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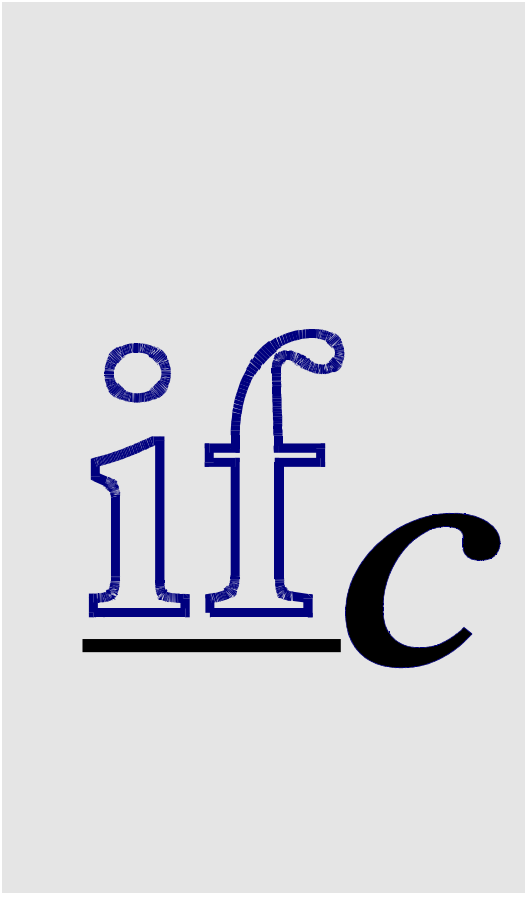

The Irving Fisher Committee is part of the International Statistical Institute

Contents

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EDITORIAL

In this third issue of the IFC Bulletin, we continue the publication of abstracts of papers that members of the Irving Fisher Committee will submit to the 52nd Session of the International Statistical Institute, to be held from 10 to 18 August 1999 in Helsinki. This time, all abstracts relate to papers on "The central banks' function in the field of statistics". These papers will be presented in the Contributed Papers Session Nr. 42.

More information on the Helsinki Meeting is to be found on page 10.

This issue contains two articles on index numbers, one on distributed lags and one on the use of indices in Belgian trade statistics.

A second batch of Irving Fisher's "Short Stories on Wealth" comprises numbers 8-12. This batch is introduced by Dr. Arthur Vogt, who discovered these articles, which had been written in the 1920s and early 1930s for trade union members.

In recent months the number of members of the Irving Fisher Committee has greatly increased. A list is presented on page 11. The IFC Executive Body invites all institutions and individuals active in the field of central bank statistics to join the Committee. Membership includes a free subscription to the IFC Bulletin. Applications can be sent to the Office of the IFC, the address of which is indicated on the opposite page.

Irving Fisher: Pioneer on Distributed Lags

Jörgen Wit

1 Introduction

Imagine that today the oil price will increase with 50%, and accordingly, petrol companies will immediately increase their gasoline rates with a similar percentage. Common sense suggests that the demand for gasoline will drop as an effect of this price change. With respect to the timing of this drop in demand, it seems not very likely that the effect is completely realized tomorrow. Most consumers are not able to adapt their behaviour immediately. The ability to react is limited by factors as the geographical distribution of residences and workplaces, the existing stock of vehicles and the existing supply of alternative transport systems. For example, a car commuter may find it hard to change his mode of transportation. First he needs to look for new modes of transportation, and when he reaches the conclusion that public transport will be a better option, he might wait until his car needs to be replaced. Moreover, some people are able to react faster than others are. For example, some people might immediately decide to use their bicycles for shopping purposes. In general, the effect of a price change will have a delayed effect on the demand for the good. The total effect of the price change is not felt at one particular point in time, but will be distributed over time. We, i.e. economists and econometricians, say that the effect is modelled as a distribution of lags, or more popularly, the effect has a distributed lag.

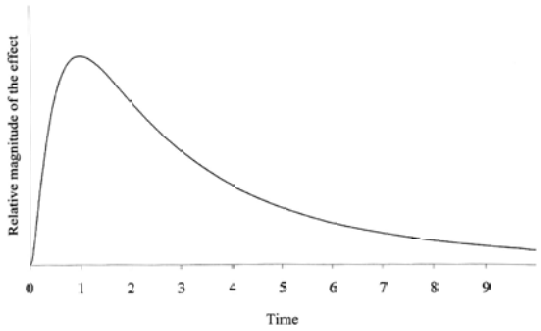
In his 'Theory of Interest' (1930), Irving Fisher was already aware of the fact that certain effects will be delayed over time. He initiated the theory of distributed lags incidentally in the course of his studies of price-trade relations in the 1920s. In a short note, published in the Bulletin de l'Institut International de Statistique in 1937, Fisher elaborated on this theory in a rather elegant way. In this article, we would like to focus our attention on this note.

Section 2 describes Fisher's model for the distribution of lags. In section 3 his approach is fit in the econometric theory of distributed lags. In section 4 his estimation procedure is compared with the current approach to estimate unknown parameters. Section 5 concludes.

2 Distributed lags

Fisher's theory was that any cause produces a supposed effect only after some lag in time, and that this effect is not felt all at once, but is distributed over a number of points in time. He hypothesized that the best general form for the lag distribution is presumably the lognormal distribution. In essence, this distribution satisfies his idea that the effect will quickly reach its peak after a very short period, and then slowly taper off. Figure 1 clarifies this idea.

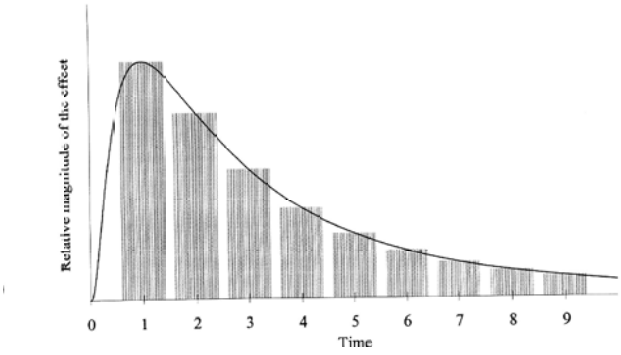
Figure 1: Lognormal lag distribution.



Suppose that at time 0, there is any cause, e.g. a 50% increase in the oil price. Then, Figure 1 shows the relative magnitude of the total effect at any time t>0. The total effect of this price change is represented by the total surface below the figure. The distribution is described by two parameters. The first parameter is the length of time from the cause to the mode of the distribution. The second parameter represents the dispersion of the distribution. One can construct statistics that summarize the information in this lag distribution. For example, the *median lag* is the time t* such that 50% of the total effect is realized. These statistics provide the researcher insight in the timing of the transmission process from cause to effect.

Contrary to other economists from his generation, Fisher had a sincere interest in the possibilities to establish an empirical basis for his theory. There are two problems that need to be solved before doing such an analysis. First, real world data are not available on a continuous basis, but are published at discrete intervals. This aspect requires a discrete approximation of the hypothesized lag distribution. A possible approximation is shown in Figure 2.

Figure 2: Lognormal lag distribution, including discrete approximation.



The second problem was more difficult to overcome in those days. Fisher must have realized that it would be difficult to perform an empirical validation for his conjecture, because he had no computational assistance at his disposal that would have allowed him today to estimate any complex non-linear relationship. Nevertheless, the paper shows Fisher's practical approach for solving problems. He notes that there is an intermediate method that 'saves some nine-tenths of the labour required by the logarithmically normal distribution and yields just as high correlations'. This short-cut method postulates that the effect will be the greatest at the next time period, and then taper off by equal decrements for each successive time unit. The only parameter in this model is the length of time that the cause will have effect. It may not come to a surprise that Fisher proposed this lag distribution. The discrete approximation of the lognormal lag distribution, as shown in Figure 2, resembles his short-cut method.

A formal approach can illustrate his short-cut method. Let us denote the length of time that the cause will have any effect by n*. Then the cause x_t in period t will have effects in the periods t+1, t+2, … , t+n*. The size of the effect will decrease in equal from decrements, from n* in period t+1 to 1 in period t+n*. In other words, the computed effect y_t* in period t is caused by x_{t-1}, x_{t-2}, …, x_{t-n^*} according to the following relationship:

$$y_t^* = \sum_{j=1}^{n^*} (n^* + 1 - j) x_{t-j} .$$

In the appendix to this article it is shown how Fisher rewrote this relationship to a more compact expression. The relationship depends on the parameter n*. The big question, however, is what is the 'right' choice of n*? Fisher argues that it is the one that makes the computed series y_t* as 'close' to the actual series y_t. Before turning to his concept of closeness, let's first take a look at the current state-of-the-art econometrics on distributed lags.

3 Econometric theory

How does Fisher's paper fit into today's theory of econometrics? The theory of distributed lags is an important branch within econometrics (see e.g. Dhrymes, 1971; Johnston, 1984; Judge, *et al.*, 1985; Greene, 1993). In general, the underlying data generating process is formalized by

$$y_t = \sum_{j=0}^{\infty} \beta_j x_{t-j} + \varepsilon_t ,$$

where the independent variable x_{t-j} represents the cause in period t-j, β_j is the weight that is associated with this cause, ε_t is an independent white noise error term in period t, and y_t is the realized effect in period t. Within this class of models, one can distinguish *finite distributed lags* ($\exists n^*$ such that $\beta_j=0$ for all $j>n^*$) and *infinite distributed lags* ($\beta_j>0$ for all $j>0$).

Fisher's general approach fits into the theory of infinite distributed lags, but his short-cut method falls within the theory of finite distributed lags. His short-cut method is formally called the *arithmetic distributed lag* distribution, and can be described by

$$\beta_j = \begin{cases} (n^*+1-j)\alpha & j=1,2,\ldots,n^*, \\ 0 & \textit{otherwise} \end{cases}$$

Essentially, Fisher's short-cut method requires one parameter to specify the lag distribution, namely the parameter n^* that specifies the number of lags included. In a regression context, there will also be a second parameter α that relates to the size of the effect.

4 Estimation

The statistical underpinning of his work was rather ad-hoc. Fisher writes that the 'best' distribution of lags is the one that maximizes the correlation between the actual and the computed series, i.e.

$$n^* = \arg\max\{n^* | corr(y, y^*)\}$$

To find this estimate, Fisher provided a heuristic approach in case one already knows the lag length that makes the correlation between the lagged x_t and y_t at its maximum. A good guess for the value of n^* would be three to four times the numerical value of the aforementioned lag length.

According to Fisher, the absolute value of the correlation coefficient between the actual and the computed series also indicates the model's performance. In one of his first applications of the distributed lag method, his support for the supposition that price changes have a distributed effect on interest rates, relies on the absolute value of this correlation coefficient. In 'The Theory of Interest' (1930), he claims that the high correlation coefficient between the actual and computed series shows that '…the theory .. conforms closely to reality..' (p. 425).

The statistical analysis dates from an age where the econometric school was in its infancy. Today's approach for estimating the parameters of the distributed lag distribution is the least squares technique. Under relatively weak conditions, it can be shown that the least squares estimator is a consistent estimator for the unknown β_j's. There is however a statistical problem when using a general approach to include a large number of lags of the independent variable. When the independent variable is relatively stable and moving around its mean, the series of lags may be nearly linearly dependent. This so-called multicollinearity problem leads to very imprecise estimators for the true parameters.

A solution to the multicollinearity problem might be to use the arithmetic distributed lag approach as proposed by Fisher. Fisher's specification has the advantage of being parsimonious. Nevertheless, Fisher's lag scheme is generally regarded as unduly restrictive (Dhrymes, 1971). More general lag schemes have been proposed in the empirical literature, e.g. the Almon distributed lag. Moreover, Koyck (1954) argues that there exists a comparable assumption regarding the lag structure, that 'saves about another 50 or 60% compared with Fisher's short-cut method'. Koyck's as-

sumption of proportionately decreasing effects allows for an estimation procedure that requires only one calculation.

5 Conclusion

In modern econometric textbooks the idea that any cause will have a delayed distributed effect, is well-established. Multicollinearity is a serious problem when one performs unrestricted estimation of the parameters of the lag distribution. This motivates the search for simplifying lag schemes. Textbooks still refer to Fisher's 'Note on a Short-Cut Method for Calculating Distributed Lags' in the Bulletin de l'Institut International de Statistique. Fisher's contribution unintentionally provided the first parsimonious device that is able to solve the multicollinearity problem.

