Kyoto University
Economic Review

CORRELATIONS BETWEEN SPOT QUOTA-
TIONS AND FUTURE QUOTATIONS
OF JAPANESE RICE

1. THE MEANING OF THE PROBLEM

When there is a slump in the rice price, rural producers
of rice complain of the practice of some speculators to bear
the market, and when there is a sparp rise in its price,
consumers in urban districts complain of the cornering
operations of a section of speculators. Setting apart the
question of whether such complaints are justified or not,
there is little doubt that they presuppose a close correlation
between future quotations in the Rice Exchange and spot
quotations of rice. This presupposition is born of the ex-
perience of many years of the public—espccially of the
parties directly concerned in rice transactions. As to the
extent of the correlation between them, however, it is beyond
the power of this common knowledge to explain. My pre-
sent article is an attempt to find out whether this general
conception is correct, and, if it be correct, exactly what in
the extent of the correlation that exists betweed the two.

One of the important functions of the Exchange is to
fix official quotations and make them public. For official
quotations to acquire full economic significance as such,
however, they must possess a variety of characteristics.

First, the official rice quotation must have a standard nature. It must indicate the standard of rice-prices in general. Not only must it form the absolute standard of the price of rice but also it must constitute the relative standard or the standard of fluctuations. Whether official quotations possess such standard nature or not can be determined by the existence or non-existance of a close correlation between it and the general price of rice. For, if the official quotation can be fixed regardless of the general price of rice, it can form no standard for the latter. If, however, it did nothing more or less than indicate the standard, the official quotation of the Rice Exchange would not be a matter of absolute necessity, for such a standard can very well be sought by collating the prices of rice of various brands ruling in different districts, just as we can find the standard of general commodity prices by finding the index number based on the prices of many commodities. Accordingly, the economic functions of the official quotation are not confined to its standard nature.

Secondly, it must have a leading nature. Besides forming the standard of the price of rice generally, the official quotation must be of a nature to lead it. In this respect, the relation between the official quotations and the price of rice is different from that existing between the index number of general prices and the individual prices of commodities. With regard to the index number of general prices, its changes embody fluctuations in the individual prices of commodities, and consequently changes in both occur simultaneously. In the case of the official quotation however, it must fluctuate prior to the spot price of rice, if it is to fulfil its economic functions' as otherwise the mere standard price of rice or the index number of the price of rice will suffice.

In order to find out whether the quotation of futures has really the leading nature, the point must be first settled which of the two, the futures quotation or the spot quotation, leads in fluctuation. This can be done, as I shall show

later on, by examining the correlation between the two by putting both either forward or backward by one month. Therefore, the leading nature of the official quotation can also be ascertained by determining the correlation under discussion. Supposing that the leading nature of the official quotation is discernible to a certain extent, it still remains to be ascertained whether its guidance is in the right direction, or, in other words, whether it is leading the price of rice in the direction of rightly reflecting the relation of supply and demand. This is the last problem to be solved.

Thirdly, a forecasting disposition is required in the official quotation. The future quotations—3-month quotations especially—must possess the nature of forecasting the future price of rice; otherwise they cannot adequately fulfil their functions as official quotations. The forecasting nature is, of course, related to the leading nature already referred to. The leading nature may be described as the forecasting nature of the immediate future, while the forecasting nature may be represented as the leading nature at some distant date. As a matter of fact, it is possible to distinguish between what leads daily fluctuations and what forecasts fluctuations a few months hence at least. And the forecasting nature of the official quotation can also be proved by correlation, as for instance, by making clear the degree of correlation between the future quotations which predict the price of two months hence and the price of rice actually ruling two months later.

The standard nature, the leading nature and the forecasting nature are, in my view, essential to the official quotation, if it is to assert its proper economic significance. In addition to its functions in relation to prices, the official quotation has the function of regulating the quantities of the demand and supply of rice, but I shall leave this question out of consideration in the present article. In so far as its functions in connection with rice prices are concerned, I believe, the economic significance of the official quotation, and accordingly, the importance of the

Rice Exchange from the national economic point of view, can be made clear to a certain extent by determining the correlation, which the present article proposes to deal with.

