Two Essays on the Economics of *Kye* (契)

Kwan Chi Oh*

I. The Economics of *Kye* and Position Selection Behavior[1]

The economic behavior of individuals' selection of particular *kye* and positions in a *kye* is based upon choice criteria. The selection of a *kye* or a position in a *kye* is not the same as an investor's portfolio selection. A *kye* member combines in varying degrees the characteristics of both a borrower and a lender of funds. In the following sections we shall first propose choice criteria for borrowers and lenders of funds, then we will try to test various hypotheses derived from the choice criteria by empirical data.

Choice Criteria

At any moment in time, a potential borrower of funds can be characterized by the nature of his needs for funds: a needed outflows of funds in two dimensions, size of fund and time within his economic horizon. Let $[t_0, T]$ be the economic horizon of a potential borrower of funds, where t_0 and T are the present time and the end of the horizon, respectively. At time t_0 his needed outflows of funds for the horizon consist of anticipated and unanticipated outflows of funds. The former, comprising rigidly fixed consumption expenditures, planned investment expenditures and other specific expenditures with known probabilities concerning the time and size of fund, are probabilistic outflows of funds in nature. On the other hand, the latter comprise outflows of funds caused by uncertainties of changes in future economic conditions.

Given the complex outflows of funds, the potential borrower will plan to build inflows of funds according to the condition that the expected marginal return on investment of the borrowed funds is equal to the sum of the marginal cost of bor-

* Assistant Professor of Economics, Korea Military Academy. The author would like to express his gratitude to Dr. Suk Bum Yoon for his helpful comments on this paper.

1) An earlier version of this paper was presented to the 1973 Annual Meeting of the Korean Economic Association.

rowing and premium for risks associated with the investment, or his marginal rate of substitution of present consumption for future consumption is equal to the marginal cost of borrowing for *every moment of time t within the economic horizon, i.e.,* $t_0 \leq T$, while maintaining provisions for uncertainties, subject to budget constraint.

In selecting a particular combination of financing methods, therefore, the potential borrower must consider *access to funds* for both anticipated and unanticipated outflows of funds and *cost of borrowing*. These are two main considerations of potential borrowers of funds in selecting a particular combination of financing methods regardless of their different economic attributes.

While it has been widely accepted that lenders of funds (financial investors) maximizes expected return for a given level of risk, there is no well accepted theory on how an individual selects a particular set of expected return and risk out of all feasible efficient sets.[2] Most portfolio selection theories start from an assumption that an investor can set his target level of expected return, then attempt to minimize risk given the expected return. For the concept of expected return to be relevant, however, the law of large numbers should be applicable: the materialized return approaches the expected return probabilistically as the sample size increases.

Investment behavior under uncertainty is basically gambling in nature. Not only is the investor's subjective probability distribution of return inconcrete, but also the law of large numbers cannot be fully applicable. An investor thus may set first the desired minimum level of return as a safety criterion (or the maximum level of loss acceptable), then he may define a choice set comprising investment options each of which is expected to yield return at least greater than or equal to his desired minimum level. Choice of particular investment option out of his choice set depends upon his subjective risk preference.

If we assume that an investor can derive his subjective probability distribution of return on each of his investment option from past data and personal experiences, the inveatment behavior can be more concretely described. Let E and σ be expected return and standard deviation, respectively. Let L be the desired minimum level of return (safety criterion) on investment of one dollar per unit of time. Then, the choice set comprises investment options such that for a number λ

2) A set is efficient if expected return can be increased by only increasing risk.

$$E-\lambda\sigma \leq L$$

for each investment option, then the choice set consists of investment options each of which has the lower confidence limit greater than or equal to the desired minimum return. Choice of particular option depends upon his subjective risk preference. He will select an investment option so as to maximize expected return for a given level of risk. We make thus the following proposition:

Propcsition: In selecting a specific combination of financing methods, potential borrowers of funds consider first *access to funds*, and then *the cost of borrowing*. Lenders of funds first set their *desired minimum return level* and collect a set of options each of which has expected return greater than or equal to the minimum return, then they select an investment option which has the greatest expected return for a given level of risk.

Empirical Investigation

If the choice criteria for the *kye* and position selection were explained by the proposition, we could expect to observe different first-consideration in selecting different positions. Holders of early positions would give greater weight to access to funds. Those holding later positions may consider mainly the rate of return over cost in the *kye*. The middle position-holders, of course, fall between the two extremes. Thus, we have a rather obvious hypothesis:

I. *In selecting a specific position in the sequence, the early position holders take access to funds as their first consideration, while the late position holders take rate of return over cost on investment in the kye as their first consideration.*

Table 1 shows a frequency distribution of positions by first consideration. As is clear from the table, position-holders in the first one-third take access to funds predominantly, and those in the last one-third positions take return relatively more frequently, while holders of middle positions fall between the two extremes. The null hypothesis that all position-holders come from the same population with respect t to first consideration can be tested by χ^2 k-sample test.[3]

The computed χ^2 is 100.5 for 6 degrees of freedom. Thus, we can reject the null

3) S. Siegel, *Nonparametric Statistics*, (New York, 1956), pp. 42—7.