One might criticize Fisher's paper for its statistical underpinnings. Indeed, the econometrics used in this paper is a dated practice. Nevertheless, as one of the founders of the Econometric Society, Fisher should be credited for his attempt to provide an empirical validation for his theoretical models.

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Appendix

Fisher showed that the computed series $\{y_t^*\}$ satisfy the following relationship:

$$y^* = (n^*+1)S_{t-1}^{(0)} - S_{t-1}^{(1)} + S_{t-n^*-2}^{(1)},$$

where

$$S_t^{(0)} = \sum_{j=1}^{t} x_j,$$

and

$$S_t^{(1)} = \sum_{j=1}^{t} S_j^{(0)}, t = 1,2,\ldots$$

This can easily be proved:

$$y_t^* = \sum_{j=1}^{n^*} (n^*+1-j)x_{t-j} = (n^*+1)S_{t-1}^{(0)} - (n^*+1)S_{t-n^*-1}^{(0)} - \sum_{j=1}^{n^*}\sum_{i=1}^{j} x_{t-j} =$$

$$(n^*+1)S_{t-1}^{(0)} - (n^*+1)S_{t-n^*-1}^{(0)} - \sum_{i=1}^{n^*}\sum_{j=i}^{n^*} x_{t-j} = (n^*+1)S_{t-1}^{(0)} - (n^*+1)S_{t-n^*-1}^{(0)} - \sum_{i=1}^{n^*}(S_{t-i}^{(0)} - S_{t-n^*-1}^{(0)}) =$$

$$(n^*+1)S_{t-1}^{(0)} - (n^*+1)S_{t-n^*-1}^{(0)} - (S_{t-1}^{(1)} - S_{t-n^*-1}^{(1)} - n^* S_{t-n^*-1}^{(0)}) = (n^*+1)S_{t-1}^{(0)} - S_{t-1}^{(1)} - S_{t-n^*-2}^{(0)}.$$

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The calculation of Unit Value Indices by applying the Fisher Formula

Bart Meganck and Ghislain Poullet

1 Introduction

Foreign trade statistics are important macroeconomic indicators for economic policy. Directly they give an idea of a country's competitive position, for example ; indirectly they are an important input for the national accounts.

Foreign trade statistics are, however, expressed at current prices, with the result that their movement may be strongly influenced by, among other things, exchange rate fluctuations and external shocks, so that their economic significance may be partly distorted. It is therefore also useful and necessary to express these statistics at constant prices. For this, however, it is necessary to have price indices, which can be obtained in two ways : first, directly, by direct observation of the prices of imported and exported goods, and second, indirectly, by making use of certain additional information (concerning quantity, such as kilos, litres, m^3, etc.) recorded in the course of collection of the foreign trade statistics.

This latter alternative makes it possible to calculate unit values for imports and exports and thus also to follow the course of the terms of trade. Given its intrinsic properties, the Fisher index is used for calculating these index numbers. This article gives a detailed description of the procedure adopted.

2 Calculation of the Unit Value Indices

The calculation of the unit value indices concerns only the registered data, for which the detailed information is available. This calculation, made monthly, consists first of all of calculating elementary price indices, making a selection from them, and then aggregating the selected indices to produce a general index by means of Fisher's formula.

The elementary price indices are calculated at the most detailed level of the Combined Nomenclature CN8 (over 8,000 elementary products) on the basis of the recorded declarations. By product, the only data in the return are the value and the quantity; the price is derived from these.

Let V_{in} be the recorded value of the exports (or imports) of i by Belgium according to the Community definition during month n and let Q_{in} be the corresponding recorded quantity. The corresponding elementary price P_{in} is obtained as the quotient[1]

$$P_{in} = \frac{V_{in}}{Q_{in}} \qquad [1]$$

Provided that the product is homogeneous and that the quantity is properly defined, the quotient of the value by the quantity is in fact a price. Working at the most detailed level of the nomenclature is the best way of achieving the greatest homogeneity. However, there are at this level numerous items called "other" or "miscellaneous" which are a combination of disparate products and for

1) *Conventional signs: V for value, Q for quantity, P for price, CP for the elementary price index (coefficient of P), CQ for the elementary index of quantity (coefficient of Q), IUV for index of unit value, IV for index of value, IQ for index of quantity, i for the products, n for the month observed, o for the reference period.*

which this quotient is not really a price but rather an average unit value, with the approximations which this entails.
The quantity to be considered is also important for the price calculation. According to the regulations and nomenclature in force, the quantity declared for most products is the net mass (weight). For a not inconsiderable number of products, the quantity declared is the mass accompanied by the number of specific supplementary units (square metres, litres, number of pairs etc.). Lastly, for a few special products, the quantity is declared only by this number of specific units without any mention of the mass (for instance, the quantity of electricity is expressed only in kWh).
For those products which have to be declared with two types of quantities it is therefore necessary to choose between the weight or the specific unit in order to calculate the price. After a survey among enterprises and a comparison of the movements of prices expressed in the two possible units, a list of products whose price is expressed per specific unit has been compiled. This list already existed in the earlier method, but was considerably shorter.
For non-industrial diamonds, which account for a substantial proportion of Belgium's trade, the price is connected with the quality and size of the precious stones; it is therefore not appropriate to take the average price per carat as the basis for estimating the accurate movement of prices. The price used is that laid down by the High Diamond Council in Antwerp, which is best able to understand the movement of prices in this particular sector.

The elementary price index CP_i is obtained by relating the price of product i in month n, P_{in}, to the average price of this same product observed during the preceding year, i.e. P_{io}. Thus:

$$CP_i = \frac{P_{in}}{P_{io}} \qquad [2]$$

and on the basis of formula [1]:

$$P_{io} = \frac{V_{io}}{Q_{io}} \qquad [3]$$

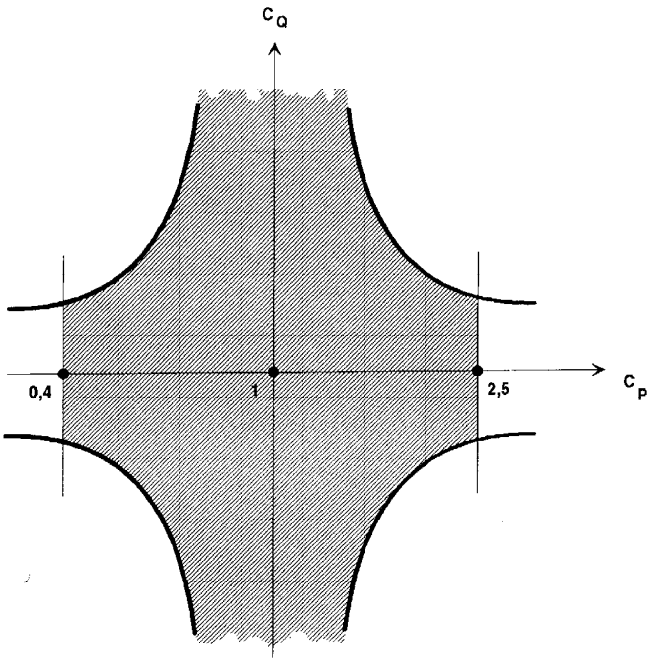
in which V_{io} is equal to the recorded value of Belgian exports (or imports) of product i according to the Community definition during the previous year and Q_{io} is equal to the corresponding recorded quantity expressed in the same unit as Q_{in}.

The elementary quantity index CQ_i is defined by analogy:

$$CQ_i = \frac{Q_{in}}{Q_{io}} \qquad [4]$$

Every year there are changes in the nomenclature (regrouping of existing products, splitting of an existing product heading into several new products, appearance of new products, disappearance of obsolete products) and in the units to be declared (abolition of the supplementary units or the mass, changes in supplementary units). The elementary indices take account of these changes by combining the appropriate groups of products in order to ensure coherence from one year to the next. The list of products for which the supplementary unit is used is also updated annually.

The products are then selected by a 4-level filter:
- Certain products are automatically omitted. These are special goods for which the concept of "price" is difficult to define (for instance, works of art, antiques, coins and securities, weapons and military equipment).
- Products for which it is not possible to calculate an elementary index are rejected. This is the case when the values and quantities observed during the previous year are zero (for instance, when a new product appears).
- Products whose values or quantities processed during the month observed are below a threshold amount are rejected. When the values or quantities recorded are small, transactions in these products, although real, are liable to be isolated or are special orders generating prices which can no longer be regarded as representing market prices. The thresholds applied are at present BEF 25,000 in value and 500 kg or 25 specific units in quantity. In the previous method the value threshold was BEF 1,000.
- Products which show excessively large price changes (either upwards or downwards) are rejected. Acting on the principle that, for a product, a price change is all the more suspect if it is accompanied by a large change in the quantities traded, an acceptance zone has been marked out for the pair of elementary indices (CP, CQ). This is the cross-hatched part in the chart.



This symmetrical chart, with logarithmic coordinates, represents the following dual constraint:

$$F(CP, CQ) < 0 \qquad [5a]$$

and

$$0.4 < CP < 2.5 \qquad [5b]$$

The first relation defines a double hyperbola which illustrates the principle expressed above, and the second indicates the absolute limits within which a change in the price is accepted, namely a multiplication or division of the previous year's price by a factor of 2.5.
Products which have passed through the four stages of the filter are selected. It should be mentioned that diamonds are not subjected to the filtering. This filtering is more selective than the previous one, causing the representativeness of the products selected to fall from 97 p.c. to about 94 p.c.
This selection process is applied every month. The elementary price indices are aggregated to produce a general index of unit values for month n (IUV_n), by Fisher's formula.

$$IUV_n = 100 \sqrt{\frac{\sum V_{in}}{\sum V_{io}} * \frac{\sum V_{io} CP_i}{\sum \frac{V_{in}}{CP_i}}} \qquad [6]$$

$\sum$ being the summation symbol for the selected products i for month n.[2]

This index expressed on the basis of the previous year is incorporated in a chain calculation by multiplying it by the annual index for the reference period. The chain begins in 1993 with an annual index number of 100. The changeover from one base year to the next due to the chain calculation, together with the annual changes in the nomenclatures, inevitably gives rise to certain discontinuities between the figures for January and those for December of the previous year.

The cumulative monthly index gives the evolution observed from the beginning of the calendar year until the last available month. Cumulative monthly indices are calculated without any further selection by applying the above formula to all the selected products each month without any aggre-

2) *Another way of writing formula [6] is:*

$$IUV_n = 100 \sqrt{\frac{\sum P_{in} Q_{in}}{\sum P_{io} Q_{io}} * \frac{\sum P_{in} Q_{io}}{\sum P_{io} Q_{in}}} \qquad [6b]^2$$

gations of values and quantities by product. Unlike in the previous method, the cumulative indices are calculated taking the previous year's average as the basis. The annual index coincides with the cumulative 12-month index and is coherent with the monthly indices, which was not the case previously.

3 Calculation of the Value Indices

The registered data are adjusted to include the estimations of the non-responses. The value indices are calculated from the adjusted data.

The general index for month n, IV_n is the quotient of the adjusted values for the month in question, V_n, by the monthly average of the previous year's adjusted values, V_o, multiplied by 100.

$$IV_n = 100\frac{V_n}{V_o} \qquad [7]$$

This index is also chained so that the base year 1993 is equal to 100.

4 Calculation of the Quantity Indices

The general quantity index for month n, IQ_n, is the quotient of the value index, IV_n, by the unit value index for the month in question, IUV_n, multiplied by 100.

$$IQ_n = 100\frac{IV_n}{IUV_n} \qquad [8]$$

As the unit value index is calculated on the basis of the recorded values and the value index is calculated on the basis of the adjusted values, the quantity index is of a hybrid nature. If the acceptable assumption is made that the index of unit values of the adjusted data is identical to that of the recorded data, this hybrid aspect disappears.

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HELSINKI MEETING 1999

IFC Sessions

As has been announced by the Organizing Committee of the 52nd ISI Session, there will be three sessions for papers from IFC members: one for Invited Papers and two for Contributed Papers. At present, the following details can be given:

Invited Papers Session No. 73,
"Globalisation of Markets and Cross-Border Holdings of Financial Assets".