2. MATERIALS AND METHODS

Researches have been made by some scholars in the past regarding the relation between spot rice quotations and future rice quotations. For instance, the study of the subject by Dr. Kawada and that by Dr. Hijikata are important in their ways. My present treatise is not, however, necessarily in agreement with these and other researches in the materials and the methods used. A few remarks may be made in this respect.

Regions. As the zones for investigation, I have chosen Tokyo, Osaka and Kyoto, which are not only three big rice consuming centres in Japan but have their big Rice Exchange. I have tried to ascertain by applying the same methods to similar materials separately collected with regard to these cities, whether there exists correlation common to all or whether any local characteristics are observable regarding each.

Period. The period chosen is from January, 1921, to July, 1930 (115 months altogether). The first reason for confining my attention to the years after 1921 was a desire to eschew the influences due to the panic of March, 1920. The second reason was that the Rice Law became operative in April, 1920. The third reason was that it was considered likely that during the ten years under review the rice prices had undergone a cycle of movements. It was therefore considered proper to take these years as the period for study. Such being the case, my present study is concerned, on the whole, with the price of rice in the post-war period of business depression when the Rice Law was in operation.

Spot quotations. Or the wholesale price of uncleaned rice, are determined differently in different cities, according as the state of the wholesale market varies. The Fukagawa

standard spot quotations, which I quote in the present article
as indicating the spot quotations of Tokyo, have been taken
from the figures made public by the Fukagawa Wholesale
Rice Merchants' Guild. These standard quotations of rice
are determined in this way. Each wholesale house in the
Fukagawa rice market reports to the Guild every day
particulars of the transactions—prices, brands of rice, quanti-
ties dealt in, etc.—made between individual wholesale houses
during the forenoon. The tone of the morning session of
the Rice Exchange is necessarily reflected in these prices.
On the basis of these reports and also after hearing the
views of six wholesale merchant nominated by the Guild,
the officials of the Guild, who are in charge of the market
business, fix the standard quotations of the first-class, second-
class and third-class rice of the day. The brands to be
selected and the methods to be adopted for classification in
this case are in accordance with the rules previously laid
down by the Guild regarding the representative brands of
rice in the market and the relation of grades of official
inspection and the first-class, second-class and third-class
rice. The spot quotations fixed in this way are daily
published in the *Tokyo Rice Report*, issued by the Guild, as
the "standard quotations." The quotations cited in the
present article represent the monthly average of the second-
class rice quotations.

Spot quotations in the Osaka market are fixed in another
way. The third-class Settsu Red is the brand of rice re-
garding which spot quotations are fixed. It is also the
standard brand in the Osaka Rice Exchange. The methods
of fixing these quotations are somewhat different from those
adopted in Tokyo too. Under the regulations now in opera-
tion, six Exchange members of the spot quotations section
are nominated to organise the price inquiry committee, and
the members of this committee meet three times a month,
viz. on the 1st, 11th and 21st, to fix the spot quotations of
the day for each brand, the chief of the inquiry section of
the Osaka Rice Exchange participating in the deliberations

at each meeting. With regard to daily quotations for the intervening days, they are fixed by the officials of the spot quotations section for each brand by taking the general tone in the spot and the market for futures into careful consideration. The quotations cited in the present article embody the monthly average of the quotations for the third-class Settsu Red brand.

The rice market of Kyoto is less perfect than the Osaka market—and altogether inferior to the Tokyo market—and consequently the rice quotations there possess the standard nature in a less degree. I have utilised in the present article the results of investigations made by the Kyoto-Fu Rice Inspection Office. The figures represent the monthly average of the rice quotations. The Kyoto-fu Rice Inspection Office originally obtains the daily rice quotations from one rice merchant each of the Sanjo market and the Shichijo market, works out the monthly average of these quotations separately, and then taked the average of both. The quotations are those of the third-class Yamashiro Red brand, which constitutes the standard rice of the Kyoto Rice Exchange.

