

19th November 1934.

Dr. Roswell H. Whitman,
Office of the Controller,
Messrs. R. H. Macy & Company,
NEW YORK CITY.

Dear Dr. Whitman,

I am sorry that it has taken such a long time to get through the new computations of your work, but now the mean results are ready. Please find enclosed tables showing the results we have obtained in re-computing your correlation coefficients, regression coefficients, etc.

In order to be quite certain that we have used the same data, we have in the enclosed Table 1 actually listed the first five and the last five observations in each of the three periods considered (first period 1903-1915, second period 1916-1920, third period 1921-1930) of the eight variables $X_1 X_2 \dots X_8$ which enter into the analysis and which should correspond to your variables in the following way:-

X_1 = Index of sales of steel, measured in millions of gross tons. This variable should correspond to your y = quantity demanded.

X_2 = Composite price of finished steel. Cents per pound should correspond to your p = price of steel.

X_3 = A three-months moving average superimposed on a central first difference with a span of four months, this difference being divided by four. As an example the value of X_3 in the month No. 4 in the year 1916 is equal to

$$x_3(1916.4) = \frac{1}{12} \left\{ \begin{aligned} & x_2(1916.1) + x_2(1916.2) + x_2(1916.3) \\ & - x_2(1916.5) + x_2(1916.6) + x_2(1916.7) \end{aligned} \right\}$$

The variable X_3 should correspond to your \dot{p} = first difference of price smoothed by a five months moving average. The correspondence will of course not be quite exact since we have used a three months moving average and you a five months average, but it seems that if the data showed any real significance in terms of the derivative of the price, this influence ought to be brought forth just as well by our formula as by yours. It seems indeed that the agreement or disagreement between the results obtained would suggest the trustworthiness of the hypothesis that the derivative of the price exerts an influence. By comparing the regression coefficients given by you with those obtained at our Institute (See Tables 3 & 4) it seems that your first differences of p are not smoothed as you say in the text of the MS., by a five months moving average, but by a five months moving total. If this is right the variable X_3 defined above should be multiplied by five in order to be comparable with your \dot{p} . The figures in parenthesis in Tables 1, 3 and 4 give those values that correspond to this new definition of X_3 . You will see that in general there is a better correspondence between your and our results when we speak of this new definition of X_3 .

$X_4 = X_2(t-3)$ (t measured in months), for instance

$$X_4(1916.10) = X_2(1916.7).$$

X_4 should correspond to your $p(t-3)$.

$X_5 = X_2(t-6)$, for instance $X_5(1916.10) = X_2(1916.4)$.

X_5 should correspond to your $p(t-6)$.

$X_6 = X_2(t-9)$, for instance $X_6(1916.10) = X_2(1916.1)$.

X_6 should correspond to your $p(t-9)$.

$X_7 =$ Defined differentially for the various periods. For the two first periods (1903-1915 and 1916-1920) the American Telephone and Telegraph Company's index of business, measured as deviations from normal, and corrected for seasonal variations and trend. Figures taken from your tables.

X_7 for the third period (1921-1930) is Standard statistics index of industrial production, corrected for seasonal variations but not for trend.

For all three X_7 should correspond to your I.

$X_8 =$ time, the time unit being measured in 100 months, that is to say, the time distance between consecutive observations in the data = 0.01.

X_8 should correspond to your t .

O E I P
S. N.
1B

Table 2

gives separately for each period the correlation coefficients r_{ij} between the variables X_i and X_j , in other words

$$r_{ij} = \frac{\sum x_i x_j}{\sqrt{\sum x_i^2 \sum x_j^2}}$$

where x_i is the variable X_i measured from its mean within the sub-period in question.

Table 3

gives the regression coefficients for X_1 on two or more of the variables X_2, X_3, X_7 and X_8 and the standard errors on these coefficients. For each such parameter the values are given as obtained both by you and by the Oslo Institute. You will see that there is a general tendency to agreement between the results, although in certain cases some discrepancies are found.

Table 4

gives in a similar way the regression coefficients of X_1 on two or more of the variables X_2, X_3, X_4, X_5, X_6 and the standard errors on these parameters.

Before I complete the analysis by my "bunch map" analysis, I should like to have your comments on the results as thus presented.

In particular I should like to know whether the gross correlation coefficients as computed by us correspond to those you have found; also your comments on the agreement between the higher parameters computed.

You may keep the enclosed tables until further notice.

Cordially Yours,

Ragnar Frisch.

Handwritten notes:
5281
1935
1935
1935
1935

Correspondence between Ragnar Frisch and Roswell Hartson Whitman (1908-1962)

Frisch to Whitman 11.10.1933

Dr. Roswell H. Whitman
University of Chicago
CHICAGO, U.S.A.

