changes in the purchasing power of the dollar, which affect both supply and demand schedules alike, and sometimes by other causes, which do not affect them alike.

We can now see more clearly than before the shallowness of the idea that the supply and demand of each individual commodity fix its price independently of other commodities.

The price level is determined by a comparatively simple mechanism, that of the equation of exchange. It is the result of the quantity of money and deposits, the velocities of their circulation, and the volume of trade. The general price level thus fixed helps to fix individual prices, although not interfering with relative variations among them, just as the general level of the ocean helps fix the level of individual waves and troughs without interfering with variations among them.

## XVI – “What’s Back of Demand?”<sup>4</sup>

WE HAVE seen that, when there is perfect competition, prices are fixed, by supply and demand. But what is back of supply and demand? What makes demand increase or decrease, and what makes supply increase or decrease?

In this story we shall study what is back of demand. We shall find:

(1) Back of the demand schedule of, say, coal, are a large number of smaller demand schedules for coal, one for each person, and

(2) Back of each such individual demand schedule for coal, are always two schedules of wants, one for coal and the other for money.

First, then as to (1): the total demand, at any price, is merely the sum of the individual demands *at that price*. For instance, suppose the following table tells us the demand schedules for coal of two individuals, Smith and Jones, at prices of from \$12 to \$2 per ton:

SMITH'S AND JONES' DEMAND SCHEDULES

Price	Smith	Jones	Both Together
12	1	0	1
10	2	0	2
8	3	0	3
6	4	1	5
5	5	2	7
4	6	3	9
3	7	4	11
2	8	6	14

The table tells us that, at a price of \$12 a ton, Smith will take only one ton, and Jones will not take any; that at a price of \$6 a ton Smith will take four tons, and Jones will take one ton; and so on. The last column gives the sum of the demands of both Smith and Jones. If we should extend such a table to include the demands of *all* individuals, we would obtain, in the last column, the total demands at the various prices.

Thus we find, that behind the total demand schedule for coal, are a number of individual demand schedules for coal.

So much for (1). Now as to (2): What influences lie back of the *individual* demand schedules? Taking, for instance, the demand schedule of Smith, we may ask: What makes his demand schedule change? The answer is, the *wants* of Smith.

It is true that a man may want coal very much without having any *demand* for it. But this is simply because he *wants still more* to keep the money he would have to spend to get the coal. He prefers to keep the money so as to spend it for *something else*.

Every purchaser of coal, thus balances *two* wants, the want for the coal and the want for the money it costs to buy that coal. On the relative strength of these two wants depends the schedule of prices he is willing to pay for coal, that is, his demand schedule.

We must then, study these two wants, the one for coal, and the other for money. We shall begin with the want for coal.

### Want and Price

The connection between want and price was, for a long time, overlooked because of the puzzling fact that many of the articles most wanted are the cheapest, and that many of those least wanted are the dearest. Thus water is indispensable; yet there are few things which are cheaper than water. On the other hand, jewelry, which could easily be dispensed with, bears high prices.

But this paradox is easily explained. It is true that water *as a whole* is very desirable, that if we were deprived of it entirely we would thirst to death. Yet the want for any *one particular* quart of water, is very little because this one quart could make little difference to anybody. Were any *one particular quart* of water indispensable; it would certainly bear a high price. On the other hand, all

4) *Brotherhood of Locomotive Firemen and Enginemen's Magazine*, Vol. 82, No. 5, May 1927, pp. 400-401.

## Laspeyres' and Paasche's Indices for particular types of goods

Dr. Vogt observes that Fisher, in his Short Stories, has not taken the opportunity to explicitly discuss the characteristics of so-called competing and complementary goods. On the demand side of the market, competing goods are being used instead of each other, and complementary goods in conjunction with each other for a given purpose. On the supply side, competing goods are characterized by similarity of efforts or cost to those who offer them, as is the case for various kinds of services, whereas complementary goods are being supplied in combination, as products and their by-products (Fisher, 1910).

Goods that are perfectly competitive (on both the demand side and the supply side) tend to have a constant price ratio as well as a constant quantity sum, whereas perfectly complementary goods tend to have a constant quantity ratio together with an inversely moving price ratio. ("If horses are abundant, and therefore cheap, the tendency is to make mules, which are a substitute, cheap also, but to make the complementary carts dear. If the price of beef rises, the amount supplied at the higher price will increase. Hence the supply of hides will be increased at the same time. Consequently, their price will fall.")