Future quotations. As the future quotations or quotations in the Rice Exchange market, I have taken the average of current month deliveries, 2-month deliveries and 3-month deliveries quotations in the three Exchanges. By the average quotations are meant the daily averages of the quotations at each of the eight sections in the morning session and of the seven sections in the afternoon session in the case of the Tokyo Exchange; at each of the ten sections in the morning and six sections in the afternoon session in the case of the Osaka (Dojima) Exchange, and at each of the eleven sections in the morning and seven sections in the afternoon session in the case of the Kyoto Exchange. But in the present article, monthly averages, instead of daily averages, are used. So far as the quotations for current month deliveries and 3-month deliveries are concerned, they are given in various statistical publications, but for information about 2-month

delivery quotations, there is no alternative but to apply to each Exchange. All information contained in the present article regarding the current month, 2-month, and 3-month deliveries quotations have been obtained directly from the Exchanges concerned.

Methods.   The above-mentioned three kinds of time-bargain quotations and one kind of spot quotations in the three cities were first obtained, and concerning 1,380 items of twelve series in all, the movable average for twelve months has been found in respect of each of these series, the correlative coefficient of deflation from this movable average being worked out.   The standard of deviation need not necessarily be the movable average, but in the present case, not only is it deemed most rational and convenient, but it is possible to eliminate seasonal fluctuations by this means.   There are two ways of finding the movable average for twelve months (Even number).   One is to take thirteen months from January to January of the following year inclusive, divide the sum total with the weight 1 attached to the terms at both ends and the weight 2 attached to the intermediate terms by $(2 \times 11) + (1 \times 2) = 24$, and regard the quotient obtained as the movable average value for the centre term, viz. July.   The other is to put the movable average value for from January to December between June and July and then put the one for February to January of the following year between July and August, and regard the average of these two movable average values as. the movable average value for July.   In the present article, the latter method was been adopted.

The correlative coefficient between two series on the basis of the deflection from the movable average has been worked out according to the following formula :—

$$r = \left(\frac{x}{\sqrt{\frac{\Sigma x^2}{n}}} \cdot \frac{y}{\sqrt{\frac{\Sigma y^2}{n}}} \right) = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \cdot \Sigma y^2}}, \quad P. Er. = 0.6745 \cdot \frac{1 - r^2}{\sqrt{n}}.$$

As x and y in the above formula represent the devia-

tions of the two series, $\sqrt{\dfrac{\Sigma x^2}{n}}$ and $\sqrt{\dfrac{\Sigma y^2}{n}}$ in the formula
are their respective standard deviations. Accordingly, the correlative coefficient can be worked out by either of the following two methods:

(1) The quotient obtained by dividing each deviation by the standard deviations is multiplied by each of the two series, and the sum total divided by the number of items;

(2) find the total of the multiplication of the deviations of two series by each other, and divide it by the square root of the multiplication of the sum of each deviation square. In the present article, the latter method has been employed.

In order to see the relation of priority (Lag) by this method, we have to put the deviations of the two series forward or backward to the necessary extent when multiplying them by each other, so as to find the correlative coefficient. It is hardly necessary to say, however, that in this case the total of the squares of each deviation forming the denominator changes, because there occur at both ends items to be eliminated. Owing to the limited space available, I must omit all the figures worked out by this means.

3. CURRENT MONTH DELIVERY QUOTATIONS AND SPOT QUOTATIONS

Inasmuch as current month delivery quotations mean the quotations of the rice to be delivered at the end of the current month, they are, in respect of factors governing transactions, most similar to spot quotations, which represent the price of the rice to be delivered on the day of transaction or on the day following it. Spot quotations are chiefly influenced by the prevailing circumstances connected with marketable rice. That is to say, (1) the market situations in the rice districts, (2) the rice prices in the city and (3) the state of demand and supply at the rice market operate chiefly, with due regard to fluctuations in futures quotations, in forming spot quotations. Current month delivery quotations are also chiefly influenced by the same rice factors,

as can easily be inferred from the characteristics peculiar
to transactions in current month deliveries.