Table 1 Frequency Distribution of the First Considerations in Selecting a Position by Position

First consideration	Position held within First one-third	Second one-third	Last one-third	Total
Access to funds	183	154	99	436
Rate of return in the *kye*	62	72	131	265
Security	16	3	0	19
Other	0	9	19	28
Total	261	238	249	748

$\chi^2(6)=100.5$ $\chi^2(6)_{.01}=16.81$

Source: The author's sample survey in Seoul 1971.

hypothesis at greater than 99 percent confidence level. The different position-holders have different motives in selecting their positions in the sequence. The two considerations, access to funds and rate of return over cost in the *kye*, are the predominant first considerations in selecting position, and the statistical observations support the proposition.

In a broad sense, the nature of needs for funds may be categrized into investment and consumption. And there may be two kinds of investment of specific nature whose opportunities must be captured more or less immediately, and investment whose opportunities are not perishable or whose specificity awaits later development in fund accumulation. Most investment in business and private loans are of the former type. Specific real estate also fits here. On the other hand, some lump-sum investment in business, nonspecific real estate, bank deposits, and other unattractive investment opportunities are of the latter type. Though potential real estate investors may hold both early and late positions according to the specificity, it is quite possible that relatively more of them hold late positions because, in most cases, investors accumulate funds first, then look for real estate to buy. The same argument holds for private loans as investment. Thus, we have a second rather obvious hypothesis:

Ⅱ. *Investments whose opportunities must be captured immediately (perishable investment opportunities) are financed with funds from the early positions, while investments whose opportunities are not perishable are financed with funds from the late positions.*

Since most investment opportunities in business must be captured immediately, and bank deposits are the most unattractive imperishable investment opportunity, polarization of positions in these regards is expected to be greater. On the other hand, the polarization is expected to be less between private loans and real estate investment. Table 2 shows a frequency distribution of positions by type of investment opportunity.

Table 2 Frequency Distribution of Positions by Investment Opportunity

Investment	Position held within: First one-half	Second one-half	Total
Business	202	56	258
Bank deposits	19	107	126
Total	221	163	384
	$\chi^2(1)=154.7$ $\chi^2(1)_{.01}=6.64$		
Private loans	85	41	126
Real estate	69	109	178
Total	154	150	304
	$\chi^2(1)=23.6$ $\chi^2(1)_{.01}=6.64$		

The two χ^2 tests can reject the null hypotheses, (1) investors in business and bank deposits come from the same population with respect to selected position, (2) investors in private loans and in real estate come from the same population with respect to selected position at greater than 99 confidence level. The most perishable investment opportunities have been captured with *kye* funds from early positions, while less perishable or unattractive ones (relative to the return from *kye*s) have been financed with funds from the late sequence positions. The polarization of positions shown by the two χ^2 values is consistent with our expectation.

Turning to consumption cash flow needs as a motive for joining *kye*s, it is difficult to judge the degree of postponability of consumption needs by looking at the categories of expenditure only. If households anticipate needs for future consumption expenditures, they start saving to accumulate funds the moment the needs are perceived. Of those households with cash needs materializing presently or in the near future, some would have accumulated sufficient past savings (with the possible aid of *kye*s joined earlier) to meet needs without borrowing; others join

the *kye* and take up early positions. Those households whose needs come later would join the *kye* and take late positions. Since relatively fewer such families would have accumulated sufficient funds for late-materializing needs, the frequency distribution for the *kye* would be unbalanced toward the late positions even if the frequency distribution of all households with anticipated consumption needs is evenly spread out on a time scale (equal to the life of a *kye*). This is all the more true since some consumption needs are recurring. The usual cycle shows that households save monthly for a year in a *kye*, then get the *kye* fund to pay an expense (*e.g.*, school expenses). If consumption needs are more postponable and subject to planning (*i.e.*, anticipation is perfect) as in consumer durables, expected division of frequency between early and late positions is not easy. It is a personal matter of choice involving the utility of an immediate possession and the cost of borrowing as compared with postponed possession and returm on saving to be accumulated.

It is our conjecture that individuals, in planning inflows of funds for their economic horizon, will do their best to meet the anticipated future consumption expenditures with accumulated fund (savings) by the time of expenditure-materializing rather than with borrowed funds (debts). The unanticipated, unpostponable consumption needs such as medical bills may be met first by private loans, then the debts may be paid either with forthcoming *kye* funds or by taking early positions in a *kye*. Not only are private loans more expensive than the *kye* loans, but also put greater strain upon borrowers. Thus, we have a third hypothesis:

Ⅲ. *Unanticipated or less postponable consumption expenditures are financed with funds from the early positions, while anticipated or more postponable consumption expenditure are financed with funds from the late positions.*

As shown in Table 3, there are four categories of consumption needs, payment of debt, school expenses, living expenses and purchase of consumer durables. Payment of debt is the least postponable due to the legal issues involved and may represent the outcome of unanticipated unpostponable consumption expenditures. Consumer durables are certainly the most postponable and definitely anticipated (subject to planning), while school and living expenses fall between them.

Table 3 Distribution of Positions by Type of Consumption Need

Consumption need	Position held within		Total
	First one-half	Second one-half	
Payment of debt	105	72	177
School expenses	288	391	679
Living expenses	26	33	59
Consumer durables	41	53	94
Total	460	549	1009

$\chi^2(3)=21.7 \quad \chi^2(3)_{.01}=11.34$

Source: The author's sample survey in Seoul, 1971.