Dr. Vogt sees a link with one of the subjects of the batch of Short Stories in the previous Bulletin: price indices. In the case that goods are perfect substitutes, or perfectly complementary, measuring price changes with Laspeyres' Index and with Paasche's Index will give the same outcome (Vogt and Barta 1997:23). In practice, however, goods are seldom perfect substitutes or perfectly complementary. This means that a price change for any group of goods measured with Laspeyres' Index will usually differ from that measured with Paasche's Index. Fisher (1922:

410, 412) describes this phenomenon by presenting two groups of two goods which are subject to changes in conditions on the demand or supply side of the market:

"Whether Laspeyres' formula is greater than Paasche's depends on whether the price relatives are positively or negatively correlated with the quantity relatives. . . . In order to study the consequences of a really wide difference between them we pick out from among our 36 commodities "rubber" and "skins" and calculate the index number for these two only, and then do the same for "lumber" and "wool". The first pair are chosen to make Laspeyres' index most exceed Paasche's, and the second to make Paasche's most exceed Laspeyres'. The reason is that the first pair . . . had their prices most affected by supply so that their quantities and prices tended to move in opposite directions. The quantity of rubber marketed rose and its price fell; the quantity of skins fell and the price rose enormously. Lumber and wool, on the other hand, were affected chiefly by demand. An increase of demand drove up the price of wool much beyond the average rise of prices, while the quantity marketed also increased; contrariwise, a decrease of demand kept the price of lumber far behind the average while the quantity marketed decreased."

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the jewels of the world could be more easily dispensed with than all the water in the world. A lady would much rather give up one quart of water than give up one diamond. Jewels are rare, and so, one jewel more or less may make a great deal of difference.

It is always the *want-for-one-more* unit of water and the *want-for-one-more* unit of jewelry which influences their prices. It is not how much a person wants *all* the water he or she has as contrasted with having none at all, or how much he or she wants all the jewelry he or she has as contrasted with having none at all.

To show how this "one-more" principle works out for any buyer, we may take a look into Smith's mind and see what motives affect him in purchasing coal, or, to change the example, chairs.

As any one purchaser's effect on the price of chairs will be negligible, we may at first overlook that effect; we may assume that Smith is unconscious of any influence on price. He thinks of the price of chairs as fixed by the demand and supply of others; all he individually has to do is to decide how many chairs to buy at that price.

Our first question, then, is how does Smith, or Mrs. Smith, decide how many chairs to buy, when, say, he or she is furnishing a new house?

As Smith does not wish to sit on the floor nor compel his friends to sit on the floor, he could scarcely get along without any chairs at all. At least one chair seems an absolute necessity; that is, it fills a much felt want. But he wants another chair almost as badly, tho not quite.

In the same way, if he had two chairs his want-for-one-more – a third – chair would be slightly less, and so on, indefinitely. If he had ten chairs, his want-for-one-more chair would be comparatively weak. If he had a hundred chairs he probably wouldn't want *any* more but would want to get

rid of some of those he had, even if he had to throw them away. The more chairs he has *the less he wants one more*. The more nearly any want is satisfied, the less it becomes. This is the important principle.

If Smith has to decide how many chairs he will buy at, say \$10 a chair, he will carefully balance in his mind whether, at any point, he wants *one more* chair or would rather keep his \$10 for something else. The number of chairs he finally decides to buy, will be fixed at, say, seven because he wants-one-more chair a little less strongly than he wants to keep the ten dollars that an eighth chair would cost him. That is, he'd a little rather have the money for something else, than buy an eighth chair, and so doesn't buy more than seven. But he bought seven rather than six because he thought he wanted the seventh just a little more than the money it cost.

In every purchase we make we do this weighing or balancing one want against another. We are forever asking ourselves two questions; one is, how much difference will it make to us whether or not to have one more chair, one more room, one more quart of milk a week and so on. The other question is, how much difference will it make to us whether we spend one more dollar. And so we are forever balancing, in our minds, one more chair against the number of more dollars we have to spend to get that chair, or one more quart of milk against the number of cents we have to spend to get that quart, and so on, and we always decide to buy up to the point where we no longer want *one more chair* or *one more quart of milk* more than we want the money.