Papers:
Hamilton, R., Bank of England
Sanchez, A. and Jurrado, M.P., Banco de España
Satoru Hagino, Bank of Japan
Bové, J., International Monetary Fund
Organizer: Zautzik, E., Banca d'Italia

Contributed Papers Session No. 43,
"Globalisation of Markets and Cross-Border Holdings of Financial Assets".

Papers:
Chaudron, R.F.D.D., De Nederlandsche Bank
Obaseki, P.I. and Okafor, C.M., Central Bank of Nigeria
Melis, G., National Bank of Belgium
Gentilini, A. and Pellegrini, V., Ufficio Italiano dei Cambi
Hella, H. and Hilpinen, J., Bank of Finland
Organizer: Van Wijk, H.H.

Contributed Papers Session, No. 42,
"The central bank's function in the field of statistics".

Papers:
Nesvadba, E.M. and Schubert, A., Oesterreichische Nationalbank
Boamah, D.O., Central Bank of Barbados
Meganck, B., National Bank of Belgium
Cowan, D., Bank of Botswana
Pospišil, J., Czech National Bank
Pécha, J. and Isnard, R., Banque de France
Monajemi, A., Bank Markazi Iran
Kropi•ne, R., Bank of Lithuania
Bissessur, J., Bank of Mauritius
Doguwa, S.I., Central Bank of Nigeria
Olensk, J., National Bank of Poland
Munyandamutsa, A., Banque Nationale du Rwanda
Bajtay, G., National Bank of Slovakia
Álvarez, R., Banco de España
Organizer: Pécha, J., Banque de France

In the June issue of the IFC Bulletin we published abstracts of papers on the subject "Globalisation of Markets and Cross-Border Holdings of Financial Assets". On the subject "The central bank's function in the field of statistics" we have received abstracts from the following central banks (in alphabetical order of English country names): Austria, Barbados, Belgium, Botswana, Czech Republic, France, Iran, Mauritius, Nigeria, Poland, Rwanda, Slovakia and Spain. These abstracts are being published in this issue of the Bulletin (pages 12-22).

Central Banks

Banque Centrale des Etats de l'Afrique de l'Ouest
Oesterreichische Nationalbank

Central Bank of Barbados
National Bank of Belgium
Banco Central de Bolivia
Bank of Botswana
Bulgarian National Bank

Eastern Caribbean Central Bank
The Central Bank of China
Central Bank of Colombia
Central Bank of Cyprus
Czech National Bank

Deutsche Bundesbank

Bank of England
National Bank of Ethiopia
European Central Bank

Banque de France
Bank of Finland

Banco de Guatemala
Banque Centrale de la République de Guinée

Bank Indonesia
Bank Markazi Iran
Banca d'Italia

Bank of Jamaica
Bank of Japan
Central Bank of Jordan

National Bank of the Kyrgyz Republic

Latvijas Banka
Bank of Lithuania

National Bank of the Republic of Macedonia
Banque Centrale de Madagascar

Reserve Bank of Malawi
Central Bank of Malta
Bank of Mauritius
Central Bank of Mongolia

De Nederlandsche Bank
Central Bank of Nigeria

Central Bank of Oman

Banco Central de Reserva del Peru
Central Bank of the Philippines
National Bank of Poland
Banco de Portugal
Banque Nationale du Rwanda

Saudi Arabian Monetary Agency
National Bank of Slovakia
South African Reserve Bank
Banco de España
Bank of Sudan
Banque Nationale Suisse

Central Bank of the Republic of Turkey

Central Bank of Uruguay

Bank of Zambia
Reserve Bank of Zimbabwe

Other institutions

BIS
Eurostat
IMF
OECD
Office for National Statistics (UK)
Ufficio Italiano dei Cambi

Individuals

A. Vogt (Switzerland)

The Central Banks' Function in the Field of Statistics

Austria

Eva-Maria Nesvadba and Aurel Schubert—
Oesterreichische Nationalbank

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The division of labor in the field of statistics in Austria
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- Austrian Institute for Economic Research
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Estimating the Stock of Fixed Capital in Developing Countries: the Case of Barbados

Daniel O. Boamah—Central Bank of Barbados

The Central Bank of Barbados collects a wide variety of statistics on various facets of the Barbados economy. Some of these are collected from the general public through periodically administered surveys. Others are collected from various sectors of the economy such as commercial banks and government departments, while a great deal of information also reaches the Bank from the Statistical Services Department, a government agency with the legal authority for collecting national statistics. Still, a number of key indicators that are essential for monitoring the performance of the economy have to be estimated by the Central Bank because of their unavailability.

For instance, reasonably consistent statistics on fixed capital formation, at various levels of disaggregation, are available in Barbados. Yet little is known about the stock of capital actually in existence and how it is deployed. The availability of this type of information is useful in estimating future capital requirements as well as providing an important input into any assessment of the efficiency with which physical capital is utilized.

This paper has two main parts. The first part gives a summary profile of the Central Bank function in the systematic collection, compilation and publication of statistics on the Barbados economy. It includes an account of the range of statistics produced, the types of publications and the difficulties the Bank faces in designing appropriate indicators for national accounts estimates. The second part gives an account of the process involved in estimating the stock of physical capital in Barbados.

Domestic fixed capital investment is classified into fixed investment on (a) machinery, transport and equipment and (b) construction and building materials. From the available information on the expected life as well as the expected distribution of depreciation of each class of capital asset, net stock series have been calculated from 1958 to 1996, using the perpetual inventory method.

The paper discusses the methodological process underlying the estimates, the problems involved in arriving at the benchmark stock of capital and in the choice of depreciation patterns, and finally the type of sensitivity analysis that has guided the choice of the preferred capital stock series.

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Belgium

The Role of the National Bank of Belgium in the Belgian Statistical System—an Exceptional Case

B. Meganck—National Bank of Belgium

1 The National Bank of Belgium occupies a prominent and central role in the process of producing macroeconomic statistics, which contrasts with that of the typical central bank in the industrialized world. The National Bank of Belgium is responsible not only for banking, monetary, financial and balance of payments statistics, but also for the production of balance sheet data of private companies, business surveys, foreign trade statistics and national and annual and quarterly accounts. These last two activities were taken over in 1995 from the National Statistical Institute by the Bank because of their hitherto unsatisfactory quality and exceptionally late publication.

From this it can be seen that the National Bank has a central role to play in providing information for the government and other policy-makers. To what extent can this have an effect on the independence of a central bank? How have the government and central bank in Belgium tackled this problem? This paper will attempt to offer an answer to these questions.

2 The central bank is not only a major producer of statistics, but also an important user of them itself. In this second section this will be discussed in greater detail, and the relationship between analyst and producer will also be examined.

3 In view of the central nature of the role which the Bank plays in the production and communication processes, the final section will pay particular attention to the aspect of "Quality in statistics".

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Botswana

David Cowan—Bank of Botswana

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

This section will provide a summary of the type of statistics produced by the Bank of Botswana and the current range of publications through which it disseminates statistics.

2 General Economic Data versus Specific Financial Data

If a researcher casually glances 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 for most developed countries, the statistics published by central banks in developing countries cover a much wider range of data. Moreover, the analysis of the data in these reports predominantly concerns itself with trends in the wider economy. In contrast, the reports produced by central banks in developed countries concentrate predominantly on developments in the financial and foreign exchange markets. This section will examine the reasons why central banks in developing countries, such as the Bank of Botswana, have adopted this more general statistical function.

3 Other roles currently carried out by Central Banks in the Field of Statistics

This section will look at the additional roles carried out by central banks in developing countries in relation to statistics. In particular, because central banks are *analytical/critical* users of statistics, many central banks in developing countries are able to provide input into the type of statistics that they would like produced, and in helping control the quality of the statistics. Over the last few years, the Bank of Botswana has, for example, had an important role in helping the Central Statistical Office improve the quality of its statistics.

4 Further Directions: What function should a Central Bank provide in the Field of Statistics?

This section will argue that central banks should be compiling statistics in areas where they have a specialist knowledge and the necessary input data. In particular, they should try to withdraw from the production of balance of payments statistics. Moreover, in addition to the normal areas such as monetary and financial market statistics, the Bank of Botswana may wish to look at producing additional statistics in the following areas: (1) An index of forward economic indicators; (2) Private sector debt monitoring.

5 Conclusion

Central banks in developing countries tend to have a much wider role relating to statistics than in developed countries. While most produce monetary, financial and balance of payments statistics in line with the majority of central banks, they tend to have a much wider role in the dissemination

of statistics from a variety of sources and in the production and quality control of a whole range of statistics. While many of these central banks would probably like to shed some of this function, in most developing countries this is unlikely to occur in the foreseeable future. However, they should strive to do so, and concentrate their resources on producing statistics in which they have specialist knowledge and important input data.

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Czech Republic

CNB Statistical Activities and Building of Databases for Analytical Purposes

Jiří Pospíšil—Czech National Bank

The proposed paper shall consist of three parts.

The first part of the paper should explain the legal powers of the Czech National Bank (CNB) in the area of statistics. The second part should focus on experience with the application of information technology in collecting data from the banking sector and non-bank institutions. The third part should explain the organization of data storage in the CNB and the building of databases for analytical purposes from both its own and external sources. All part should deal with the contact areas of co-operation between the CSO (Czech Statistical Office) and the CNB (the Central Bank).

The basic themes for the individual parts are as follows:

1 By law, the statistical activities in the Czech Republic are conducted by the CSO and the CNB. The CNB is responsible mainly for banking statistics and balance of payments statistics. This legal power includes the collection, control and storage of primary data from the banking sector in particular. The first task was to set up a legal framework for the reporting system, on the basis of which a reporting obligation was established. Later on, the form, extent and dates for the provision of data by banks were defined, as were the instruments and methods of transferring the data from the banks to the CNB.

2 The system of data collection and processing in the CNB has been heavily influenced by the development of information technology. The collection of reports in paper form has gradually but quickly been replaced by more progressive methods. At present, commercial banks report to the CNB solely by means of information technology. The whole system consists of four subsystems : the "Metainformation System" (MtS), the "Electronic Data Interchange" (EDI), the "Information Service" (ISL) and the statistics-accounting database (SUD).

The Metainformation System defines the data and their interrelationships, as well as fundamental data on reporting entities, subject, dates, periodicity and method of reporting. It provides basic information on what data are available and when, where and in what structures they are stored, as well as on their current pre-processing status. This system also manages and implements the preparation process for individual reporting methodologies, generates these methodologies for reporting entities, prepares transport structures for the reports, and in future will create basis output structures from the database.

The electronic interchange of data is effected in the structures of the UN/EDIFACT standard. This means of communication makes it easier for reporting banks to create applications. The reports are secured by encryption against misuse, and confirmed by digital signature for sender identification and prevention of modification of the report during transmission; last but not least they are secured by an AUTACK report, which averts the possibility of acceptance of the report being denied.

The Information Service in the Czech National Bank controls the automated acceptance of reports, the procedure for their processing and the checking of banks' fulfilment of their reporting obligation. Within these field of activity, it also effects, among other things, the formal and logical check-

ing of reported data and the checking of appropriate storage of these data in the database, and is responsible for dispatching obligatory reports and reminders to reporting entities. In the opposite direction, i.e. towards the CNB, this service provides information about the processing status of data received and the status of reporting obligation fulfilment.

3 The tasks of the CNB statistics department also include the collection of fundamental economic and statistical data from other domestic authorities (the CSO in particular), selected data from the business sector used for compiling the balance of payments, trend surveys etc. The statistical data are then formed into databases. These databases are the foundation for analytical activities in the CNB and are used by individual specialized departments (the monetary and banking supervision departments in particular) to create data structures and selective and analytical instruments according to their requirements.

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France

Jacques Pécha and René Isnard—Banque de France

1 The reasons for the role of central banks in the field of statistics

1.1 Easier access to information than statistical institutes

Intervention in foreign exchange markets, expertise on commercial banks' transactions and on capital markets, regulatory role and lender-of-last-resort function are at the root of most statistics: monetary statistics (monetary aggregates) banking statistics, national financial accounts, databases on companies' balance sheets and, except in Anglo-Saxon countries, balance of payments and international investment position statistics.