In the first place, those who make current month delivery
transactions may be divided into two categories—under one
category fall those who act passively in re-selling or re-
purchasing rice against what has already been dealt in,
while to the other category belong those who act positively
in making fresh sales or purchases. The former transac-
tions are made mostly in the way of what speculators call
" clearance," or by way of releasing hedgings on the part
of rice merchants. In any case, they are most strongly in-
fluenced by the rice factors referred to. It is thus fair to
conclude that the rice factors form the theoretical grounds
on which fpeculators decide whether they should liquidate
by re-sales or re-purchases, or whether they should arrange
for actual delivery of rice; and that rice factors operate in
current month delivery quotations. When, for instance, a
strong tone of the rice market encourages the belief that it
is advantageous to take delivery of rice and disadvantageous
to deliver it to others, there will naturally be many who
either try fo secure deliveries by withholding re-sales or
attempt to shun deliveries by means of re-purchases. This
inevitably leads to a rise in the current month deliverys
market. On the contrary, when the tone of the spot market
is weak and there is a general desire to make deliveries,
refraining from re-purchases, or to eschew taking delivery
by effecting re-sales, the current month delivery quotations
must necessarily decline.

Secondly, active sales or purchases in current month
deliveries are, in ordinary circumstances, mostly by rice
dealers. They operate chiefly with an eye to the actual
delivery of rice. For instance, they either make purchases
of rice from producers and put their purchases on the
Exchange, or make purchases in the Exchange to supply
the actual demand for rice. In either case, the rice factors
react on the current month delivery quotations. When
the tone of the rice market is strong, purchases in the

Exchange increase, with the consequent rise in the current month delivery quotations, while when the tone of the rice market is weak, holdings are disposed of in the Exchange, resulting in a decline in current month delivery quotations.

In this way, by its very nature, current month deliveries are largely influenced by the rice factors, and it is easy to imagine that they are closely connected with the spot quotations which are also similarly influenced. Now, let me correlate the current month delivery quotations with spot quotations for the same month in respect of the figures of Tokyo, Osaka and Kyoto separately and work out the correlative coefficient of each by $r = \dfrac{\Sigma xy}{\sqrt{\Sigma x^2 \cdot \Sigma y^2}}$.

The result is $\begin{cases} \text{Tokyo:} & r = 0.895, \text{ P. Er.} = \pm 0.014239, \ n = 97. \\ \text{Osaka:} & r = 0.787, \text{ P. Er.} = \pm 0.025354, \ n = 103. \\ \text{Kyoto:} & r = 0.759, \text{ P. Er.} = \pm 0.028491, \ n = 103. \end{cases}$

From the above, it will be seen that the correlation between the two is pretty close in all three cities. The correlative coefficient is highest in Tokyo, while there is no wide difference between that ot Osaka and that of Kyoto. They show at once the generality of the correlation for the three cities and some local peculiarity concerning it. As to why the rate of correlation is lower in the Kwansai market than in the Kwanto market, I am not in a position to explain at present. It may perhaps be due to the difference in the organisation of the rice markets in the Kwanto and Kwansai districts.

This coefficient of correlation relates to the standard nature of the official quotation to which reference was made at the outset. In other words, this correlative coefficient may be taken as indicating the relative standard nature of official quotations. The fact that the current month delivery quotations of the tree cities stand in such correlation to their respective spot quotations testifies, in so far as it relates to the standard nature of official quotations, to the social functions of the Exchange.

Some time ago, I studied the correlation between the

wholesale and retail prices of rice in the city of Kyoto and found the coefficient: $r = 0.906$. Compared with this, the above-mentioned coefficient is somewhat lower. This is probably the natural outcome of the different nature of both kinds of correlation. The relation between wholesale and retail prices is, so to speak, direct, while that between spot quotations and current month delivery quotations is collateral.