The fundamental forces behind demand, then, are Smith's, Jones', and everybody's, *want-for-one-more* unit of anything and everything.

## XVII – The Relation of Want and Demand<sup>5</sup>

DICKENS' boy, Oliver Twist, was everlastingly wanting "more." We have seen that demand rests on just this human "want-for-one-more" whether it is one more loaf of bread, one more pound of butter, one more ton of coal, or anything else, always compared with the want-for-one-more dollar.

Consequently, our next problem is to show how this makes a difference in the demand of different people. Why is it that Smith, say, has more demand for coal than Jones? Jones may want coal as much as Smith and yet have less demand for it because Jones' want for a dollar is more than Smith's. Suppose that Smith is richer than Jones so that Smith's want-for-one-more dollar will tend to be less than Jones'. Suppose, for instance, that a dollar "looks twice as big" to "poor" Jones as it does to "rich" Smith. Of course we have no yardstick by which to measure wants exactly; but, to fix our ideas, let us make up a word, "wantab," for such a unit and suppose that Smith's want-for-one-more-dollar is measured as one "wantab" and that Jones' want-for-one-more-dollar is measured as two wantabs.

We can now get Smith's, or Jones', demand schedule for coal from his want schedules for coal and money, as for instance:

TABLE FOR SMITH

For successive tons of coal, namely:	His want-for-one-more-ton is:	His want-for-one-more-dollar is:	The price per ton he is willing to pay is:
1	12 wantabs	1 wantab	\$12
2	10 wantabs	1 wantab	10
3	8 wantabs	1 wantab	8
4	6 wantabs	1 wantab	6
5	5 wantabs	1 wantab	5
6	4 wantabs	1 wantab	4

In this table, each figure in the last column is gotten from the two preceding columns, by dividing the figure for the want-for-one-more-ton by "1," the figure for the want-for-one-more-dollar. For instance, the very last figure "4," in the table tells us that Smith is willing to pay 4 dollars to get 6

5) *Brotherhood of Locomotive Firemen and Enginemen's Magazine*, Vol. 82, No. 6, June 1927, p. 506.

tons of coal because his want for the sixth ton is 4 wantabs and his want for a dollar is 1 wantab; so that his want for that ton is four times his want for the dollar. If, then, the market price is \$4, Smith will buy just 6 tons.

But Jones will not. We are supposing that Jones has exactly the same intensities of want for coal as Smith has, but that, being poorer, he wants a dollar twice as much as Smith does:

TABLE FOR JONES

For successive tons of coal, namely:	His want-for-one-more-ton is:	His want-for-one-more-dollars is:	The price per ton he is willing to pay is:
1	12 wantabs	2 wantabs	\$6
2	10 wantabs	2 wantabs	5
3	8 wantabs	2 wantabs	4
4	6 wantabs	2 wantabs	3
5	5 wantabs	2 wantabs	2.50
6	4 wantabs	2 wantabs	2

In this table for Jones the first two columns are the same as in the table for Smith, but the last two are different. For instance, Jones' want for a sixth ton (last line in the table) is 4 wantabs, just as was Smith's; and Jones' want for the fifth ton (line above last in the table) is 5 wantabs, just as Smith's. But if the price is \$4 Jones "can't afford" \$4 a ton even for five tons. As his want-for-one-more dollar is two wantabs, the price he is willing to pay for the fifth ton is 5 wantabs divided by 2 wantabs, or 2½. That is, \$2.50 is all he can afford to pay for the fifth ton.

### Differing Demands

If, as we are supposing, the market price of coal is actually 4 dollars a ton, Smith will buy 6 tons but Jones will buy only 3 tons. Jones' want for the third ton is eight wantabs so that this third ton is wanted by Jones four times as much as a dollar is wanted by him; just as a sixth ton is wanted by Smith four times as much as a dollar is wanted by him. The poorer a man is the higher is his want-for-one-more dollar. So the lower must be the price which he is willing to give for a given amount, and the less the amount he can afford to buy at a given price.

We see, then, that two individuals, like Smith and Jones, tho they have precisely the same intensities of want for coal, have very different demands for coal simply because the want for a dollar is so different.