In the real sphere, central banks' statistical role has remained more limited, although some have designed enquiries to companies so as to better assess the economic situation and its short-term development or have even taken over from national statistical institutes.

1.2 Enhancement of central banks' independence from the government

1.3 Inadequate resources allocated by government to the statistical institute to meet the needs of users, and especially the central banks

2 Limits to central banks' statistical role

2.1 Potential ethical problems (collection of figures may influence monetary concept and the conduct of monetary policy).

2.2 International methodological frameworks are set by IMF, the UNO

2.3 Only the data necessary to their tasks are collected by central banks, although, sometimes they collect data on behalf on statistical institutes (financial services)

3 The importance and place of the statistical function in central banks

3.1 Importance is high in the European Central Bank and the European System of Central Banks, but lower in Anglo-Saxon countries

3.2 The place of statistics in Central Banks' organisation charts is not yet harmonised. There are:
- the system of DE, NL, SE, DK, BE, FI, AT, PT and the ECB (one department in charge of statistics but not of studies),
- the system of ES and GR (split between the domestic and international aspect of statistics) and

- the French system, in which the statistical function is split but maintains a close link between statistics and studies.

3.3 At the European Central Bank, statistics are separated from the economic and monetary function, up to the level of the Executive Board

4 Relations between statistics departments in central banks and Statistical Institutes

Two statistical systems exist at European level: Eurostat (+ Statistical Institutes), and the European System of Central Banks (ECB + NCBs).

The Committee on Monetary, Financial and Balance of Payments Statistics (CMFB) gathers all statistical institutes and central banks' statistics departments in the European Union and the European Economic Area, and is extending to Pre-access countries. New relations should develop with the creation of the Euro-11 Council.

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Iran

Assad Monajemi—Bank Markazi Iran

The general directorate of economic statistics of the Central Bank consists of two departments, namely: the Research and Surveys Department and the Economic Statistics Department. The main duties of the former consists of updating frames, evaluation of different projects, and design of questionnaires and new surveys. Whereas the latter is mostly in charge of data compilation and preparation of reports concerning 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.

In addition, the National Accounts Department, under the auspices of the general directorate of economics is in charge of compiling and analysing the national accounts statistics.

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Mauritius

J. Bissessur—Bank of Mauritius

The production of statistics in any economy is a vital exercise and any environment that is devoid of data renders the monitoring of developments and policies elusive. Timely, accurate and reliable statistics is an indispensable ingredient for policy formulation and monitoring of progress such that the collection of statistics has become unavoidable in the contemporary economies. The Bank of Mauritius, as the apex of the financial system in Mauritius, is one of the major producers of statistics in the country. The Bank of Mauritius produces financial statistics through the processing of the assets and liabilities of domestic banks, and the production of Balance of Payments statistics. Dissemination of financial statistics with the minimal lag is important to lend transparency to the central bank's operations and to influence expectations of economic participants. Users in the market want data that signal future trends and performance and help them to cope with rapid and unexpected change. The Bank of Mauritius uses its publications and its web-site to provide information to the market. The Bank's monthly bulletin plugs the information gap and aims to promote more informed decisions by efficient players in the financial sector. This paper examines the process of data collection, organization, presentation, analysis and dissemination by the Bank of Mauritius.

Nigeria

An Overview of Nigeria's Central Banking Statistics within the National Statistical Information System

S.I. Doguwa—Central Bank of Nigeria

In Nigeria, efforts have been put in place to ensure quality in the Nigerian statistical information through the establishment of the National Statistical Information System (NSIS). The NSIS sole objective is to co-ordinate national statistical production, and comprises the agencies with legal backing for the collection and processing of official statistics. These agencies include the Federal Office of Statistics, the Central Bank of Nigeria and the National Population Commission, while the National Data Bank stores and disseminates data to users.

The Central Bank of Nigeria occupies a unique position in the NSIS by functioning simultaneously as a producer and user of socio-economic and financial statistics. The Central Bank enabling laws empower the Bank not only to request for information on matters affecting the Nigerian economy, but also to process and disseminate the processed information to the public. The laws further stipulate that proper books of accounts, with respect to all transactions, shall be kept by all deposit money banks and other financial institutions, which are required to render their returns to the Bank in the forms prescribed by the Bank. Within the context of the laws, therefore, the statistical functions of the Bank, among other things, are quite enormous.

For purposes of monitoring and evaluation of monetary, credit and foreign exchange policies, the Bank needs financial statistics, which it generates as well as other socio-economic data that are outside its purview. The International Financial Statistics framework is used by the Bank to recast the financial data available from national sources into a form that permits analysis and international comparison. However, resulting from the existing data gaps in Nigeria's socio-economic data over the years, the Bank has been collaborating with other government agencies to improve the data quality. The Bank's effort to improve the timeliness of data processing and dissemination led to the computerization of its operational and research activities, and the provision of a different dissemination medium through its widely circulated and referred publications.

The objective of this paper is to discuss the statistical function of the Central Bank of Nigeria within the context of the National Statistical Information System. For ease of exposition therefore, the paper is structured into seven sections. Section one contains the introduction. Section two examines the survey activities of the Bank in its effort to bridge the data gaps existing in the four macroeconomic accounts. The traditional data processing role of the Bank in money and banking statistics is discussed in section three. Section four highlights the collaborative efforts of the Bank with other agencies, with the view to improving data quality and frequency. The computerization of the Bank's operations and its data processing activities and analysis are discussed in section five. The dissemination of the data by the Bank is discussed in section six, while section seven summarizes and concludes the paper.

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Poland

Information Infrastructure of National Central Bank and its Role in Official Statistics

Józef Olensk—National Bank of Poland

A model of the information infrastructure of the National Central Bank and a specification of its segments is presented. Following, the function of information infrastructure of national central banks in official statistics is discussed:

- central banks as the source of administrative records for statistical use;
- official statistics conducted by central banks;
- central banks as institutional user of official statistics.

Legal and organizational prerequisites of an active role of central banks in official statistical systems are discussed on the basis of the Polish experience. Specific problems of transition countries accessing EU are mentioned.

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Rwanda

Anastase Munyandamutsa—Banque Nationale du Rwanda

1 Introduction: Considérations Générales

1 Evolution du statut, de l'organigramme de la BNR et de ses attributions en matière statistique
2 Evolution de la structure des unités administratives chargées des statistiques à la BNR
3 Brève description de l'appareil statistique du Rwanda (en dehors de la BNR) depuis 1961 à ce jour.

2 Contribution passée et actuelle de la BNR à l'amélioration de l'information économique et financière du pays

1 Dans le domaine des statistiques du secteur réel de l'économie
2 Dans le domaine des statistiques du secteur des finances publiques
3 Dans le domaine des statistiques du secteur extérieur de l'économie
4 Dans le domaine des statistiques du secteur monétaire et financier
5 Dans la recherche de la cohérence et des interrelations entre les statistiques de ces 4 secteurs fonctionnels de l'économie
6 Dans les publications régulières au grand public
7 Dans les communications régulières au FMI

3 Perspectives d'avenir

1 Analyse critique de l'existant: forces et faiblesses de l'apparail statistique national
2 Nécessité de la création d'un office (institut) autonome de statistique au Rwanda
3 Nécessité de la restructuration à moyen terme de l'appareil statistique de la BNR
4 Place de la BNR dans la participation du Rwanda à la norme spéciale de diffusion des données (NSDD) et au système général de diffusion de données (SGDD) du FMI.

4 Conclusion et recommandations

5 Annexe statistique

6 Notes bibliographiques

Slovakia

Gregor Bajtay, Branislav Sodoma—National Bank of Slovakia

Following the division of former Czechoslovakia, the National Bank of Slovakia came into existence along with an independent Slovak Republic on January 1, 1993. Its assignment was to take over as a successor to the Czechoslovak State Bank and ensure unbroken performance of its functions. A special law constituted the bank as a legal person with registered office in Bratislava. In performing its duties of a central bank as defined in the law, the bank is independent of the government. In addition to its law-given assignments, the central bank is also part of Slovakia's national statistical system. Despite its relatively short time in operation, the bank already managed to establish standard-quality statistical reporting in particular in the banking sector, both for individual entities of the banking sector in the Slovak Republic and for international financial institutions.

The paper will come divided into three parts with the following content:

1 Position of the National Bank of Slovakia in the Slovak Republic

This part will define the legal position of the National Bank of Slovakia, its main tasks, as well as the legislation on data reporting applied to banks and non-banks under the Banking Act and the Act on State Statistics.

2 Tasks of the statistical section at the National Bank of Slovakia

This part will describe the activities and assignments carried out by individual departments of the NBS statistical section, the respondents reporting statistical data to the NBS, the products of data processing and how they are used. There will also be a word about new tasks facing the NBS statistical section in the wake of further relaxation of foreign exchange control.

3 Co-operation between the National Bank of Slovakia and national and international institutions in the area of statistics and participation in the SDDS project

There will be a more detailed description of co-operation with the Statistical office of the Slovak Republic, the International Monetary Fund, the World Bank, Eurostat, as well as of the fulfilment of SDDS criteria in data categories supervised by the NBS.

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Spain

The Experience of the Banco de España

R. Álvarez—Banco de España

1 Introduction

The organization and operation of the statistics function in the Banco de España have been shaped by historical developments and reasons. The set of units responsible for statistics have been developed solely to attend as practically as possible to the new requirements which have necessitated continuous adaptations in the last fifteen years. The function is predominantly carried out by two departments (or "Oficinas", to use the Banco de España's old-fashioned Spanish expression), namely the Statistics and Central Balance Sheet Department and the Balance of Payments (BoP) Department, but has clear implications for many others.

2 Statistical production

In the seventies, the Banco de España was not aware of the need for a specific statistical function involving anything other than compiling information relating to supervision and other functions of the Bank, mostly for internal purposes. The development of statistics as an independent function is linked to the conduct of monetary policy, which started in proper in 1973. Broadly speaking, the bases or principles that have defined or inspired the current statistical production since the beginning of the eighties, when the Monetary Statistics and Central Balance Sheet units merged to form the *Statistics and Central Balance Sheet Department* (under the Directorate General for Research), can be summarised as follows.

- Priority is given to storing daily all the information produced in the other units of the Banco de España (supervision, financial institutions, operations, public debt book-entry system, international, payments system, audit, central credit register system and others) in a FAME database, under the control of the Statistics Department. Resources have been assigned to developing IT applications for transferring the data produced by these units to the aforementioned database for use for statistical purposes. There is no legal constraint on using aggregate supervision information for statistical purposes. The information requested of reporting institutions, which is highly detailed, also involves statisticians in its design (delimitation of institutional units and transactions, valuation, etc.). Apart from financial institutions under the Banco de España's supervision, the information mentioned in this indent refers to the production of monetary and credit aggregates, general government debt and trading in the interbank and public debt markets.
- The same attention is given to all the statistical production outside the Banco de España, national data (mainly from the National Statistical Office and the National Securities Market Commission (NSMC), but also from ministries and other agencies) or international data of national interest, which are also stored in the database. Concerning national statistics, the aim is to compile everything immediately after its dissemination. Priority is given to national accounts, general government accounts, price statistics, securities market statistics, financial institutions under the NSMC's supervision and other general economic statistics.
- The databank has, as of the beginning of October 1998, more than 350,000 series (daily, monthly, quarterly and yearly) and the information it stores is the basis for the various statistical publications of the Banco de España (Monthly Statistical Bulletin, Economic Indicators etc.). The quarterly national account is the "ideal" system behind overall statistical production, whatever the periodicity. That means that this system is the reference for detecting shortcomings and information gaps in the available sources. The concern of the Banco de España is with an overall view of the system: the accounts of institutional sectors and sub-sectors (financial and non-financial), balance sheet accounts, reconciliation accounts and the broad aggregates of supply and demand. The Banco de España is officially responsible for the elaboration of the Financial Accounts.
- As a matter of general policy, the Statistics Department is respectful of the national distribution of responsibilities in the field of statistics (as is the case in most EU countries) not only because of legal constraints but also out of conviction. That means, in practice, using the latest figures available from the source officially responsible for them. Additionally, where possible, the Banco de España estimates the information relating to the most recent period when it is not available from the official source, these estimations later being replaced by the official figure when it is finally available.