It is not clear even in the light of common sense based on the long experience of those concerned in rice transactions, which of the two, spot quotations and current month delivery quotations, fluctuate first or which of the two leads the other. It sometimes happens that rice factors influence futures quotations strongly. but even in such cases, it is not very clear whether it is in futures quotations or in spot quotations that rice factors make themselves felt at first. Much less is it possible for common knowledge to determine the point in a general way. In order to determine this point of priority, I have adopted the method of putting spot quotations one month forward or backward to find the correlation with current month delivery quotations. For instance, when advancing spot quotations one month, spot quotations for February are put in correlation with current month delivery quotations for January. If current month delivery quotations in the Rice Exchange run one month ahead of spot quotations, the correlative coefficient in this case must be largest. If, on the contrary, spot quotations go one month ahead of the other, the biggest correlative coefficient ought to be obtained when spot quotations are put backward one month. The following table shows the results of calculations separately made about the three cities :—

Tokyo
/ Coefficient when spot quotations have been
  put forward by one month ...... 0.708, 0.333, ...,
{ Correlative coefficient for the same month... **0.895,**
  Coefficient when spot quotations have been
\ put backward by one month...... 0.607, 0.122, ...,

Osaka
{
Coefficient when spot quotations have been put forward by one month ...... 0.710, 0.454, ...,
Correlative coefficient for the same month... **0.787,**
Coefficient when spot quotations have been put backward by one month ..... 0.438, 0.009, ... ,
}

Kyoto
{
Coefficient when spot quotations have been put forward by one month ...... 0.752, 0.449, ...,
Correlative coefficient for the same month... **0.759,**
Coefficient when spot quotations have been put backward by one month...... 0.385, 0.004, ...,
}

From the above, it may be seen that in all three cities (1) The correlative coefficient for the same month is the biggest, (2) the coefficient when spot quotations have been put forward by one month comes next, (3) the coefficient when spot quotations have been put backward by one month is remarkably lower than the other two, and (4) the coefficient when put backward by one month is always lower as compared with that when put forward by one month. All this testifies, in a general way, to the preceding tendency of current month delivery quotations. However, as is clear from the fact that the coefficient for the same month is biggest, they do not necessarily run one month ahead of spot quotations. At any rate, the fact that the coefficient in this case is far higher than that when spot quotations have been put forward by one month proves that current month delivery quotations have a much stronger tendency to lead than have spot quotations.

This result is related to the leading nature of official quotations, to which reference was made in the opening chapter. If a result entirely different from this had been obtained and if it had been proved that spot quotations, not current month delivery quotations, run ahead, the economic importance of official quotations would be less than the index number of the price of rice, and much doubt would necessarily be cast on the social functions of the Rice Exchange. As it is, the preceding tendency of current month delivery

quotations has been clearly proved, a fact which shows that such quotations have a more or less leading nature.

4. 2-MONTH DELIVERY QUOTATIONS AND SPOT QUOTATIONS.

As the middle quotations represent the quotations of the rice to be delivered at the end of the month following that in which the transactions were arranged, they are not so markedly influenced by the prevailing rice factors as current month delivery quotations. They rather seem to reflect future rice factors. But transactions in middles are passive in nature, as they are chiefly carried out either for the purpose of cancelling past transactions by means of re-sales or re-purchases, or in order to convert the deals already completed into futures, but not on any positive bulling or bearing impulses in anticipation of the future rise or fall in the price of rice. For when speculators start positive activity in anticipation of future fluctuations, they prefer to transact in 3-month deliveries rather than in 2-month deliveries, even when their anticipation of fluctuations refers to the following month, so that their dealings may cover a wider scope. Nor are 2-month deliveries so convenient as current month deliveries for rice merchants who make either purchases or sales for the purpose of the actual delivery of rice. For these reasons, of the three different dealings, 2-month deliveries are most barren of positive sales and purchases. This is the reason why not much importance is attached, comparatively speaking, either to transactions in 2-month deliveries or to 2-month delivery quotations. Regardless of the personal intentions of the parties to transactions, however, it seems fair to conclude that the second-month deliveries quotations, which are the outcome of their rival biddings, are predictive of fluctuations at a date more distant than current month deliveries quotations indicate and nearer than 2-month delivery quotations do. It is theoretically possible to suppose that they take their place between the other two in this connection.