From the fact that the richer a man is, the less satisfaction a dollar gives him, it further follows: that the real difference between two fortunes is much less than their difference in money values. A man whose income has increased from \$1,000 to \$10,000 a year, is much better off than when it was \$1,000 a year, but he is not ten times better off; he cannot get ten times as much satisfaction of wants. In fact the extra \$9,000 may not be worth as much to him as the first \$1,000, in which case he does not even get twice as much satisfaction. It is still truer that a man with a fortune of \$500,000,000 gets only slightly more satisfaction out of it than one with only \$1,000,000 gets, not 500 times as much. It follows that, if wealth were more equally divided (without being diminished thereby) it would satisfy more wants.

But in this story we are not studying distribution. We are merely trying to see how demand works.

## XVIII – The Influences Behind Supply<sup>6</sup>

IN the last few stories we found that the demand schedule for any commodity, say coal, is made up of many little demand schedules, one for each individual in the market; and that these demand schedules all depend upon the wants for coal and money.

The same general principles apply to supply. The total supply is merely the sum of individual supplies. And back of each individual supply schedule are two want schedules, one for coal and the other for money. Just as, in demand, the buyer of coal balances in his mind his want to get the coal against his want not to sacrifice his money, so in supply, the seller of coal balances in his mind his want to get the money against his want not to sacrifice his coal.

As a result, the market price, as finally fixed by supply and demand, is not only measured by the want of the buyer to get one more ton but also by the want of the seller not to give it.

Thus, if the price of coal is \$5 a ton, the last ton bought by each buyer is worth about \$5 to him, while the last ton sold by each seller costs him about \$5 worth of expense and trouble.

This balancing of \$5 against a ton of coal goes on in the mind of each separate buyer and of each separate seller and fixes what both the supply and the demand of coal will be, at \$5 a ton. If the \$5 price will not "clear the market," it will change to a higher or lower price which will clear the market.

### Market Prices

There is, of course, a separate market at each stage in the operations by which coal, or any other commodity, passes from producer to consumer. At each stage supply and demand fix a price for the market at that particular stage. The market price at the mine is quite different from the market price later on, in the wholesale market, and the wholesale price in turn is different from the price later on, in the retail market.

But the same general principles apply to all these market prices. The consumer, producer and middleman all balance two things in their minds. At the consumer end of the chain, the user of the coal balances in his mind the money he pays for it against the agreeable satisfaction of his wants, in burning it. At the producer end, the laborer mining the coal balances in his mind the money he gets paid against the disagreeable effort required to dig the coal.

Between these two ends of the chain, the middleman, that is the jobber, wholesaler and retailer, balances the money paid against the money received. But this balancing money against money of the middleman, who merely buys to resell, really depends on the two ends of the chain. The middleman will (other things equal) pay more for the coal he buys if the labor of digging it is more intense; and he will get more for the coal he sells if the consumer's want for it is more intense.

So the prices in the middleman's market really reflect the conditions at the two ends of the chain which joins producer and consumer. The really fundamental causes controlling the prices all along the line are the efforts of the laborers and the satisfaction of the wants of consumers.

Efforts and satisfactions are thus the two great forces behind supply and demand. Behind demand we found satisfactions. Now we find efforts behind supply.

### Money a Symbol

Money is merely a symbol and always represents efforts or satisfactions. In primitive times there were no links separating efforts and satisfactions. We may picture Robinson Crusoe picking berries and eating them, hand to mouth. He then balanced in his mind the effort of picking against the satisfaction of eating. He stopped picking and eating when he reached the point when the last berry picked cost as much effort as it was worth in satisfaction.

But today, in our complicated civilization, the comparison between effort and satisfaction is not so direct. Instead, each effort is balanced against money and each satisfaction is balanced against money. So we get to thinking in terms of money and almost forget to look at the efforts and satisfactions for which the money really stands.

In this story we are especially interested in efforts. At the beginning of the chain linking production to consumption we find effort, and we find effort all along the line. Even the middlemen, who buy coal, have to buy some labor, too, and they have to labor themselves.

6) *Brotherhood of Locomotive Firemen and Enginemen's Magazine*, Vol. 83, No. 1, July 1927, pp. 25-26.