The division of cell frequencies show clearly the association consistent with our expectation. The χ^2 test can reject the null hypothesis that all consumption expenditures are financed with the *kye* funds which come from the same population with respect to sequence of the position at greater than 99% confidence level. Thus, the hypothesis is confirmed.

Since investment opportunities are more open to owners of businesses, uses of *kye* funds may be closely related with the occupation of households. Thus, we have a fourth hypothesis:

Ⅳ. *Uses of kye funds are different among different occupational groups.*

Table 4 shows the frequency distribution of uses of *kye* funds by occupation with a direction of association consistent with the χ^2 test can reject the null hypothesis that there is no difference in the uses of *kye* funds among different occupational groups at greater than 99 percent confidence level. Owners of businesses invest *kye* funds relatively more frequently than the salary and wage-earners, while the latter use *kye* funds to finance consumption needs relatively more frequently.

Table 4 Frequency Distribution of Uses of *Kye* by Occupation

Uses	Owners of business	Salary and wage earners	Total
Investment	239	126	365
Consumption	228	256	484
Total	467	382	849

$\chi^2(1)=28.0 \quad \chi^2(1)_{.01}=66.4$

Since the main category of consumption expenditures is the school expenses of their children for the salary and wage-earners, some qualification is needed in interpreting the results. There are good arguments against the procedure of the conventional national income accounting which consider educational expenses as consumption.[4]

Hitherto, we have been mainly concerned with the sequence *kye*. As explained before, the sequence *kye* has many merits which can be welcomed by the majority of households. However, it has an intrinsic weakness in the mechanics of fund allocation: once a *kye* is organized with a predetermined payment-receipt scheme, there is no flexibility in adjusting to unanticipated needs for funds. Businessmen should always be on the alert for changing economic conditions to avoid possible losses or to take advantage of profitable investment opportunities. To them access to funds in a short time is a prerequisite; therefore they would participate in the auction *kyes*.

On the other hand, households, whose future needs for funds are anticipated, would join the sequence kyes. They can avoid uncertainties regarding access to funds by joining them. Future needs for funds may be anticipated with more exactness for salary and wage-earners' households than for other groups. We can expect, therefore, that salary and wage-earners participate in the sequence kyes relatively more frequently. Thus, we have a fifth hypothesis:

V. *Different occupational groups have different mixes of kyes.*

Table 5 shows a distribution of kyes by occupational group.

Table 5 Frequency Distribution of Kinds of *Kyes* by Occupation

Kind	Owners of business	Salary and wage-earners	Total
Sequence *kye*	724	687	1411
Auction *kye*	158	47	205
Total	882	734	1616

$\chi^2(1)=130.4 \quad \chi^2(1)_{.01}=6.64$

Source: The author's sample survey in Seoul, 1971.

4) Anthony M. Tang, "Research and Education in Japanese Agricultural Development," *Economic Studies Quarterly* (Feb. and May, 1963), pp. 27—41 and 91—99.

The observed frequency distribution shows clearly the association between kind of *kye* and occupation consistent with the hypothesis. The χ^2 test can reject the null hypothesis that all occupational groups come from the same population with respect to mix of kind of *kye*s at greater than 99 percent confidence level. Thus, the hypothesis is confirmed.

As different occupational groups select different mixes of kinds of *kye*s as provisions for different uncertainties, they also may choose different sizes of *kye*s with respect to *kye* fund to accomodate their specific needs. If households expect more needs of a single lump-sum fund, they would join *kye*s with large funds. On the other hand, households who anticipate more frequent needs of small amounts may join smaller *kye*s. Usually, investment expenditures are of the former type, while consumption expenditures are of the latter. Thus, we have a sixth hypothesis:

Ⅵ. *Different occupational groups select kyes with respect to different sizes of funds.*

Table 6 shows a distribution of *kye*s of different sizes by occupation.

Table 6 Frequency Distribution of Size of *Kye*s by Occupation

Size(wons)	Owners of business	Salary & wage earners	Total
Less than 200,000	188	330	518
200,000—500,000	214	52	266
500,000 & over	80	9	89
Total	482	391	873

$\chi^2(2)=267.8$ $\chi^2(2)_{.01}=9.21$

Source: The author's sample survey in Seoul, 1971.

The cell frequencies show clearly that owners of business are associated with large *kye*s, whereas salary and wage-earners are associated with smaller *kye*s. The χ^2 test can reject the null hypothesis that all occupational groups come from the same population with respect to size of *kye* funds at greater than 99 percent confidence level. Thus, the hypothesis is confirmed. Households adjust the size of the *kye* funds to their needs for funds. This is another flexibility in meeting their needs which can be obtained by wise selection of *kye*s.