Dear Dr. Whitman,

Through Mr. Wm. F. C. Nelson I have received the manuscript of your paper on "The Statistical Law of Demand for Producer's Goods as illustrated by the Demand for Steel."

Thank you for submitting this paper for "Econometrica." I am much interested in your vigorous attempt at exploring this difficult field. Personally I believe that the difficulties of statistical investigations in this matter are very great and that the usual technique of computing standard errors on the regression coefficients is not a sufficient guard against false interpretations. I am thinking particularly of the possibility – always inherent in a study involving several variables – of getting into a situation where the unfolding capacity of the material is smaller than the dimensionality of the set of variables which are put into the correlation machine. Before reaching a final conclusion as to the suitability of your paper for "Econometrica", I feel that I shall have to look into the matter very closely. I shall possibly find it necessary to have some fresh computation done in order to see whether substantially the same results are obtained by a different technique. In particular I want to make an attempt at studying the significance of the unfolding capacity of your data.

In order to give me an opportunity of carrying out these tests would you be kind enough to send me your original raw data (not corrected for seasonals, trends, etc.). If the result of this scrutiny is positive, I should be very glad to accept your paper for publication in "Econometrica". You will of course understand that I attach great importance to your attempt, otherwise I would not undertake this big work to verify it. But I am sure that you will also appreciate my attitude of not being able to accept your paper for publication without further check.

With best regards,

Sincerely Yours

Ragnar Frisch

Frisch to Whitman 04.01.1934

Dr. Roswell H. Whitman
Illinois Emergency Relief Commission
University of Chicago
Chicago, Ill, U.S.A

Dear Dr. Whitman,

Thank you very much for your letter and the numerical data. Please excuse me for not having acknowledged receipt of it before.

I hope to be able to have a shot at your data sometime in the near future. In the meantime I would ask you to do me still another service if it is not inconvenient to you. For some reason or other which I cannot explain your letter which accompanied the data has been misplaced at the Economic Institute. If my recollection is correct the letter contained certain indications about the nature of the material and this may be useful in the study. Therefore would you be kind enough to let me have a copy of the letter, or at least of that part of it which contained the comments on the data? This refers only to the accompanying letter – the sheets containing the actual data are safely preserved at our Institute.

Best regards,

Sincerely Yours

Ragnar Frisch

Whitman to Frisch 01.02.1934

I enclose a copy of my former letter to you giving notes on the data which I forwarded. I hope that you may be able to work with the data within a fairly short time.

Thanking you very much for your attention to my work, I remain.

Frisch to Whitman 26.03.1934

Dr. L. Whitman
Illinois Emergency Relief Commission
CHICAGO

My dear Dr. Whitman,

I am just dropping you a few words to let you know that I have done a very extensive work on your data. As a matter of fact I have had several assistants working on it for weeks. We have computed the correlation coefficients and applied my test of regression significance to a great part of your data, and we are going to do it on more of it.

I have not yet analyzed the results so thoroughly that I have formed a definite opinion, but my general impression is that the nature of the data does not warrant the inclusion of all the variables you have used. It is I think probable that my personal attitude would be that quite a few of your results are non-significant. However, this does not mean that I want to decline your paper for publication in "Econometrica". I think it should be published, possibly with a few small modifications, but then I would at the same time write up an independent paper showing the results of my computations and indicating the limits within which your results must be interpreted. Even if the final conclusions should not be exactly what you have put down. I think the publications of these two papers together would be an interesting feature.

Best regards,

Sincerely Yours

Ragnar Frisch

Whitman to Frisch 27.04.1934

I was very pleased to get your letter of March 26 and to learn that you have been able to spend so much time studying my data. I sincerely hope your final decision will be that you can accept my paper for publication in "Econometrica".

I am sure, from your statement, just which of my results your analysis indicate are not significant; but I would like to note that I did not myself claim significance for all the results which were placed in the tables. The tables were for the purpose of indicating what the results were, and to allow the reader to judge, by study of the behavior of the parameters and the relation of their size to their standard errors, whether or not that particular result was significant. Particularly in using my first equations, you will note that I built my conclusions only upon the parameters for the price in current month and that three months previous, and do not attempt to give any significance to parameter for prices of an earlier date. The two parameters for which I did claim significance were at least three times their standard errors. I am not certain, of course, that your own method of analyzing the data would show the same degree of significance as this.