In order to make this point clear, 2-month delivery quotations cannot be left entirely out of consideration. I shall next describe the result obtained by applying the same method as stated above.

To begin with, the coefficient when spot quotations and 2-month delivery quotations for the same month are correlated with each other is :—

Tokyo : $r=0.774$ Osaka : $r=0.718$ Kyoto : $r=0.737$

It will be seen that the three cities have coefficients which are very similar to one another, and that the correlation in each case is quite close. As compared with the case of current month delivery quotations, however, the degree of correlation is somewhat lower in all these cities. Thus, it may be concluded that the correlation with spot quotations is closer in the case of current month deliveries than in that of 2-month deliveries, or, in other words, the standard nature of official quotations is more pronounced in current month deliveries quotations than in the other.

Secondly, in order to ascertain learn whether 2-month delivery quotations really forecast the future movement of the rice price or, if they do, what is the degree of prediction, we have to put spot quotations one month forward for correlation with second-month delivery quotations and compare the correlative coefficients. If, as is naively imagined, 2-month delivery quotations predict the rice price a month hence, the coefficient ought to be largest when spot quotations for February, for example, are correlated with second-month deliveries for January, putting the former by one month. The following table shows the result of calculations. For reference, the coefficient when spot quotations are put backward by one month is also given.

Tokyo {
Coefficient when spot quotations have been put forward by one month 0.756, 0.489, 0.155,
Correlative coefficient for the same month... **0.774,**
Coefficient when spot quotations have been put backward by one month... 0.356, −0.141, ...,
}

Osaka ⎰ Coefficient when spot quotations have been
put forward by one month 0.685, 0.497, 0.239,
Correlative coefficient for the same month .. **0.718,**
Coefficient when spot quotations have been
put backward by one month... 0.303, −0.166, ... ,

Kyoto ⎰ Coefficient when spot quotations have been
put forward by one month 0.717, 0.477, 0.127,
Correlative coefficient for the same month... **0.737,**
Coefficient when spot quotations have been
put backward by one month... 0.321, −0.081, ... ,

As the above table shows, 2-month delivery quotations, like current month delivery quotations, have the largest coefficient when correlated with spot quotations for the same month. The belief that 2-month delivery quotations may most strongly forecast the rice price of a month after is not correct, though it is wrong to deny their predictive nature simply on that accoupt. On the other hand, they are shown to have a stronger predictive nature than current month delivery quotations. Because, while the difference between the coefficient when spot quotations are put one month forward and the one when quotations for the same month are correlated is smaller than that of current month delivery quotations, the disparity between the coefficient when spot quotations are put one month backward and the one when quotations for the same month are correlated is bigger than that of current month delivery quotations. It is also noteworthy that these results, as the above-mentioned coefficient shows, are common to the three cities.

5. 3-MONTH DELIVERY QUOTATIONS AND SPOT QUOTATIONS

Of the three kinds of futures dealings, the volume of transactions is largest in 3-month deliveries. It is mainly in the 3-month option market that speculators act positively in anticipation of future fluctuations in the rice prices.