Households can have still another flexibility by joining more than one *kye*. No single *kye* can provide the necessary inflows of funds which households can synchronize with thir outflows. Hence, households may select a mix of positions in different *kye*s which are differentiated by size of fund, timing, length of life, liquidity and risk to approximate the inflows of funds to their outflows, subject to their budget constraints. Thus, we have a seventh hypothesis:

Ⅶ. *Households select more than one kye purposefully for a finite period of time.*

There is no a priori ground to argue that a particular group of households has more complex outflows of funds than the others. Since participating in many *kye*s is generally limited by households' budget constraints, we shall examine *kye* participation by income class. The higher income classes may have a greater ability to join many *kye*s than the low income classes. If we observe that the former participate in more *kye*s than the latter, what is the economic rationale for this behavior?

There may be three possible explanation for this: (1) any one member cannot take more than one or two positions in a *kye* because there are a limited number of positions available in the *kye*; (2) households want to have access to large lump-sum funds, but sufficiently large *kye*s do not exist, (3) they join many *kye*s purposefully to diversify investment and to have greater flexibility. Explanations (1) and (2) are only possible in the very short-run. If there had been sufficiently large number of households who had sought large *kye*s, economic forces would have led them to organize *kye*s of the preferred sizes in the long-run. Therefore, the first two are not economically well founded. Households may join many *kye*s to diversify investments, but there may be a limit to minimizing risks by diversification. As they increase the number of *kye*s joined, less dependable households may come in their kyes; therefore, the default risks may rise after a certain point.

It is clear that risks cannot be reduced by joining many *kye*s, but participation in many *kye*s can certainly increase the flexibility in building inflows of funds to accomodate outflows. Therefore, we may argue that households join many *kye*s to have greater flexibility.

Table 7 shows a distribution of numbers of *kye*s participated in by income class. It clearly shows the direction consistent with the hypothesis that the higher income classes are associated with a greater number of *kye*s. The null hypothesis that all

income classes come from the same population with respect to the number of *kye*s joined can be rejected at greater than 99 percent confidence level. Thus, households participate in many *kye*s for a finite time period purposefully within their budget constraints.

Table 7 Frequency Distribution of Number of *Kye*s Participated in by Income Class

Number of *kye*s	Monthly average income(won)					Total
	Less than 30,000	30,000— 50,000	50,000— 80,000	80,000— 100,000	100,000& over	
1	91	140	71	50	28	380
2	17	59	80	59	27	242
3	0	0	16	16	14	71
4 & over	0	0	17	8	6	31
Total	108	224	184	133	75	724

$\chi^2(12)=120.5 \quad \chi^2(12)_{.01}=26.22$

Source: The author's sample survey in Seoul, 1971.

Conclusion

In this paper we have attempted to test various hypotheses on households' *kye* and position selection behavior. Over an economic horizon, needs for funds for any households can be described by outflows of funds in two dimensions, the size of fund and time of need, together with uncertainties. Given outflows of funds, households endeavour to build a *mosaic* of inflows to approximate the outflows by taking various positions in many *kye*s which are differentiated by the size of the fund, timing, length of life, liquidity and risk, subject to budget constraints.

In general, results of empirical examinations are consistent with the proposed choice criteria. *Kye*s are very efficient and convenient informal financial intermediaries in the absence of better substitutes in the organized financial sector.

II. An Analysis of the Sequence Structure of Rates of Return over Cost in *Kyes*

Conceptually, the sequence structure of rates of return over cost in a *kye* is the set of rates of return attaching to positions of the *kye* which draw from an identical *kye* fund in a fixed sequence of borrowing. In order to analyze the sequence structure of rates of return over cost, first we shall define a theoretical *kye* together with the interest rate underlying an actual *kye*. Then, we shall construct a proposition to explain the sequence structure. Finally, we shall examine some empirical evidences supporting our proposition. In the following sections a sequence *kye* and an auction *kye* will be analyzed seperately.

The Sequence *Kye*

The interest payments and earnings of *kye* members are embedded in the predetermined monthly *kye* payment-receipt scheme in a sequence kye, while they depend upon the actual outcomes of bidding in an auction *kye*.

Superficially, there seems to be no difficulty in finding the internal rates of return for all positions-holders on the bases of cash flows shown in the monthly payment-receipt scheme, but a closer examination reveals various theoretical difficulties.[5] Moreover, when it comes to actual computations, we encounter various difficulties: (1) which one is the right internal rate of return out of many rates for a cash flow over multiple periods? (2) how can we interprete a discontinuity of rates of return between contiguous positions? (3) how can we interprete a rising rate of return with sequence for the earlier and later position-holders, and very high internal rate of return for a few middle position-holders and nonexistence of the rates of return for some middle position-holders?

Table 1 shows the monthly payment-receipt scheme of the most popular sequence

5) Theoretical as well as empirical difficulties have been well recognized by writers on capital budgeting decisions. See Jack Hirshleifer, "On the Teory of Optimal Investment Decision," *Journal of Political Economy* (August, 1958), pp. 329—52, J. H. Lorie and L. J. Savage, "Three Problems in Rationing Capital," *Journal of Business* (October, 1955), pp. 236—9, and A. A. Alchian, "The Role of Interest, Fisher's Rate of Return over Cost, and Keynes' Internal Rate of Return," *American Economic Review* (December, 1955), p 636.

kye consisted of 20 positions for a *kye* fund of 50,000 wons. The first column, for example, shows that the holder of the first sequence position receives the *kye* fund of 50,000 wons at the first monthly meeting, then he pays in his monthly payment of 3,350 wons from the second meeting to the last. The cash flow with a negative sign stands for the corresponding sequence position-holder's monthly payment, and the positive lump-sum cash flow stands for his receipt, *i.e.*, the *kye* fund.