I should, of course, be very happy to have you publish simultaneously a paper by your own dealing with the same data and criticizing my own work. I readily appreciate the difficulties which presently attend our work with time series, and will be very grateful if a more definitive word can be said upon the limitations of interpretation to be placed on parameters obtained from the analysis of this type of material.

I am now in Washington on the staff of the Central Statistical Board, which is engaged in reviewing and coordinating the statistical work of the various Government agencies. Future mail can be addressed to me here at 7028 Commercial Building.

Frisch to Whitman 06.06.1934

Dr. Roswell H. Whitman
Central Statistical Board
7028, Commerce Building
Washington, D.C:

My dear Dr. Whitman

I have to apologize for the delay which have been caused in discussing your data. The analysis is not yet quite finished. It has been much more of a job than I originally anticipated. I want to let you know, however, already at present, that your paper is accepted for publication in "Econometrica". In the same issue in which your paper appears I shall probably publish an account of the result of my investigation of your data. As there is a considerable amount of material at present awaiting publication, I do not think it will be possible to have your paper appear before the January issue 1935, but I hope that we shall be able to get it into that issue.

Best regards,

Sincerely Yours

Ragnar Frisch

Whitman to Frisch 24.09.1934

I did not consider it necessary to answer your kind letter of June 6th, but I now find that I should know, if possible, the issue of "Econometrica" in which my article may be printed.

I may need to submit reprints to the University Chicago, since my thesis was not published in book form. I should be happy to have any information you may have on this point.

As you will note, I have again transferred to a position as statistician with R. H. Macy and Company. It is my hope to make a number of price studies with the data which is available from the operations of a large department store.

Thanking you for your careful consideration of my work, I am

Sincerely yours

Frisch to Whitman 19.11.1934

Dr Roswell H. Whitman
Office of the Controller
Messrs. R. H. Macy & Company
NEW YORK CITY

Dear Dr. Whitman,

I am sorry that it has taken such a long time to get through the new computations of your work, but now the main results are ready. Please find enclosed tables showing the results we have obtained in re-computing your correlation coefficients, regression coefficients, etc.

In order to be quite certain that we have used the same data, we have in the enclosed Table 1 actually listed the first five and the last five observations in each of the three periods considered (first period 1903-1915, second period 1916-1920, third period 1921-1930) of the eight variables $X_1 X_2 \dots X_8$ which enter into the analysis and which should correspond to your variables in the following way:-

X_1 = index of sales of steel, measured in millions of gross tons. This variable should correspond to your y = quantity demanded.

X_2 = Composite price of finished steel. Cents per pound should correspond to your p = price of steel.

X_3 = A three-months moving average superimposed on a central first difference with a span of four months, this difference being divided by four. As an example the values of X_3 in the month No. 4 in the year 1916 is equal to

$$X_3 (1916.4) = 1/12 \{X_2 (1916.1) + X_2 (1916.2) + X_2 (1916.3) - [X_2 (1916.5) + X_2 (1916.6) + X_2 (1916.7)]\}$$

The variable X_3 should correspond to your \dot{p} = first difference of price smoothed by a five months moving average. The correspondence will of course not be quite exact since we have used a three months moving average and you a five months average, but it seems that if the data showed any real significance in terms of the of the derivative of the price, this influence ought to be brought forth as well by our formula as by yours. It seems that the agreement or disagreement between the results obtained would suggest the trustworthiness of the hypothesis that the derivative of the price exerts an influence. By comparing the regression coefficients given by you with those obtained at our Institute (See Tables 3 & 4) it seems that your first differences of p are not smoother as you say in the text of the MS, by a five months moving average, but by a five months moving total. If this is right the variable X_3 defined above should be multiplied by five in order to be comparable with your \dot{p} . The figures in parenthesis in Tables 1, 3 and 4 give those values that correspond to this new definition of X_3 .

You will see that in general there is a better correspondence between your and our results when we speak of this new definition of X_3

$X_4 = X_2(t-3)$ (t measured in months, for instance $X_4(1916.10) = X_2(1916.7)$).

X_4 should correspond to your $p(t-3)$

$X_5 = X_2(t-6)$, for instance $X_5(1916.10) = X_2(1916.4)$

$X_6 = X_2(t-9)$, for instance $X_6(1916.10) = X_2(1916.1)$.

X_6 should correspond to your $p(t-9)$.

X_7 = defined differentially for the various periods. For the two first periods (1903-1915 and 1916-1920) the American Telephone and Telegraph Company's index of business, measured as deviation from normal, and corrected for seasonal variations and trend. Figures taken from your tables.

X_7 for the third period (1921-1930) is Standard statistics index of industrial production, corrected for seasonal variations but not for trend.