## The Role of Advertising

As Dr. Vogt notes, the subject of the present series of Short Stories may be called individual price theory. He refers to what Fisher said about individual price theory in *My Economic Endeavors*, a typed manuscript Fisher had been correcting by hand until a few days before his death in 1947.<sup>1</sup>

"It is my belief that there is much still to be done on individual price theory. This will utilize but extend the excellent work already done by Carnot, Walras, Marshall, Edgeworth and others on competition, monopoly, duopoly, price policies..., the effect of mass production, and last but not least, the effects of spreading information (and misinformation) especially through advertising and salesmanship.

The last has been especially impressed upon me through my experience in business, both in developing my "Index Visible" and as director of various corporations.

An illustration will serve to show one point I have in mind. A midwestern concern dealing in a machine used in business offices, finding itself "in the red" asked an expert salesman if he would become its sales manager. After studying the situation, he replied "Yes, on one condition – that you double your price." The Company demurred. "That's our very trouble! Our price is already so high, we have too few customers". (This expressed the orthodox doctrine that demand decreases with increased price.)

He replied "Then I must decline. I need that 100% extra margin to pay my selling costs". Finally, being desperate, the Company accepted the expert's terms, with the result that they have become one of the largest and most prosperous concerns in the United States.<sup>2</sup> Moreover, the public benefited. Although the price was

Every laborer balances his efforts against his pay. If wages are low, a rise in wages will at first stimulate him to work longer hours. He earns so much in a few hours that he feels it is no longer necessary to work so hard.

The longer any person works the more intense and disagreeable is the effort it takes to keep on working; while the more money he earns the less intense is his want for one more dollar. He balances the increasing effort against the decreasing want for money and stops, or would like to stop, when they get equal to each other.

## XIX – Monopoly Price<sup>7</sup>

IN the last three stories we have seen how supply and demand work when there is competition.

We now turn our attention to monopoly. Where the sellers have a monopoly, the price charged is not the cost-of-one-more ton, or the cost-of-one-more unit of any kind, but is higher than that cost – altho that cost itself may be lower under monopoly than under competition.

The rule of a monopoly is to charge "what the traffic will bear." That is, a monopoly charges whatever will seem to give the largest profit. But this does not mean, as some people seem to think, that there is no limit to what a monopoly can charge. Total profits are, of course, the difference between the total costs and the total income from sales. If a monopoly raises its price beyond a certain point the demand at such a high price will shrink enough to reduce the total profits. Customers do not usually have to buy. If a meat trust raises the price of meat too high the customers will use less meat and more fish, fowl, eggs, cheese, nuts or other substitutes. So a trust cannot afford to raise prices beyond a certain point – the point which gives the trust the greatest profits. Even if the demand at high prices keeps very strong there is always the fear that these high prices will attract competition. A monopoly always wants to remain a monopoly and not lose the advantage of big profits. For this reason and others, a monopolist seldom dares to raise prices much above what they would be under competition.

### Object of Monopoly

Will a monopoly ever reduce prices below what they would be under competition? That may seem a curious question to many people who have never looked into this subject. They suppose that, of course, prices will always be higher under a monopoly than under competition. It would, at first sight, seem that this must be so if, as I have said, monopoly price is above the "cost-of-one-more." But, as has been said, the cost under monopoly may be much less than the cost under competition.

7) *Brotherhood of Locomotive Firemen and Enginemen's Magazine*, Vol. 83, No. 2, August 1927, p. 104.

doubled, probably a hundred times as many people obtained help from the machine as could have done so without the price rise. Most of these would never have heard of it without the costly advertising and salesmanship. We cannot expect consumers to know the merits of new products without paying the cost of telling them. This is, of course, exactly what is tacitly assumed in most books on economics. This principle is overlooked by those who regard advertising as waste and propose that Government grading should replace private brands. This might hamper progress. It seems to have done so in Russia."

2) It can be assumed that Fisher referred to his own firm producing the visible card-index system, about which Fisher's son wrote: "... the small firm struggled out of the red into the black and merged with its chief rival to form the nucleus of what was known as Remington Rand and has since been enlarged into Sperry Rand." (Fisher, I.N., 1956, *My Father Irving Fisher*. Comet Press, New York, p 161.)

1) Fisher, I., 1947, *My Economic Endeavors*. Manuscript, in the Fisher Papers, Series III, Box 26, Folder 414-417, Yale University Library.