3 Organization

The Statistics and Central Balance Sheet Department, as it is organized, attempts to serve the aforementioned purposes. It is divided into five blocks of units. The first of these is responsible for the institutional focus; the second for securities markets; a third covers non-financial enterprises (the Central Balance Sheet unit), undertaking quarterly and annual surveys which are conceived as a statistical tool to produce information for economic analysis, but by no means as a management guide for enterprises; a fourth unit acts as the "monitor" of the non-financial statistics produced outside the Banco de España, mainly for meeting the purposes described in the second indent of point 2; and, finally, the fifth unit is responsible for the technical arrangements and practical management of the aforementioned FAME databank and for technical assistance to users of the computer network of the Statistics Department and of the whole of the Directorate-General for Research. It is worth mentioning that the fifth unit is also the link between the Statistics Department and the Data Processing and Organization Department.

Balance of Payments Department. The statistics function of the Banco de España is also discharged by the Balance of Payments Department, which is part of the Directorate General for the International Division. The Banco de España started compiling the Balance of Payments in 1992, under a formal delegation of the National Statistical Office within the framework of the Law on public-sector statistics. Until 1992 there had been a rigid system of foreign exchange controls in Spain managed by the Division of the Banco de España now in charge of the Balance of Payments. As far as possible, the rich statistical base of the former system has been maintained since the abolition of the controls. As regards the activity of the BoP Department and its working relations with the Statistics and Central Balance Sheet Department, the following may be mentioned. It produces a monthly (key items), quarterly and yearly Balance of Payments and quarterly International Investment Position. Before publication, the Balance of Payments and International Investment Position statistics are reconciled with the rest-of-the-world accounts of the Financial Account and vice versa.

In practice, the two Departments responsible for the statistics functions maintain exclusive responsibility in their respective fields of competence and full co-ordination in matters of shared responsibility.

4 Conclusion

The paper of which this note is a summary will attempt to explain in greater detail the points put forward here. It will also describe the advantages and possible shortcomings of the Banco de España's experience in the field of statistics. Other aspects will be addressed, such as references to how current organization and procedures have responded to the challenge of statistics for Monetary Union; specifically, meeting the ECB's statistics requirements for EMU and those linked to the Excessive Deficit Procedure, among others. Some reference will also be made to relations with International Organizations concerning statistics.

Fisher's Short Stories on Wealth 8–12

Arthur Vogt

> *In all mathematical sciences the first essential is a unit for measurement. The lack of such a unit for measuring the value of money in the sense of its purchasing power...*
> *Fisher (1946)*

> *We now have a gold dollar of constant weight and varying purchasing power; we need a dollar of constant purchasing power and, therefore, of varying weight.*
> *Fisher (1920, xxvii)*

In IFC Bulletin Nr. 2, a general introduction to all the Stories 1 to 86, was given. A list of all these Stories which might be called economic columns, was also included. It should be added that they are scattered and difficult to gather together. That is why the IFC Bulletin decided to reprint them all. As a prelude to Stories 8 to 12 we reproduce below an illustration which he published 61 days before his death.

Fisher comments it as follows:

> In Civil War time, that is when I was born, 1867, the dollar was worth a little bit more than now. It was worth one basket, the same market basket of representative goods, plus one-quarter of another basket. In 1864 it was worth about what it is now, a trifle less. So, roughly, the dollar is now worth what it was worth when I was born, and I am eighty years old today. In 1897 ... the dollar was worth three times as much, three market baskets. In 1920, a dollar's worth was one market basket, the same as today. In 1929, the dollar's worth was one-and-a-half market baskets. In 1933, the dollar's worth was three market baskets. In 1947, the dollar is, by definition, worth one market basket.

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". In IFC Bulletin 2 we published the numbers 1 to 7. In this issue we continue with the numbers 8 to 12.

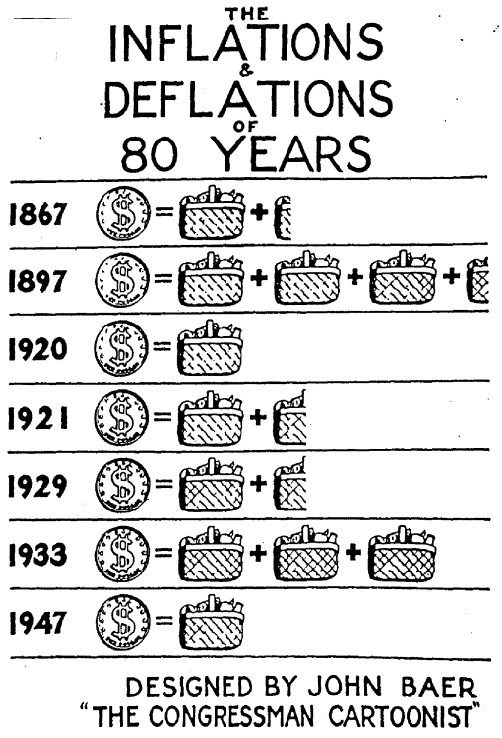

Fig. 1 (Fisher 1947:4)

It is noteworthy that throughout Fisher's life the purchasing power of the US dollar as shown in this illustration was never lower than at its end.

In his Stories (1926) Fisher did not use the term "money illusion". Two years later he published an entire book with this title (Fisher 1928). Section 11 of Fisher (1920) has this title already. In a speech (which can be listened to from a tape in Yale University Library) Fisher (1941) says:

> ... People complain about the high cost of living. They don't understand really what is behind it. I found in Germany when I visited it in 1922 that 19 people out of twenty had no notion that anything had happened to the mark. They realized that the cost of living was high that prices were high... I visited Germany expressly in 1922 to find out if these people had the illusion that a mark was still a mark. I call it the money illusion. I wrote a book with that title. They did, 19 out of 20 thought that the mark by which they measured business was just the same as it was before... These women had no notion that the mark had fallen. They knew prices had risen, but they didn't identify the two things. And I said, "why are prices so high" and she said "I don't know, I suppose the blockade of the Allies has made goods scarce in Germany". Well, there was a grain of truth in that. That might have explained a ten or 20% rise in prices, but it wouldn't explain a fifty-fold rise in prices.

Five years later Fisher (1946) concludes:

> But a year later, when the mark had fallen so terribly that a trillion marks of 1923 were only worth one mark of 1914, many Germans did finally wake up enough to start measuring some German values in terms of dollars or Swiss francs. Today, after the second world war, in the inflations of Hungary and China, history is repeating itself.

The example of Hungary mentioned by Fisher is the highest inflation ever recorded. The price index grew from 1 in mid-1945 to

> 3,806,000,000,000,000,000,000,000,000 (3806 quadrillions)

in mid-1946. The repeating of history has continued up to now (Serbia, Russia).

I read drafts of the Stories in manuscripts and archives in Yale University Library. They show that Fisher did a lot of work on the drafts. On 17 September 1928 he wrote the following in such a draft. As it is not included in the printed version it is given here:

> The general level of prices might better be called the scale of prices. Just as we may magnify or shrink the scale of a map or a picture without changing its individual outlines, so we may inflate or deflate the scale of prices without disturbing individual price relations....

The map metaphor may be illustrated by the example of a Swiss tourist travelling in England. The map printed in Switzerland does not indicate whether the distances are given in miles or in kilometres. Driving through the country it had to be decided which unit was used.—Fisher continues in the draft:

> .... This distinction between the two concepts "individual prices" and "scale of prices", was drawn clearly in Germany during the period of her money inflation by the service of a "multiplicator". By this a hotel guest translated the printed prices on his bill of fare. He found the price of a dinner listed as, say, "6 marks", and the price of his room as "9 marks"; but, before he paid the bill, these figures had to be multiplied by the "multiplicator". This was a factor, or index, representing the price level, or scale of prices, and varied from day to day, going up as the market went down. It had nothing to do with the real price of the dinner, either in terms of labour or relatively to the price of the room. Whether the multiplicator was 100,000 or 1,000,000 made no difference to these relations, but only changed the dinner and room from 600,000 and 900,000 to 6,000,000 and 9,000,000. The multiplicator, or index, saved the trouble of too frequently reprinting the price list. The real price paid was the product of the list price by the multiplicator.
>
> This principle applies universally, in America as well as in Germany. Every price paid is the product of an ideal price multiplied by an index; that is, it is partly a matter of supply and demand affecting the individual price, and partly a matter of relative inflation or deflation affecting the price level.

When I was in England in 1980 and looked at the meter in a taxi, I was surprised how cheap the fare was. When I looked around in the cab, I saw the notice "fares of 1977 (?) are increased by 50% (?) by by-law of 1979 (?)"—Still cheap.—I looked around further, I saw the notice "fares of 1979 are increased by 40% (?) by by-law of 1980". —No longer cheap, but still cheaper than in Switzerland!—In the first Story Fisher discussed different kinds of measures. The kilometre and the mile are stable, the dollar and the pound less so. The taxi fare in 1998 is the same in dollars per km as in pounds per mile.—Another example from the high inflation in Romania in 1997 might be mentioned. It is more flexible. It not only contains a "price scale", but all "individual prices" can be changed independently. When I looked at a restaurant's handsome menu, I did not find any prices. The waiter told me that the prices are given on a separate cheap sheet. This sheet is often replaced, whereas the menu card lasts longer.—At Pickering and Chatto (sellers of antique books on economics) I bought Fisher (1926a) and Fisher (1926b), both published in the same year as these Stories—the second actually the same month. The price of the first was exactly three times that of the second. But how much of my purchasing power (in Swiss Francs) did they absorb ? I discovered this when I received the statement of my credit card account and realized how much the Swiss Franc had fallen.

8 The purchasing power of money

At the beginning of the "Index Number" section Fisher gives a special example of the proportionality test. In Fisher (1922:420), he writes generally "An index number of prices should agree with the price relatives if those agree with each other." This is a very clever expression of proportionality. However, Fisher (1911:400) wrote:

> A formula for the price index should be such that the price index will agree with all individual price ratios when these all agree with each other. *Thus, if in 1910 the price of everything is 10% higher than in 1909, the index number should register 10% higher.*

The first sentence corresponds to the definition Fisher has given above. The second sentence, the implication in italics, is not correct: The Divisia index on the straight line (formula (3.9) in Barta (1997)) does fulfil the first proportionality but not the second one which is called linear homogeneity by Eichhorn (1978). Later authors have expressed proportionality by "the value of the index changes by the factor I if all prices of the observed situation change I-fold"—probably misled by the wrong implication by Fisher.

Today it is common to speak of "commodity basket" in the context of price indices. To express the idea that not all commodities of an economy can be accommodated in a basket, Fisher uses the more poetic expression "ark".

Fisher mentions his own weekly index number. In 1923 he established his Index Number Institute, a business for preparing and selling index numbers and other economic data for publication. The Index Number Institute became the first organization to provide systematic economic data in index number form to the public, long before governments even began to think about it. By 1929 Fisher's wholesale price index reached 5 million newspaper readers.

Beside the price index Fisher also published its reciprocal—the purchasing power of the monetary unit. Fig. 1 of the present introduction, turned by 90degrees, constitutes its graphical illustration. Waser, a pastor who was decapitated in Zurich because of suspected high treason in 1780, calculated this reciprocal (the standard of coinage, i.e. a reciprocal price index for precious metals, cf. Vogt and Barta (1997:2) from the year 485 after the foundation of Rome until his time for various countries.

9 What fixes the purchasing power of the dollar?

This Story mainly deals with the *arithmetical* illustration of the equation of exchange. A "mechanical" illustration and the algebraic statement of this equation was dealt with in Fisher (1911), too. Here we reproduce the mechanical illustration. The equation reads

quantity of money x its velocity = quantity of (annual) trade x average price.

Fisher (1911) uses the example of bread, coal and cloth representing all goods of the economy. He starts with the following "tabular standard":

Good	Price	Quantity	"Value" = Price x Quantity
Bread	$ 1/10 per loaf	200 million loaves	$ 20 million
Coal	$ 5 per ton	10 million tons	$ 50 million
Cloth	$ 1 per yard	30 million yards	$ 30 million

The right side of the equation, i.e. the sum of the "values", works out at $ 100 million. It is equal to the left side of the equation, namely the quantity of money $ 5 million times its velocity 20 (times per year). The arm, or distance of each from the fulcrum in Fig. 2, represents the price. To prevent the lever arms on the right from being inordinately long, the unit of measure for coal was reduced from tons to hundredweights, and that for cloth from yards to feet, and consequently the numbers of units were increased.