For all three X_7 should correspond to your I.

X_8 = the time unit being measures in 100 months, that is to say, the time distance between consecutive observations in the data = 0.01.

X_8 should correspond to your t

Table 2

Gives separately for each period the correlation coefficients r_{ij} between the variables X_i and X_j , in other words

$$r_{ij} = \frac{S x_i x_j}{S x_i^2 S x_j^2}$$

where X_i is the variable X_i measured from its mean within the sub-period in question.

Table 3

Gives the regression coefficients for X_1 on two or more of the variables X_2 X_3 X_7 and X_8 and the standard errors on these coefficients. For each such parameter the values are given as obtained both by you and by the Oslo Institute. You will see that there is a general tendency to agreement between the results, although in certain cases sine discrepancies are found.

Table 4

Gives in a similar way the regression coefficients of X_1 on two or more of the variables X_2 X_3 X_4 X_5 X_6 and the standard errors on these parameters.

Before I complete the analysis by my "bunch map" analysis, I should like to have your comments on the results as thus presented.

In particular I should like to know whether the gross correlation coefficients as computed by us correspond to those you have found; also your comments on the agreement between the higher parameters computed,

You may keep the enclosed tables until further notice.

Cordially yours

Ragnar Frisch

Frisch to Whitman 05.02.1935

Mr. Roswell H. Whitman
Messrs. R. H. Macy & Co.
34th Street and Broadway
New York City

Dear Mr. Whitman,

Thank you for yours of January 10th.

I am glad to have now your zero order correlation coefficients, and I hope it will not be very long before we have reached our conclusions.

I am sorry that this has considerably delayed publication of your paper but I hope you will agree that it will be more interesting if the whole material can be presented at once showing what part of the conclusions reached are trustworthy and what other parts may – perhaps – be looked upon with skepticism.

With best regards,

Sincerely Yours

Ragnar Frisch

Whitman to Frisch 11.12.1935

It is a number of months since I have heard from you concerning the results of your analysis of the steel data in my paper presented to you for possible publication in *Econometrica*. While I realize from my own work with this data that considerable time is necessary for a thorough analysis, I had hoped that you might now have completed your study.

Providing you are still considering publication of my paper, I am anxious that this be not unduly delayed since such publication before March 1936 would enable me to present reprints to the University of Chicago at that date and would thereby make it unnecessary for me to bear the expense of independent publication of my thesis.

I have been somewhat hesitant in bringing this matter up again, but in talking with Prof. Schultz he suggested that I write you once more.

My study of demand curves at R. H. Macy & Co., Inc., is progressing quite nicely and I hope to be able to present a brief paper at the December meeting of the Econometric Society in New York.

Hoping to have your continued interest in my work, I am

Sincerely yours

Frisch to Whitman 04.01.1936

Mr. Roswell H. Whitman
Messrs. R. H. Macy & Co.
34th Street and Broadway
New York City

My dear Dr. Whitman,

I owe you an apology for the long delay that has taken place in the final publication of your paper which has been accepted for *Econometrica*.

We shall do what we can to have the reprints in your hands before March 1936 thereby making it unnecessary for you to bear the expenses of publishing it independently. As you know, the next issue of *Econometrica* will not appear until April, but I hope that it will be possible to let you have the reprints before. Of course this is an unusual procedure but I think it is justified in the present case. A carbon of this letter is being sent to the Assistant Editor, Mr. Wm. F. C. Nelson, Mining Exchange Building, Colorado Springs, Colorado. Please communicate with him directly.

Your MS will be dispatched from here direct to Nelson one of the first days.

One of the first things I shall do will be to write a brief note explaining the findings of my analysis of your data. It would be desirable to have this note appear together with your paper. But the type-setting of your paper and the preparation of the reprints should be done independently and not delayed until the MS of my note arrives in Colorado Springs.

With best wishes for the New Year and hoping that you will excuse the delay in publishing your paper, I am,

Sincerely Yours,

Ragnar Frisch

Copy sent to Professor Henry Schultz.

Whitman to Frisch 28.01.1936

I wish to thank you very much for your letters of January 4th and 11th telling me of the prospective publication of my paper in the April number of the *Econometrica*. I am naturally pleased that I shall be able to obtain these reprints, and appreciate not only your acceptance of the paper but the special effort necessary to provide these reprints by March of this year.

I am sure the changes you have made in the paper will increase the quality of my presentation and am quite certain they will meet with my approval.

I am communicating with the Assistant Editor, Mr. Wm. F. C. Nelson concerning whatever details may be necessary to prepare the reprints.

Thanking you again, I am

Very sincerely yours