We must not forget that the real object of monopoly is not to increase prices but to increase profits. One way to increase profits is to reduce prices by reducing costs. Reduced costs will often make it profitable to lower prices. Low costs, low prices and small profits per unit usually give the highest total profits per year. For example, the Standard Oil Company doubtless reaped many millions in monopoly profits while at the same time selling kerosene, gasoline and their other products at prices lower than would have been possible under competition.

When competitors form a combination they almost always find the costs can be surprisingly reduced by saving wastes of many kinds, wastes which could not be helped under competitive conditions. They find that one office, or one factory, will serve instead of two or more, and so will one president, one manager, one line of advertising. Materials can be bought in bulk. Above all, the products can be standardized and mass production methods used. Many other economies can be effected, the total of which is generally much larger than expected. The result is that, in many and probably in most cases, monopoly prices are actually lower than competitive prices. They might, of course, be still lower in the interest of the consumer and yet yield a good profit to the producer. But the way to get them lower is not by "trust busting" and forcing competition, but by regulating the monopoly.

In this story, however, we are not trying to solve the trust problem but merely to show how monopoly works. We have found that:

- (1) The price charged by a monopolist is "all the traffic will bear" to give him the greatest profit.
- (2) This price is higher than the "cost-of-one-more" unit to him.
- (3) But this cost is usually much smaller under monopoly than under competition.
- (4) The result usually is that the monopolist's most profitable policy is to reduce prices below what they could be under competition.
- (5) The monopolist could afford to reduce prices still lower and yet make a good profit.
- (6) But if we try to make him reduce prices by compelling competition we are apt to produce the opposite effect and raise prices because under competition costs will go up.

## XX – Cut-Throat Competition<sup>8</sup>

WE have now seen, in a general way, how prices are fixed by supply and demand under competition or under monopoly. We have also seen that the price of a commodity under a monopoly is often lower than it would be under competition.

This is not always true, however. There are two kinds of competition. One is ordinary, or old-fashioned competition and the other we may call "cut-throat" competition. This last is a modern phenomenon, and its nature is not yet understood by many people.

8) *Brotherhood of Locomotive Firemen and Enginemen's Magazine*, Vol. 83, No. 3, September 1927, p. 197.

These two kinds of competition correspond to two kinds of supply schedules. The only kind of supply schedule which has thus far been mentioned in these short stories is an increasing supply schedule, namely a supply schedule such that the more the supply the more the cost per unit and so the higher the price which will be charged. A farmer has such a supply schedule. If a farmer doubles his wheat production from 10 bushels per acre to 20 bushels per acre he will have to use more labor and more fertilizer so that the cost per bushel will be higher. If he should try to double again, so as to raise 40 bushels instead of 20, the cost might be prohibitive. To double again from 40 to 80 would probably be simply impossible.

In other words, the farmer's supply is subject to a law, or condition, of increasing cost. Increasing cost applies, in general, to agricultural products and to mining. But it does not apply so generally to manufacturing or to railroads. Usually in the case of railroads and manufacturing plants the more that is produced the lower will be the cost per unit. This is a condition of decreasing cost. It has not been mentioned before in these short stories, but it is very important in modern industry. If a railroad, for instance, doubles its traffic (assuming it does not have to build new plant or equipment) the cost, for any mile per passenger, or per ton of freight, will decrease.