The actual pattern of the sequence structure of internal rates of return from the monthly payment-receipt scheme shown in Table 1 is shown on Figure 1. It starts at 2.6 percent per month for the first position, then it rises with sequence up to 6.5 percent for the 7th position. For the four middle positions from the 8th to the 11th, the internal rates of return are not existent, *i.e.*, there do not exist nonzero

Table 1 Monthly Payment and Receipt Scheme of 50,000 Won-20 Position Sequene *Kye*

	Sequence position									
Month	1	2	3	4	5	6	7	8	9	10
1	**50000**	−3350	−3300	−3250	−3200	−3150	−3100	−3000	−2900	−2850
2	−3350	**50000**	−3300	−3250	−3200	−3150	−3100	−3000	−2900	−2850
3	−3350	−3350	**50050**	−3250	−3200	−3150	−3100	−3000	−2900	−2850
4	−3350	−3350	−3300	**50100**	−3200	−3150	−3100	−3000	−2900	−2850
5	−3350	−3350	−3300	−3250	**50150**	−3150	−3100	−3000	−2900	−2850
6	−3350	−3350	−3300	−3250	−3200	**50200**	−3100	−3000	−2900	−2850
7	−3350	−3350	−3300	−3250	−3200	−3150	**50250**	−3000	−2900	−2850
8	−3350	−3350	−3300	−3250	−3200	−3150	−3100	**50350**	−2900	−2850
9	−3350	−3350	−3300	−3250	−3200	−3150	−3100	−3000	**50450**	−2850
10	−3350	−3350	−3300	−3250	−3200	−3150	−3100	−3000	−2900	**50500**
11	−3350	−3350	−3300	−3250	−3200	−3150	−3100	−3000	−2900	−2850
12	−3350	−3350	−3300	−3250	−3200	−3150	−3100	−3000	−2900	−2850
13	−3350	−3350	−3300	−3250	−3200	−3150	−3100	−3000	−2900	−2850
14	−3350	−3350	−3300	−3250	−3200	−3150	−3100	−3000	−2900	−2850
15	−3350	−3350	−3300	−3250	−3200	−3150	−3100	−3000	−2900	−2850
16	−3350	−3350	−3300	−3250	−3200	−3150	−3100	−3000	−2900	−2850
17	−3350	−3350	−3300	−3250	−3200	−3150	−3100	−3000	−2900	−2850
18	−3350	−3350	−3300	−3250	−3200	−3150	−3100	−3000	−2900	−2850
19	−3350	−3350	−3300	−3250	−3200	−3150	−3100	−3000	−2900	−2850
20	−3350	−3350	−3300	−3250	−3200	−3150	−3100	−3000	−2900	−2850
Total payments[a]	63650	63650	62700	61940	60800	59850	58900	57000	55100	54150

Month	Sequence position 11	12	13	14	15	16	17	18	19	20
1	−2750	−2650	−2550	−2450	−2300	−2150	−2000	−1850	−1650	−1550
2	−2750	−2650	−2550	−2450	−2300	−2150	−2000	−1850	−1650	−1550
3	−2750	−2650	−2550	−2450	−2300	−2150	−2000	−1850	−1650	−1550
4	−2750	−2650	−2550	−2450	−2300	−2150	−2000	−1850	−1650	−1550
5	−2750	−2650	−2550	−2450	−2300	−2150	−2000	−1850	−1650	−1550
6	−2750	−2650	−2550	−2450	−2300	−2150	−2000	−1850	−1650	−1550
7	−2750	−2650	−2550	−2450	−2300	−2150	−2000	−1850	−1650	−1550
8	−2750	−2650	−2550	−2450	−2300	−2150	−2000	−1850	−1650	−1550
9	−2750	−2650	−2550	−2450	−2300	−2150	−2000	−1850	−1650	−1550
10	−2750	−2650	−2550	−2450	−2300	−2150	−2000	−1850	−1650	−1550
11	**50600**	−2650	−2550	−2450	−2300	−2150	−2000	−1850	−1650	−1550
12	−2750	**50700**	−2550	−2450	−2300	−2150	−2000	−1850	−1650	−1550
13	−2750	−2650	**50800**	−2450	−2300	−2150	−2000	−1850	−1650	−1550
14	−2750	−2650	−2550	**50900**	−2300	−2150	−2000	−1850	−1650	−1550
15	−2750	−2650	−2550	−2450	**51050**	−2150	−2000	−1850	−1650	−1550
16	−2750	−2650	−2550	−2450	−2300	**51200**	−2000	−1850	−1650	−1550
17	−2750	−2650	−2550	−2450	−2300	−2150	**51350**	−1850	−1650	−1550
18	−2750	−2650	−2550	−2450	−2300	−2150	−2000	**51500**	−1650	−1550
19	−2750	−2650	−2550	−2450	−2300	−2150	−2000	−1850	**51700**	−1550
20	−2750	−2650	−2550	−2450	−2300	−2150	−2000	−1850	−1650	**51800**
Total payments[a]	52250	50350	48450	46550	43700	40850	38000	35150	31350	29450

Source: The author's sample survey in Seoul, 1971.