Good	Price	Quantity	"Value" = Price x Quantity
Bread	$ 1/10 per loaf	200 million loaves	$ 20 million
Coal	$ 1/4 per hundredweight	200 million hundredweights	$ 50 million
Cloth	$ 1/3 per foot	90 million feet	$ 30 million
Average, sums	$ 0.204 per "Fisher-unit"	490 million "Fisher-units"	$ 100 million

The first three lines of the above table are embodied in Fig. 2.

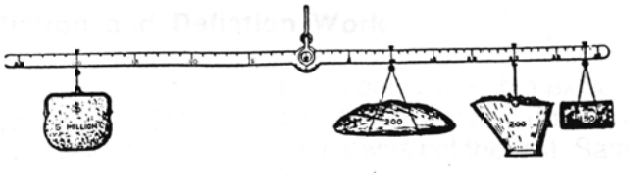

Fig. 2

It represents the equilibrium state of a balance, the two sides of which symbolize the money side and the goods side of the equation of exchange. The weight on the left, symbolized by a purse, represents the money in circulation; the "arm" or distance from the fulcrum at which the purse is hung represents the efficiency of this money, or its velocity of circulation. On the right side are three weights,—bread, coal and cloth, symbolized respectively by a loaf, a coal scuttle and a roll of cloth.

If one is interested in the average change in prices rather than in the prices individually, one can simplify the mechanical representation in Fig. 2 by hanging all the right-hand weights at one average point, so that the arm represents the average price. This arm is a "weighted average" of the three original arms, the weights being, literally, the weights on the right. In the last line of the above table the average price of the three goods is indicated, namely \$ 0.204 = \$ 100 million/450 million.

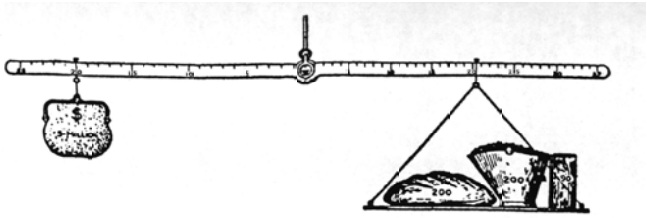

Fig. 3

If this procedure is performed in two situations, the ratio of the two average prices is the price index developed by Drobisch (Vogt and Barta 1997:14). Fisher (1911) presents the development with a sequence of figures corresponding to Fig. 3 for the 17 years between 1896 and 1912. (The last three years were only given in the second edition of 1913.) The left side of the balance is completed by a weight, the bank deposits, with its velocity as leverage.

The (erroneous) opinion is often expressed that there is no single solution to the price index problem because the "quantity" is not a content, i.e. because the different quantities cannot be added together. For example, Frisch stated: "The index-number problem arises whenever we want a quantitative expression for a complex that is made up of individual measurements for which no common *physical* unit exists." In Vogt and Barta (1997:146ff) it is shown in the context of Simpson's paradox that, even when a common unit exists, there is no ideal solution to the index problem. That is in harmony with Fisher (1922:245), assessing Drobisch's index as "poor" on his scale

worthless – poor – fair – good – very good – excellent – superlative.

10 How inflation and deflation work

The effect of the quantity of money is not only stated but explained. To do so, Fisher uses the picture of the financial Santa Claus. I do not know whether Fisher was the first to do so. Certainly he was not the last. Samuelson and also Swamy (1974:592) did this.

11 The flowing stream of money and goods

In this Story Fisher discusses the other factors of his equation of exchange, namely the velocity of money and the volume of trade.

12 Bullion and currency—What free coinage of silver would mean

The subject of the last Story of the second batch is already dealt with in chapters V and VI of Fisher (1911). In this book Fisher uses figures. We wish to present just one of them, namely Fig. 6 representing the three lakes "gold bullion G_b, minted gold G_m and silver bullion S_b", dealt with in this Story after the first two lakes.

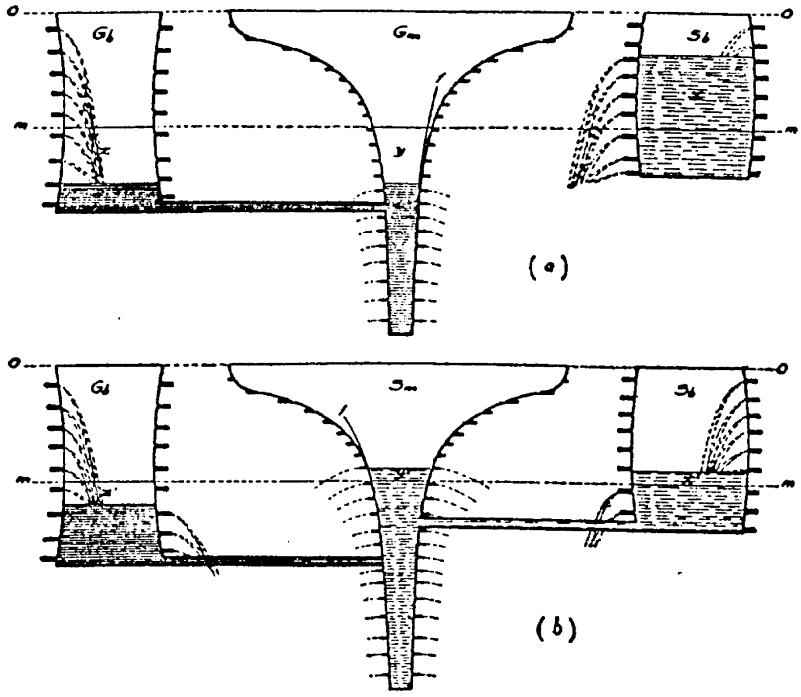

Fig. 4

This figure explains Gresham's Law: The surface distances below OO represent the purchasing power of gold bullion, minted gold and silver bullion (The higher the level the lower the purchasing power). In Fig. 4a silver is cheap. When the silver lake is connected with the gold lake by a canal (bimetallism!) as shown in Fig. 4b, the silver price rises (silver flowing into the minted gold lake) and the gold price falls to the same level. The quantity units have to be chosen properly: the silver unit being 16 times heavier than the gold unit. Before the connection of the lakes, one ounce of gold had been 32 ounces of silver. But under bimetallism it takes only 16 ounces of silver to equal 1 ounce of gold. Every debtor pays in silver, i.e. the cheap money silver drives out the dear money and gold. The silver price rises and that of minted gold falls until they reach the same level as shown in Fig 4b.

The shapes of the cisterns must be such as will make the distance of the liquid surface below 00 decrease with an increase in the liquid, in exactly the same way as the purchasing power of the metal decreases with an increase in its quantity.

Fisher develops his idea further by means of four figures similar to Fig. 4:
No. 5 showing only two lakes, the gold bullion and the minted gold lake, dealt with at the beginning of the Story,
No. 6: Fig. 4 above, where the silver drives out all the minted gold,
No. 7: where there is not enough silver to drive out all the minted gold,
No. 8: where the canal to silver bullion is interrupted but minted silver remains from before the interruption.

Fisher uses the ratio 1:16 for the values of silver to that of gold. Waser (1778:35) wrote that in early times it was 1:13 corresponding to the sun and moon circle (mystical identification of gold = sun and silver = moon). In the luxurious Rome it was 1:15. Under Nero it was 1:16.088. In Waser's time it was again 1:15. Waser concludes from historical data that the richer and more extravagant a nation is, the higher is its value ratio for silver to gold. The present ratio is 1:60...

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Short Stories on Wealth

Irving Fisher

VIII. The Purchasing Power of Money[1].....[1].....[1].....[1]

WE have now seen what money is and is not, and, how closely deposit currency is related to actual money. We have also seen that the dollar—which is the unit of our money and deposit currency—is 23.22 grains of pure gold.

But we are not really very well acquainted with money until we know more about its purchasing power. In this short story the meaning of the "purchasing power of a dollar"—in other words "a dollar's worth"—will be explained.

Since money is simply to buy things with, at bottom a dollar, or a unit of money, is not so much what a dollar weighs as what a dollar will buy. We don't really care very much whether a dollar is a twentieth of an ounce of gold—as it is very nearly—or a tenth, or a fortieth of an ounce. What we really do care about is how much food, clothing, shelter and other goods a dollar will buy.

When a dollar will not buy very much—"will not go very far"—we complain of a "high cost-of-living." The higher the "cost-of-living," or the "general level of prices," or the "scale of prices," the lower is the dollar's worth.

The scale of prices today is on the average about double that of 1899, or, putting it the other way around, the dollar of today is worth half the dollar of 1899.

The dollar of today is worth about two-thirds of the "pre-war dollar" of 1913; or, putting it the other way around, the present scale of prices is about three halves of the 1913 prices. In still other words, prices today average fifty per cent higher than in 1913.

But what do we mean by "average?" Can we tell precisely the rise and fall of the dollar—i.e., the fall and rise of the price level? Is the highness of the high cost of living capable of measurement?

Index Number

Yes; by means of an "index number ."Of course, if all prices rose or fell in exactly the same ratio, if for instance, the price of everything were today just about double what it was in 1899, there could be no doubt that the dollar today would be just half that of 1899.

But if coffee has more than doubled in price while steel has less than doubled and if, likewise, hundreds of other articles have dispersed widely in their price changes since 1899, we must strike some sort of an average.

There are various ways of doing this, but all the good ways—those worth considering—agree closely with each other.

One of the best ways is this: Imagine a great ship, a sort of Noah's Ark, with a cargo consisting not of every kind of animal but of every kind of commodity. And imagine that the amount of each commodity in the cargo corresponds to the amount of that commodity actually marketed in the United States in a certain representative year.

This imaginary fixed cargo, or bill of goods, taken as a whole, is worth different amounts of money at different times, as the prices of the various commodities in the cargo change. The value of this imaginary cargo in 1926 relatively to its value in 1913 is the index number. Thus, if its value was 100 billion dollars in 1913 and its value today is 150 billion dollars we call 150 the index number for 1926 relatively to 1913 taken as 100. The 100 billionth part of this representative cargo of all goods cost $1.00 in 1913 and $1.50 in 1926.

My own weekly index number published in the newspapers each Monday is of this "cargo" kind. It supposes the cargo to contain two hundred and two varieties of commodities in the propor-

1) *Brotherhood of Locomotive Firemen and Enginemen's Magazine, Vol. 81, No. 3, September 1926, pp. 211-212.....*

tions in which, according to the census, these commodities actually enter into our country's trade, e.g., four billion pounds of raw cotton, one hundred and thirty million hundredweights of live beef steers, four hundred million barrels of crude petroleum, three hundred million tons of bituminous coal, seven hundred million bushels of wheat, one billion dozen eggs, one billion gallons of gasoline, one hundred million pounds of cheese, etc. Such a huge cargo of two hundred and two varieties of goods is very representative of our annual commerce.

My index number is published in two ways, (1) so as to express the price level and (2) so as to express its reciprocal, the purchasing power of a dollar. For instance, last week (the week ending August 6, 1926) the index number of the price level was 147.7 and the purchasing power of the dollar was 67.7 pre-war cents. That is, the dollar last week would buy, on the average, what 67.7 cents would buy in 1913.

By means of index numbers we may trace the changes in the purchasing power of the dollar. Thus in 1860, before the Civil War, the dollar was worth about what it was in 1913 before the World War. So we may call this dollar the "pre-war dollar" whichever war is meant. By 1865, however, the greenback inflation reduced the purchasing power of the dollar to 40 pre-war cents. Then it increased in value for a generation until in 1896 it was worth 152 pre-war cents, the highest it ever reached.

The lucky possessor of a 100 dollar bill in those days could buy nearly four times as much with it as in 1865—or as in 1920 (for then, too, the dollar reached 40 pre-war cents). Continuing to fluctuate, its purchasing power had risen by January, 1922; to 72 pre-war cents, while by April, 1923, it had sunk again to 59.9. By June, 1924, it had risen to 69.9, falling to 61.5 in February, 1925. In early August of this year it is 67.7, as just stated.