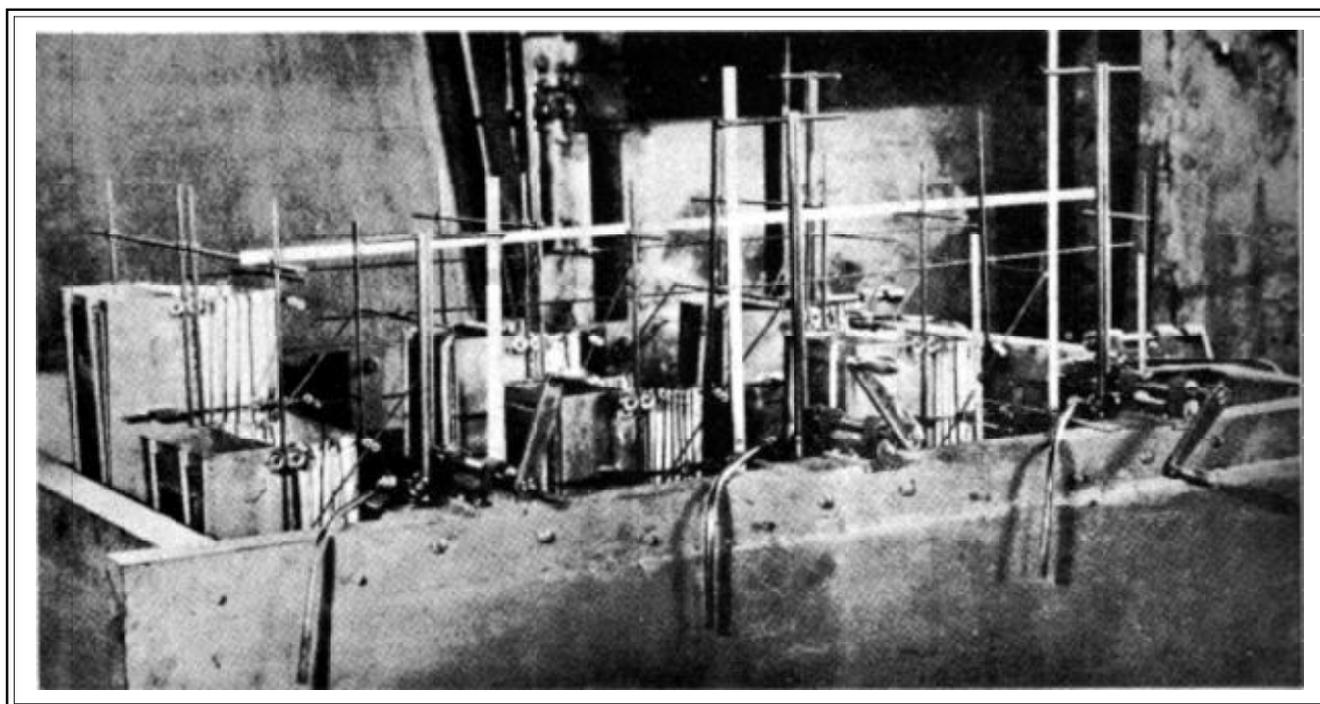
### As Costs Vary

Under increasing cost the larger the sales at a given price the smaller the profit per unit sold; under decreasing cost the larger the sales at a given price the larger the profit per unit sold.

Under increasing cost, producers have very little motive to cut prices in order to get business away from competitors, because they would have little use for more business if they could get it – it might cost more than it was worth; under decreasing costs, the producers have a very strong motive to cut prices in order to get business away from competitors; the more business the better. Such competition, then, is well called “cut-throat” competition.

Under increasing costs (ordinary competition) if the producer finds there is a much increased demand he will raise his price; otherwise he can't afford to supply much more. Under decreasing costs (cut-throat competition) the producer will *lower* his price; otherwise his competitors will do so and get his business.

And so it is that, under cut-throat competition, there tends to be price cutting. The market price



To illustrate his theories, Fisher designed an elaborate hydrostatic mechanism to represent “in terms of mechanical interaction, that beautiful and intricate equilibrium which manifests itself in the exchanges of a great city.” With a series of interconnected cisterns, representing individual consumers and producers, he used the physical law that water seeks its own level to show that “a given amount of commodity to be consumed by a market during a given period will be so distributed among the individuals that the marginal utility measured in money will be equal...” (Fisher 1891:ii,38; 1956:48).

then tends to sink lower and lower as each competitor tries to cut the throats of the rest. Of course most of the competitors will be sorry, in the end, that the price has been cut; and yet, no individual competitor dares to raise his price without securing the agreement of others for fear that he would lose his own customers.

### Importance of First Cost

Closely associated with decreasing cost is the fact that modern industry requires a large outlay to start with but does not need adding to for a long time. Railroad plants are generally not working to capacity. For instance:

Suppose the cost of operating is 1 cent per passenger per mile and the yearly interest payment is \$1,000,000. If there are only 1,000,000 passengers per mile each year the interest amounts to \$1 per passenger. This, added to the 1 cent operating cost, makes the total cost per passenger \$1.01 for each mile. But if there are fifty times as many passengers hauled, the interest chargeable against each passenger is not 1 but only 2 cents. This, added to the 1 cent operating cost makes only 3 cents instead of \$1.01. (In practice the showing would be even more favorable because even the running cost would not stay at 1 cent but would be reduced.)