[a]The sum of undiscounted monthly payments in current wons.

positive rates at which the present value of the income stream (*kye* fund) is equal to the present value of the cost stream (monthly payment). The internal rates of return falls drastically from 8.4 percent for the 12th position-holder to 0.2 percent for the 13th position, then it risese again with sequence. It was, therefore, not possible to find an economically meaningful sequence structure of internal rates of return—which behaves as the economic theories can explain or predict—for a sequence *kye*. In employing the present-value rule as an alternative, however, we also have a problem of which interest rate should be chosen as a discount rate. This leads us to investigate a theoretical sequence *kye* corresponding to an actual sequence *kye*.

A theoretical sequence *kye* can be constructed by visualizing an ideal sequence

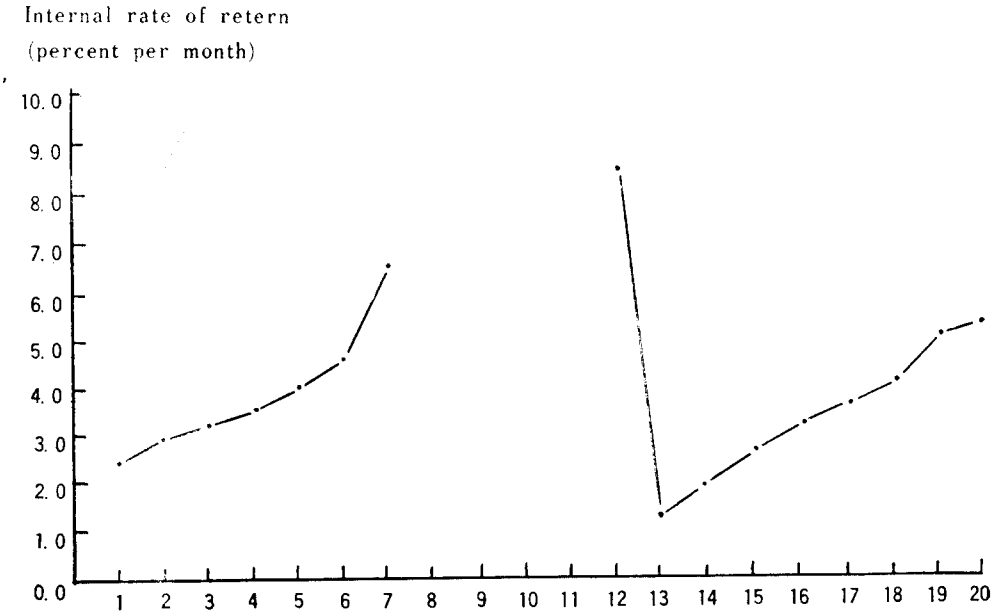

Figure 1. Sequence Structure of Internal Rates of Return in the Sequence *Kye* of 50,000 won - 20 Positions

kye as a competitive fund market under certainty. In this market the forces of supply and demand will establish eventually an equilibrium market price of funds which is invariant with sequence of borrowing. Let us call the ideal sequence *kye* which functions as a competitive fund market under certainty the theoretical sequence *kye*. Then, there exists a market equilibrium interest rate at which *kye* members borrow and lend funds freely. Let us call this equilibrium market rate the basic interest rate, denoted by r. Then, the monthly payment of the kth position, for example, a_k in a theoretical sequence *kye* of *A won—n position* can be computed from the condition that the present value of the receipt is equal to the present value of the monthly payments at the basic rate. Thus, we get

$$0.0=-a_k-a_k(1+r)^{-1}-a_k(1+r)^{-2}-,\cdots\cdots,\ -a_k(1+r)^{-(k-2)}+.1(1+r)^{-(k-1)}$$

$$-a_k(1+r)^{-k}-,\cdots\cdots,\ -a_k(1+r)^{-(n-1)}$$

After some algebraic manipulation we can solve for a_k as follows:

$$a_k=\frac{rA(1+r)^{n-k}}{(1+r)^n-1-r(1+r)^{n-k}} \tag{1}$$

Therefore, given the size of *kye* fund, A and the number of positions, n, a_k is a function of a single argument r, the basic interset rate. We will define the payment-receipt scheme computed from the equation (1) as the payment scheme of the theoretical sequence kye of A won—n position.

Suppose that the basic interest rate r of the theoretical sequence *kye*, corresponding the actual sequence *kye* of A won—n position, is known. Then, from equation (1) we can construct the payment-receipt scheme of the theoretical sequence *kye* which corresponds to that of the actual *kye*. If there were any differences between them, these differences should be due to provisions for (1) default risks and uncertainties on the part of lenders—first. (*i.e.*, holders of the late position); (2) security consideration on the part of the *kye* organizer;[6] (3) rewards to some of members for their responsibility in organizing and managing the *kye*.