Evidently our dollar, while never as unstable as the German mark, and today much more stable than in war time, is nevertheless, far from a really stable standard of value. When we remember that every other unit in commerce, such as the yard, pound, kilowatt, has long since been standardized it is remarkable that we still have a stone-age dollar, a dollar with a fixed amount of gold in it but not a fixed amount of purchasing power.

The next story will tell the causes that raise or lower the purchasing power of the dollar.

IX. What Fixes the Purchasing Power of the Dollar?[212]

IN the last story was described what is meant by the purchasing power of the dollar. In this we shall see what forces fix that purchasing power.

The reader will notice that this is the first time in this series of articles that causes have been discussed. All of the preceding eight stories have been confined to describing the economic world in which we live. We are now ready to explain how it operates. In other words, thus far we have studied, so to speak, economic anatomy; but now we are to study economic physiology.

As we know, the purchasing power of the dollar is simply the price level upside down. As one goes up the other goes down in the same proportion. So, in explaining the purchasing power of the dollar, we are explaining the general level, or scale, of prices.

Now it is much simpler to explain this general level of prices than to explain any one price, surprising as this may sound. The first step is understanding why wheat is worth, say, two dollars a bushel, is to explain why the dollar is worth what it is.

The purchasing power of the dollar, or the general level of prices, is explained chiefly by the "equation of exchange"—the fact that money and goods are always balanced against each other.

If you buy ten pounds of sugar at nine cents a pound, of course what you pay is the ten pounds multiplied by the nine cents per pound, or ninety cents. You pay 90 cents = 10 lbs. x 9 cents.

Every other purchase may be expressed in the same way. The money spent is always equal to the amount bought multiplied by the price. We might write thousands of such equations. Besides the one for sugar, are those for wheat, steel, cloth and so on, one for every purchase in the country. But we can combine them all into one. The total number of dollars exchanged for goods in, say, 1926, is equal to the total amount of goods exchanged, each multiplied by its price.

The "Equation of Exchange"

In figures, the money side, or left hand side, of this equation might be, say $I00,000,000,000. The

2) *Brotherhood of Locomotive Firemen and Enginemen's Magazine, Vol. 81, No. 4, October 1926, pp. 297-299.*

other, or goods side, or right hand side, however, consists not of one figure but of thousands of separate items—for sugar, wheat, steel, etc., etc.

But these thousands of items can be combined by adding all the amounts bought (say twenty billion units) and multiplying this by the average price per unit (say $5 per unit).

We shall then have, as the combined "equation of exchange," $100,000,000,000, is equal to 20,000,000,000 units multiplied by $5 per unit.

This equation is like the first equation (that for sugar) except that the price, $5, is now not the price of sugar nor of any other one commodity but an average of all prices, and the amount is the total number of units in all the trade of the country.

Of course these units are a miscellaneous lot—pounds of sugar, tons of coal, bushels of wheat, quarts of milk, yards of cloth, acres of land, etc., and the number of units and average price per unit would be different if we measured say, sugar in tons instead of pounds, or coal in pounds instead of tons, etc., etc. We may select any sets of such units we wish, hut a good way is to select units having nearly the same value. As the values are constantly changing, a certain year, say 1913, may be chosen and the unit of each commodity taken so as to be about a dollar's worth at that time. Thus the unit for sugar might be fifteen pounds instead of one pound.

In this way the right hand side of the equation has become the sum of all amounts of goods exchanged (or the volume of trade) multiplied by the general level, or scale of prices (or the index number of prices).

Velocity of Circulation

Having reduced the right hand side to two factors—trade and price index, we shall next, for convenience, change the left hand side. The left hand side gives $100,000,000,000 as the total sum of dollars spent or exchanged during the year. This $100,000,000,000 is much more than the total currency in existence because each dollar is spent several times in a year.

The average number of times the total currency is spent, or turned over, in a year is called the velocity of circulation. It may be, say, forty times a year. Then the total number of dollars spent will be the number of dollars in circulation (say $2,500,000,000) multiplied by the average velocity of circulation (say forty) which makes up the $100,000,000,000 or total spent.

So we have as our equation of exchange, in its final form: $2,500,000,000 in circulation multiplied by forty times a year is equal to 20,000,000,000 units multiplied by $5 per unit.

Or, in general terms, currency in circulation multiplied by its velocity of circulation is equal to the volume of trade multiplied by the index number or price level. This is the most important principle fixing the price level.

To illustrate, if the currency should be doubled in quantity—"inflated" (becoming say $5,000,000,000) while the velocity should remain unchanged (say at forty) and the volume of trade should also remain unchanged (20,000,000,000 units). the price index would have to double (to $10 per unit). Of course, in actual fact, the velocity does not stay constant nor do any other elements in the equation. They are all constantly changing, but yet in such a way as to keep the equation true.

Trade Fluctuates Greatly

The velocity of circulation changes the least and slowest. It is largely fixed by the convenience of the people. Some people find it convenient to keep in their pockets, or in the banks, a great deal of ready cash in proportion to their annual expenditures and turn it over slowly; others like to get along with very little and turn it over rapidly. In a city, money circulates faster than in the country, and in a large city faster than in a small one. It is also true that the velocity of circulation fluctuates up and down with the short time fluctuations of the volume of trade. In the long run, however, the velocity changes slowly, tending gradually to increase.

The other two factors, trade and currency, fluctuate far more. Trade tends to increase. If currency would keep pace steadily the price index would keep steady. But currency is sometimes inflated out of all proportion to trade and sometimes deflated.

Why Prices Are High in France

Practically then, it is the currency which is the most variable and unruly factor. Its inflation and deflation raise or lower prices far more often and more sharply than any variation in the velocity of

circulation or even in the volume of trade. In other words, the master key to the price level is the inflation or deflation of the currency. The great reason why prices rose millions of times in Germany after the war, was the inflation of paper money (although at the same time velocity of circulation increased and the volume of trade decreased); and the great reason why prices in Germany today have snapped back is that the over plentiful paper marks were abolished and their place taken by the scarcer gold marks. In the same way the great reason why prices today are high in France and Italy and the franc and lira are worth so little is inflation. The great reason why the price level in America is 50 per cent above the pre-war level is that there are more dollars of currency in circulation both in the form of money in people's pockets and tills and in the form of deposits subject to check in the banks.

In short, currency—that is money and deposits—is a little like any other goods in that when it is scarce it is dear and when it is abundant it is cheap.

The chief conclusion is that inflation, increasing the number of dollars in circulation relatively to the volume of trade to be done with those dollars, tends to raise prices in general while deflation, or decreasing the number of dollars in circulation relatively to the volume of trade to be done tends to lower prices.

X. How Inflation and Deflation Work[313]

WE have seen that prices rise and fall as the quantities of currency rise and fall, and that this is so whether the currency used is gold or paper money or checks against bank deposits. But to know a thing is so and to see how it is so are two different things. You may know that the engine in a steamboat makes the boat go, but that does not tell you how it does it. Let us now, as the child says, "see the wheels go round." Let us issue a lot of extra currency and see what action it takes to make you pay more for, let us say, your groceries.

The answer is that more money in tills and pockets means more lavish spending. People are willing to pay more for goods, because they have more money with which to pay. To make the picture vivid, let us imagine a financial Santa Claus. Let us suppose that, before his visit, the average amount of money in actual "circulation" in the United States is about $40 per capita. On Christmas Day Santa Claus doubles this amount. Each individual person, firm and bank suddenly has on hand twice as much as before.

Now, while the amount carried by any one individual necessarily fluctuates because of his expenditures and receipts, in a large group of people the average amount carried usually fluctuates but little. If, then, an addition to the total circulation is suddenly made so large as to put forty extra dollars per capita in the pockets of the people, everybody suddenly feels flush. Everybody suddenly becomes a bit reckless in his spending. Of course, if everybody should hoard the extra money in stockings or in safes or bury it in the earth or drop it into the sea, it would have no effect on prices. But, what they actually do is to make use of it either by expending it for goods, or by depositing it in banks and the banks will expend it. Moreover, this extra spending will mostly be done in a few days.

Suppose, as is probably the truth, that the average individual ordinarily expends or turns over his original $40 in about two weeks. This is about three dollars a day, or over $300,000,000 a day for the entire country of over 100,000,000 people.

"How Far Will Prices Rise?"

If then, within five days after his Christmas present the average person should expend the additional $40, which spread over five days would be at the rate of eight dollars a day, the result would be an extra $800,000,000 per day for the nation. Such a sudden briskness in trade would astonish and delight the shopkeepers, They would promptly raise their prices. Indeed if they didn't their stocks of goods in many cases, would be entirely depleted in a few days.

At first sight, it might seem that it would, according to this supposition, only require five days for every one to get rid of his extra $40, so that the flurry in prices would be only temporary. Such

3) *Brotherhood of Locomotive Firemen and Enginemen's Magazine, Vol. 81, No. 5, November 1926, pp. 406-407.*

reasoning, however, is wrong; when the extra money is spent, society as a whole is not rid of it. What about the shopkeeper? The shopkeeper first had his till-money doubled—by Santa Claus. Then he received the extra cash of his customers. So that he, even more than the average man, will seek to make some use of the surplus. He will spend it for pleasure or invest it in goods for his business, or deposit it in his bank. In either case it keeps on being spent. It keeps on going along to some other person. It does not disappear when it is spent the first time. The average person still has $40 more money than before to buy goods with; but nobody has more goods to sell. The effects on prices will be upward, and this effect will go on until prices have reached a sufficiently high level to stop the process.

How far will prices rise? Unless some other cause enters, they will exactly double. For as long as prices fail to double, the surpluses and the tendency to spend them will continue to exist. The average man will still think $80 too big to carry as an average cash balance. Individuals; tradesmen and bankers will all be trying to make use of their surplus, and their efforts to do so must tend to raise prices. Only when prices have reached double their original level will the $80 cease to be regarded by its possessors as excessive. At that time, since $80 will then buy only what $40 bought before, the $80 will no longer seem too much to carry for an average balance. It was the competition of buyers that doubled the prices.

People would find on the average their wages or incomes doubled likewise. Some incomes, to be sure, lag behind but others more than double, so the average is double. Thus, if formerly the average man was accustomed to expend $1,000 a year and to carry an average balance of $40, he would now expend $2,000 and carry an average balance of $80. This $80 is now exactly the same part of $2,000 that the former $40 was of $1,000. It is a two weeks' supply.

The Effect of Discovery of Gold Mines

This imaginary example represents roughly what happens when new gold is discovered. Gold mines are sometimes the Santa Claus, although they don't treat us all alike. The mine owners get the extra cash, by carrying gold to the mint and getting coin. They then find themselves in possession of money far beyond what is needed for their pockets. Suppose one of these men gets from the mint a thousand gold dollars while, for pocket money, $50 is sufficient; he is almost sure to get rid speedily of at least $950 by spending it for enjoyables, investing it in durables, or depositing it in the bank, and the bank expends it.

The first effect is felt in the immediate neighborhood of the mine. It was thus that prices rose in the mining camps of California, seventy-five years ago, and in Colorado and the Klondike, twenty-five years ago. But this local rise of prices soon communicated itself to other prices. The price level in one locality cannot greatly exceed that in a neighboring locality without causing an export of money from the flush locality to the slack locality; for buyers will rush their money to the place where prices are low, and at once raise them. Thus, new money gradually finds its way into circulation throughout the world, raising prices as fast as it can flow from place to place.

In Europe, during the recent paper money inflation, we had another example, even more like Santa Claus. The governments which could not pay their bills in any other way simply printed more paper money and paid with that. Instantly the people who got this newly created money used it to purchase goods and those who sold them the goods, then took their turn at spending the extra money.

Process Quiet and Pervasive

So an increase of money causes a rising tide of prices. This process is so quiet and pervasive that to most people it seems to come from nowhere in particular and from everywhere in general. The price of butter at the corner grocery is lifted and nobody knows just why, just as a fisherman's beat is lifted by the tides of the sea without his knowing that the moon did it.

And it is harder to trace the cause, just because each of us sees only what his dealer sees. The grocer thinks he raises prices because the wholesaler does; the wholesaler blames the jobber, the jobber blames the factory, and so on. As a matter of fact, each retailer charges more, partly because his customers are flush, but partly and mainly because he has to pay more; the wholesaler charged more partly because his customers, the retailers, were flush and partly because he had to pay more; and so on. When you get the whole picture in all its stages it is all because the world as a whole is flush in money. It is nobody's fault. It is the fault of money.