In modern big business the great cost is the first cost, the cost of construction. This may be paid for by borrowed money and the interest on this becomes a fixed annual charge while the other costs, those for actual operation vary with the amount of business done.

Under decreasing costs, whenever there is cut-throat competition the price sinks down to the bare operating expenses and there is nothing left to pay the interest, so the first cost cannot be recovered. Often railroads continue to compete even after they are bankrupt. As long as they make running expenses and pay a little on account of upkeep and interest on debts, it actually *pays to run at a loss*. For, if the railroads should stop running the loss would be still greater; the interest owed on the debt would not stop. If they default payment the bondholders may foreclose and take possession but the road will not even then stop running. It will merely change hands.

Under increasing costs and old-fashioned competition as soon as losses appear in place of profits the producer has a bankrupt sale and goes out of business. But under decreasing cost a bankrupt concern does not in general go out of business but merely goes into the hands of a receiver.

## XXI – Cut-Throat Competition Leads to Monopoly<sup>9)</sup>

THE most important difference between the two kinds of competition, “cut-throat” and “old fashion,” which have been compared in the last short story, is still to be mentioned. Under old fashion competition there is little temptation to form a monopoly but under cut-throat competition that temptation is often irresistible. That is, old fashioned competition is stable and tends to be perpetual, while cut-throat competition is unstable and disappears altogether by turning into monopoly.

This happens because competitors are cutting each others' throats and losing money, so some competitors sooner or later see that there is no hope to secure the large sales necessary to make their business worth while. They sell out. This reduces the losses for the rest. But even so, the tendency of the price to fall is not hindered. Cut-throat competition tends to lower the price so long as there are any competitors left. When this crowding out of competitors is completed there is only one producer left and he, at that moment, becomes a monopolist. Or else, before this can happen, the other competitors offer to combine and a big corporation or “trust” is formed. In either case competition stops and monopoly takes its place.

It is largely because of decreasing costs, and the cut-throat competition which results from decreasing costs, that there is so much tendency in modern industry to monopoly, mergers, “trusts”, and “big business.”

After the monopoly is established it usually raises the prices which had been reduced under cut-throat competition.

During the time when cut-throat competition lasts, it keeps prices low and the consumer gets the benefit, while the producers are often ruined. But while the consumer temporarily gets such unduly cut prices, in the end he gains nothing by the ruin of producers.

9) *The Lather, Vol. XXVIII, No. 3, November 1927, pp. 8-9.*

In the long run investors will refuse to build railways or start industries where cut-throat competition is likely to follow.

For instance, enforced railway competition has sometimes resulted in checked railway enterprise. Years ago when two or more people believed in competition without any reservations there often sprang up in the same city different competing telephone companies. This proved a nuisance to the public and invariably the companies would consolidate after a time. Nowadays few people want unrestricted competition. Telephone, water, gas, electric light and power companies and railways are now allowed to be monopolies, but are regulated.

Monopoly is thus often a good thing rather than a bad thing, because it keeps costs from being duplicated. Even in industry in general the consumer is finding big business better for him than little business. Ford and the Radio Corporation of America get rich, but they do so by lower prices than could be got by small competing concerns.

It is largely in recognition of such facts as these, and in order to encourage investment, that patents and copyrights are given. These are monopolies expressly fostered by the government.

Trusts, pools, and rate agreements due to the necessity of protection from cut-throat competition, are like the protection given by patents and copyrights. It promotes new enterprises. The anti-trust measures, in so far as they aim to compel competition, do not take these facts into account.

A great number of enterprises today require large capital investments and operate under conditions of decreasing costs. Unless trade agreements are permitted under proper regulations, such kinds of large scale business are hindered or made impossible. Capital will not be sunk in what may have to run at a loss under cut-throat competition. Restrictive measures should evidently be directed toward the control of monopolies and combinations, not to the restoration of cut-throat competition.

There is still an immense field in which the older-form of competition holds away that is, in which cost increases with increased production. In such cases competition is still the "life of trade" and affords a safeguard for the consumer against exorbitant prices. Such competition needs no regulation to prevent "unfair," cut-throat practices. The only important kind of regulation needed for such temperately competitive business, is inspection to insure the proper quality of the products offered to the public. But cut-throat competition is the "death of trade" and needs a different kind of regulation. Industries subject to cut-throat competition need to be enough protected to attract capital and enough regulated to keep prices reasonable.