Since organizing a *kye* involves the organizer's special entrepreneurial functions, and the necessary compensation for them should be made within the *kye* itself, the organizer must modify the monthly payments of the theoretical sequence *kye* according to his own evaluation of the necessary provisions for each position for the *kye* to be operational, subject to two conditions: (1) that the sum of monthly payments of the actual *kye* at each meeting be equal to the predetermined size of *kye* fund, (2) that the sum of deviations of the actual *kye*'s payments from the corrresponding ones of the theoretical *kye* be equal to zero. Let a_k and c_k be the kth position's monthly payment in the theoretical and actual sequence *kye* respectively. Then the above conditions imply

$$\sum_{k=1}^{n} c_k=A \tag{2}$$

$$\sum_{k=1}^{n} (a_k-c_k)=0.0 \tag{3}$$

where A: the predetermined sized of *kye* fund

6) The reader should be cautioned that current organizers do not design new monthly payment-receipt schemes in most cases. They choose the schemes that suit their purpose best from prevailing ones in their community.

n: the number of positions predetermined.

Equation (2) is, however, redundant because given $\Sigma a_k=A$, Equation (3) includes Equation (2). Given the payment-receipt scheme of an actual *kye*, therefore, we can find the corresponding payment-receipt scheme of the theoretical sequence *kye*. The procedure is an iterative method to find the interest rate r and the corresponding a_k's from the two Equations (1) and (3):[7] first, generate a_k's for different r's by equation (1), second find that r and corresponding a_k's satisfying equation. (3).

The r and a_k's so identified are, respectively, the basic interest rate and monthly payments of the theoretical sequence *kye* whice corresponds to the actual *kye*. Since the basic interest rate thus identified is the best information on the discount rate which is essential to applying the present-value rule, the Fisherian rates of return over cost for sequence positions are computed by Equation (4) at the basic rate:[8]

$$R_k=\frac{B_k-C_k}{C_k}r \tag{4}$$

where R_k: the rate of return over cost of the kth position-holder; *i.e.*, the perpetual income flow on investment of one dollar in the *kye* at the first meeting

B_k: present value of *kye* fund received by holder of the kth position

C_k: present value of total monthly payments of holder of the kth position

r: the basic interest rate identified

Table 2 shows the theoretical sequence *kye* corresponding to the actual sequence *kye* shown in Table 1 and its computed rates of return over cost. The basic interest rate so identified is 3.6 percent per month. It should be emphasized that provisions for risks and uncertainties associated with different positions, the organizer's special entrepreneurial functions and other factors are not considered in the theoretical sequence *kye*. As we see from the column, "Deviation," the actual *kye*'s monthly payments deviate from the theoretical *kye*'s. For the first four positions

7) The actual number of unknowns is $n+1$; $r, a_1, a_2, \cdots, a_n$, and the number of equation is also $n+1$; n equations are given by Equation (1) for $k=1,2,\cdots, n$ and Equation (3).

8) Irving Fisher, *The Theory of Interest*, (New York, 1930), pp. 15—66.

Table 2 **The Theoretical Sequence *Kye* and Rates of Return over Cost in the Actual Sequence *Kye***

Position	Actual Sequence *Kye* (A) (wons)	Theoretical Sequence *Kye* (T) (wons)	Deviation (A-T) (wons)	Rate of return over cost[a] (at r=3.6%/month)
1	3,350	3,679	−329	.310
2	3,350	3,542	−192	.172
3	3,300	3,414	−114	.097
4	3,250	3,291	− 41	.024
5	3,200	3,172	28	−.046
6	3,150	3,058	92	−.114
7	3,100	2,949	151	−.179
8	3,000	2,846	154	−.184
9	2,900	2,747	153	−.185
10	2,850	2,649	201	−.244
11	2,750	2,558	192	−.239
12	2,650	2,469	181	−.229
13	2,550	2,384	166	−.215
14	2,450	2,302	148	−.195
15	2,300	2,225	75	−.094
16	2,150	2,151	− 1	−.025
17	2,000	2,079	− 79	.167
18	1,850	2,010	−160	.336
19	1,650	1,945	−295	.666
20	1,550	1,879	−329	.788

[a]Calculated from equation (4).

and last five positions, the payment in the actual *kye* is less than the corresponding one in the theoretical *kye*, while the eleven middle positions pay greater monthly payments in the actual *kye* than in the theoretical *kye*. This pattern of the monthly payments in the actual *kye* is reflected clearly by the U-shape of the sequence structure of rates of return over cost shown on Figures 2 and 3.

How can we, then, euplain the deviations of the actual *kye*'s monthly payments from the theoretical *kye*'s ones which lead to the U-shape sequence structure of rates of return over cost? As an explanation, we present the following proposition:

Proposition : In the theoretical *kye* neither risks associated with different po-