So the process by which inflation raises prices is misunderstood because, at any one stage, it is almost invisible.

That inflation raises prices is perhaps the most important principle in economics. One practical consequence of it is evident. The world cannot get rich by inflation. Inflation will tend to raise wages but at the very same time it will raise the cost of living; so that higher money wages do not usually mean higher real wages. If any Santa Claus or any government should makes us all a present of $40, the average man would be no better off.

Needless to say, the Santa Claus case just described is highly imaginary. In actual practice, things are not so simple, because of the existence of debts. Debts are fixed in terms of dollars. Unlike prices they cannot change. But, that is another story.

XI. The Flowing Stream of Money and Goods[414]

IN the last short story we saw how inflation and deflation work. They raise and lower the cost of living—in other words, lower and raise the purchasing power of money.

But, if we want to get a full picture of all the causes which influence the purchasing power of money, we must not forget the other factors in the "equation of exchange."

Although the chief cause for the ups and downs of prices is usually to be found in the quantity of currency, nevertheless, sometimes the velocity of circulation and sometimes the volume of trade are also causes.

But it is a curious fact, recently shown by Mr. Carl Snyder of the Federal Reserve Bank of New York, that the ordinary month to month fluctuations in these two causes—velocity and trade—largely offset each other. The two go up together and go down together. That is, when money circulates fast goods circulate fast in trade, and when one of these two slows up the other does too.

We know that, other things equal, every increase of velocity would raise prices and every decrease would lower them. We also know that, other things equal, every increase in the volume of trade would lower prices and every decrease raise them. That is, any change in trade influences prices in exactly the opposite way to that of the same change in velocity.

Constant Change

But other things never do remain the same. It is because velocity and trade thus both increase together or both decrease together, and because their influences on prices are opposite, that whatever effect on the price level either would otherwise have is almost entirely offset by the almost equal and opposite effect of the oscillations of the other. So these short time, or month to month, fluctuations of trade and of the velocity of money may be almost left out of account. But we still have left the long time, or year to year changes in these two causes.

These long time changes in velocity are not very great. Velocity tends, in the long run, to remain fairly constant. Although it is constantly fluctuating up and down like the waves of the sea, it keeps a fairly constant level, just as the sea does.

The average man keeps his average dollar about two weeks. That is, the average time between receiving a dollar and spending it is about two weeks. Some dollars, of course, are spent within an hour after they are received. But some dollars are kept in pockets or stockings for years. The average dollar tarries about a fortnight with each person before it goes on its way circulating from person to person.

Trend of Volume of Trade

An average stay of two weeks means that the average dollar visits about twenty-five pockets or tills in a year. It travels faster in times of prosperity and slower in times of depression; it travels faster in the city and slower in the country. But the two weeks' average is maintained approximately. The reason is that the average man finds it wasteful to keep much money idle months at a time; while on the other hand, it would be a physical impossibility to spend every dollar within a day after it is received. As a matter of convenience then, the velocity seldom wanders far from forty or fifty times a year, but it does fluctuate.

4) *Brotherhood of Locomotive Firemen and Enginemen's Magazine, Vol. 81, No. 6, December 1926, pp. 502-503.*

So far as it does tend to change at all in the long run, it tends slowly to increase, but not as fast as the other cause.

As already stated in the ninth short story, the volume of trade generally tends continually to increase with the increase of population and the progress of invention and civilization. This steady growth of trade tends to lower the level of prices whenever the quantity of currency fails to keep pace with the expansion of trade. Such a fall of prices, due to trade expanding without a corresponding expansion of currency, occurred after the Civil War, and it may occur a few years from now after the World War, although the first few years after that war showed an opposite price movement.

We see, then, that the price level is chiefly affected by just two influences: the long time changes in the volume of trade, and the changes in the quantity of currency. The volume of trade is usually tending steadily to drag prices down, while the quantity of currency is usually tending to boost them, but sometimes tending the other way. It is the only big unsteady influence.

When the gold mines of California were opened seventy-five years ago, the world was flooded with gold and this inflation raised prices. When in 1896 the new cyanide process again flooded the world with gold, prices rose again. When in the Civil War Uncle Sam paid his bills by printing the paper "greenbacks" prices rose again. When during the World War the same thing was done in Germany, Russia, Austria, Italy, France, and many other countries, prices soared thousands, millions, and, in the case of Germany, billions of times. Inflation of the currency may come from gold discoveries and processes, from increased bank credit (as when the Federal Reserve System came in), from paper money issues in war time, and from other causes.

In a nut shell, the price level rises when currency increases faster than trade, and falls when trade increases faster than currency.

XII. Bullion and Currency— What Free Coinage of Silver Would Mean[515]

IN the last article we saw that the "purchasing power of the dollar" depends on these three things:

- The velocity of circulation of the dollars,
- The volume of trade,
- The number of dollars of currency in circulation.

In general we may forget the first—velocity of circulation. The other two are usually running a race with each other. If currency outruns trade, prices rise (the dollar falls). If currency lags behind trade, prices fall (the dollar rises).

We saw that the dollar depends on the three influences just mentioned according to the "equation of exchange." But these three factors are themselves influenced by many other things. What are these other things which influence these three factors?

First, what things change the velocity of circulation? Well, for one thing, the closer men live together, the faster their money circulates. In the whole country, the average speed is fifty times a year. In Santa Barbara it is less than once a year; in New York City it is about seventy-five times a year. Again it makes a difference whether wages are paid monthly or weekly, when wages are paid weekly, money moves a little faster than when wages are paid monthly. Second, what things change the volume of trade? Well, division of labor, for one thing; and inventions, scientific management, free trade, cheap transportation, the growing closer together of population, business confidence, and the steady increase in the number of different kinds of articles we want—all these increase the volume of trade.

Third, what things change the quantity of currency? New methods of banking, issues of paper money or credit currency of various kinds by a hard pressed government (say at war, and unable or unwilling to pay its bills by taxes), new gold mines, new methods of extracting gold from the ore.

This brings us to the "gold bullion" market. By gold bullion I mean all gold that has been mined but not coined, nor manufactured into gold watches, picture frames, tooth fillings, or other prod-

5) *Brotherhood of Locomotive Firemen and Enginemen's Magazine, Vol. 82, No. 1, January 1927, pp. 18-19.*

ucts. So long as the gold is raw, i.e., not coined, nor manufactured, it is in the bullion market. It is then like any other raw material such as copper or iron.

The Gold Bullion Market

I want to call especial attention to this bullion market, not because it is especially important but because its influence on the dollar is especially misunderstood by so many people. You see, there are these two great masses of gold—coined and uncoined, and some people think only of the quantity of currency as affecting the dollar's purchasing power, or the price-level, while other think only of the bullion market. As a matter of fact, both must be considered, and there is no inconsistency in admitting that each has an influence on the dollar's worth.

Bullion gold may become coined any minute and coined gold may become uncoined again by melting it down. So I will ask you to think of two lakes. One is made of currency, including coined gold, paper money, bank credit, and the rest. The other is the bullion lake. Between these lakes there is a connecting canal. A law of Congress says that any one who has gold can take it to Uncle Sam's mint and have it coined. If he does, he will get out of each ounce twenty and two-thirds dollars. That is because the law fixes the dollar at such a weight. Well, then: since every ounce in the bullion lake can be coined into 20 2/3 dollars, the price of that ounce in the currency lake will be 20 2/3 dollars. The price of the gold in both lakes will be the same. That is, a jeweler or a dentist will give exactly $20.67 for an ounce. It is true that his customers have to pay him more, simply because he pays for the workmanship that is added to the gold. He doesn't pay more for the gold itself. These two lakes will stay at the same level.

Price Levels

"Ah, but," you say, "supposing fashion changes, so that some kind of jewelry becomes very popular—a fad, or 'all the rage.' Will not the jewelers fall over each other to buy gold, and will they not be willing to pay more than $20.67 to get an ounce?" Yes, for about five minutes. But then the canal gets busy. For as soon as you know you can take your currency-lake gold to the bullion-lake and get a jeweler to pay you even a single cent more than $20.67 for each ounce, you will hurry to do it, until there is such an abundance in the bullion lake that jewelers can get all they want for $20.67 an ounce. So the two price levels come even, almost as soon as fashion disturbs them.

And it Works both ways. If jewelry becomes unfashionable, so that jewelers won't pay as much as $20.67, people will immediately rush the raw gold from the bullion lake to the mint, so that in almost no time, jewelers will have to pay $20.67 to get even the little gold they still want. Practically then, the gold in either lake is always worth $20.67 an ounce. The level, the same in both lakes, depends on the amount of gold in both.

A century ago, most of the gold was in the bullion lake. Now most of it is in the currency lake—4½ billion dollars in the United States alone, or nearly half the world's stock of monetary gold. (Besides this the currency lake is, of course, swollen by many other sorts of currency besides gold, especially bank deposits.)

Another question: What about "bi-metalism"? That is, what happens when you can take either gold or silver to the mint and get it coined! Yon cannot do that now, but once it could be done, especially in France between 1803 and 1873. Bryan proposed in 1896 that we in the United States should go back to bi-metalism, by a law for the free coinage of silver as well as gold. This law would say that you could get at the mint 20.67 dollars in gold or silver, either for one ounce of gold or for 16 ounces of silver.

"Cheap Silver"

Here we must imagine three lakes, as follows: First, the same old currency lake, then the gold bullion lake, then the silver bullion lake. From each of the bullion lakes, a canal leads to the currency lake. Now if, in l896, one ounce of gold had been about as valuable as 16 ounces of silver, all three lakes would, for a time at least, stay the same. But silver was so common in the market that it actually took about 32 ounces of silver to equal one ounce of gold. Yet, in the currency lake, every debtor was to be allowed to pay off as much debt with 16 ounces of silver as with one ounce of gold. Had the law passed, instantly silver would have rushed into the currency lake, till the dollar's worth would have been cheapened. Any one who had an ounce of gold or $20.67 would rush it into the bullion market where he could get about 32 ounces of silver dollars for it, or two blocks of 16 ounces each. Each of these two could be coined into $20.67 and he would have in both together

over $40 to pay his debts with instead of the $20.67 with which he started,

Gresham's Law

So when cheap silver thus rushes into the currency lake, it pushes the dearer gold out. The purchasing power of money then gets lower. Prices get higher. This is called Gresham's law—that cheap money drives out dear money.

When this very thing began to happen in France in 1873, the French Government filled up the canal between the silver bullion lake and the currency lake. That is, it repealed the law permitting free coinage of silver.

It is hard to keep two metals in circulation if both are freely coined. So now-a-days only one is freely coined, and all others—silver, nickel, copper—are coined only at the discretion of the government.

We may end this short story by trying to imagine a great moving picture of how "the equation of exchange" works—the buying and selling constantly going on in the United States. In such a picture we see, every year, several hundred billion of dollars worth of goods changing hands. Most of them actually move from place to place, across the counter, through the parcel post, on the railways, and, on motor trucks through the streets. Some of it, especially real estate, does not change place but only changes ownership.

Flow of Currency

This mighty stream of transfers of ownership includes such concrete wealth as lands, buildings, furniture, machinery, tools, raw materials, and finished products in thousands of varieties. It includes such abstract services as human work, or "labor," of various kinds, services of transportation, telephone and telegraph service, and numerous other services of men, or things, or both. It includes such property rights as stocks, bonds, mortgages, short term notes, bills of exchange, checks, bank notes, and other money.

Theoretically any part of this vast miscellaneous assortment of goods could be exchanged for any other. In fact, in small quantities, hundreds of different sorts of things are bartered against each other. But practically, only the last three items, checks (representing bank deposits), bank notes, and other money—in short, what we have called currency—are exchanged against all the rest.

So our moving picture reveals two opposite streams, several hundred billion dollars of currency being paid annually from buyers to sellers and the equivalent in goods of all other sorts being transferred in exchange from sellers to buyers. This vast double stream is the first big picture of our economic machine in action. It is as important in the economic life of society as the circulation of the blood in our bodies.

And it is this flow of currency against goods which fixes the real value of the dollar. When this value changes very much, in either direction, great harm is done, especially to laboring men. But the story of that harm comes considerably later.