Consequently, it is generally believed that 3-month delivery quotations have the largest measure of the nature for forecasting the future prices of rice, but exactly how much of a forecasting nature they have can only be ascertained by comparison of the correlative coefficient in the manner already described. The result of calculations may be thus shown —

Tokyo
Coefficient when spot quotations have been put one month forward...0.700, **0.488**, 0.200, 0.067, ...,
Correlative coefficient for the same month **0.720,**
Coefficient when spot quotations have been put one month backward ....0.319, 0.140, ...,

Osaka
Coefficient when spot quotations have been put one month forward.. 0.500, **0.497**, 0.235, 0.003, ... ,
Correlative coefficient for the same month **0.594,**
Coefficient when spot quotations have been put one month backward ....0.199, −0.261, ...,

Kyoto
Coefficient when spot quotations have been put one month forward...0.572, **0.442**, 0.193, 0.006, ...,
Correlative coefficient for the same month **0.553,**
Coefficient when spot quotations have been put one month backward .... 0,219, −0.175, ... ,

As it obvious from the above, 3-month delivery quotations are not necessarily most strongly predictive of the prices of rice two months hence. They are rather most closely correlated with the spot quotations for the current month. This result deserves attention, as it testifies to the mistake we are liable to fall into from making hasty guesses.

This result, however, does not, entirely militate against the farecasting nature of 3-month delivery quotations. If the changes which come over the above-mentioned coefficients are carefully studied, in comparison with those concerning current month and 2-month delivery quotations, it will be seen that 3-month delivery quotations have a forecasting nature more pronounced than that of the other two. In

order to make this point clear, the index number of each of the coefficients, worked out with the coefficient of quotations for the same month as 100, is given below :—

Quota-tions.	Tokyo.				Osaka.				Kyoto.			
	One month put forward.	Two months put forward.	One month backward.	Two months backward.	One month put forward.	Two months put forward.	One month backward.	Two months backward.	One month put forward.	Two months put forward.	One month backward.	Two months backward.
Current month	79.11	37.21	67.82	13.63	90.22	57.69	55.65	1.14	99.07	59.16	50.72	− 0.53
2-month	97.67	63.18	45.99	−18.22	95.40	69.22	42.20	−23.12	97.28	64.72	43.55	− 1.10
3-month	97.22	67.78	44.31	19.44	84.18	83.67	33.50	−43.92	103.44	79.93	39.60	−31.65

From the above table, it will be seen that the index number of coefficients given in the second section of each city (where spot quotations are put forward by two months) progressively increases as seen from top to bottom. This means that 3-month delivery quotations have the largest measure of the nature to predict the price of rice two months from that time. The above table also shows that with the exception of Kyoto, the nature of predicting the price of rice a month later is most pronounced in 2-month delivery quotations. In short, it may be said that although the forecasting nature of futures quotations is not so marked as their standard or leading nature, it is discernible in 3-month delivery quotations more strongly than in the other quotations.

6. CONCLUSIONS

To sum up what has been affirmed in the preceding chapters regarding the correlation between spot quotations and futures quoations of rice :—

(1) There is a fairly large measure of generality about this correlation for all cities. As speciality attaching to it, however, it may be noted that the correlative coefficient is

almost invariably high in Tokyo, and that the tendency of futures quotations to go ahead of spot quotations is somewhat more marked in Kyoto than elsewhere.

(2) The correlation with spot quotations, which is generally taken for granted, is recognisable to a pretty high degree in all three kinds of futures quotations, though there is a difference in degree among them. It is largest in current month delivery quotations and smallest in 3-month delivery quotations, 2-month delivery quotations taking their place between them. From these facts it is possible to recognise the general standard nature of futures quotations. Such a nature is particularly noticeable in current month delivery quotations.

(3) In futures quotations—even in current month delivery quotations—the tendency to go ahead of spot quotations is clearly observable. This tendency is, needless to say, more marked in 2-month and 3-month delivery quotations. The leading nature of futures quotations thus sufficiently manifests itself.

(4) The forecasting nature of futures quotations is not, generally speaking, so manifest as their standard or leading nature, but, by comparison, this nature is more largely perceptible in 3-month delivery quotations than in the other two quotations, current month and 2-month. In short, so far as the influences exerted by official quotations on the price of rice are concerned, it seems fair to conclude that the social functions of the Rice Exchange are being fulfilled in present-day society to a certain extent, though not completely. I admit that the present article lacks thoroughness in its treatment of the subject, but nevertheless I hope and believe that it has done something to set forth these points statistically.

KICHIHIKO TANIGUCHI.