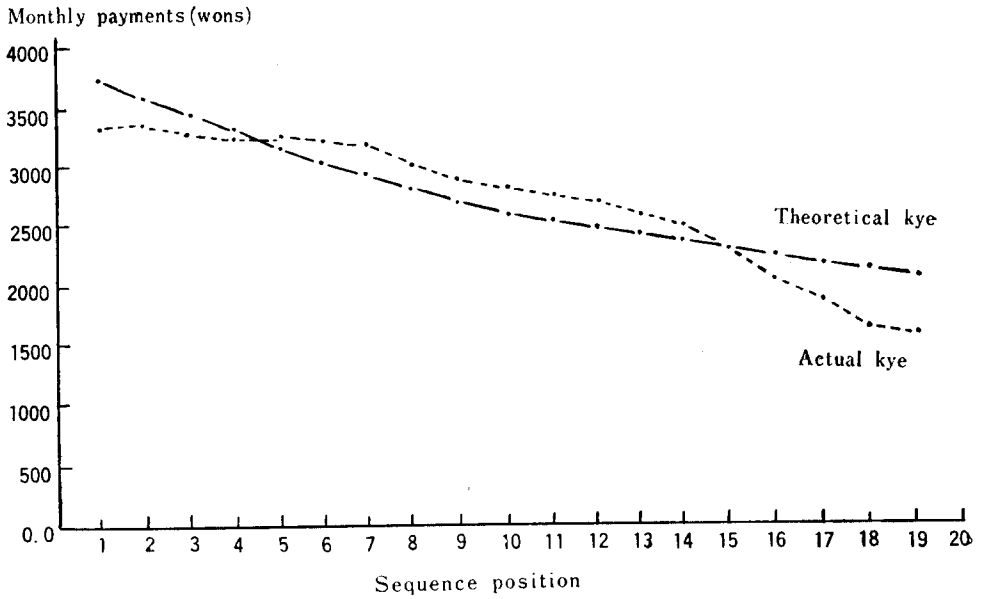

Figure 2. Monthly Payment Schemes of a Theoretical and an Actial Sequence *Kyes* of 50,000 won - 20 Positions

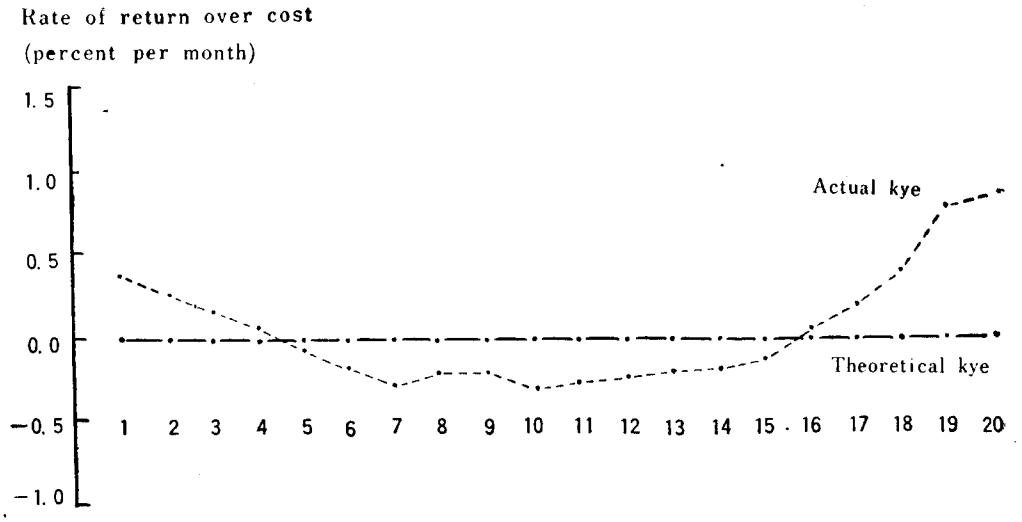

Figure 3. Sequence Structures of Return over Cost of a Theoretical and an Actual Sequence *Kyes* of 50,000 won - 20 Positions

sitions nor the *kye* organizer's special entrepreneurial functions are recognized. The former, which consists of default risks and uncertainties regarding rate of change of price level and other economic—noneconomic conditions, is an increasing function of sequence. The organizer, therefore, may provide premiums for the risks with gradual reductions in the monthly payments of the later positions, and raise the monthly payments of the earlier positions by gradual increases as prices of the less risky *kye* funds.

On the other hand, the organizer's special entrepreneurial functions include primary responsibilities for organizing and managing the *kye*. Thus he must assume primary responsibilities for any losses due to defaults. Recognition of these special entrepreneurial functions requires low monthly payment for the organizer (discretely different from the immediately following positions) or maintaining small gradual differences between positions (hence, overstating the profitability of the early positions) to be offset by tying in later positions in pairs where the latter's payment schedule is deliberately rigged to yield depressed returns. The organizer may select the latter scheme for the following reasons:

First, the low monthly payment of the organizer can hide in the shadow of the other early positions' payments by maintaining small gradual differences between positions. This is important because the organizer can advertize his free services in organizing and managing a *kye* among close acquaintances in the community. It would not be well accepted that the organizer be paid a conspicuous reward for his services, since there exist strong cultural constraints concerning the propriety of charging such people for one's services. Second, the more important reason is that the organizer can spread (or reduce) the default risks which he assumes primary responsibilty for by the pairing when the law of large numbers cannot be applicable.[9]

Suppose that the second position is tied in with the 12th, and that default is made by the holder of the pair before the 12th meeting. Then the loss to the organizer is the difference between the *kye* fund and the sum of monthly

9) For the organizer's actual loss to approach the expected value, the sample size (the number of *kye*s) must be very large. This is, however, not the case in reality. The number of *kye*s which an organizer manages is very small. See W. Feller, *Introduction to Probability Theory and Its Application*, I (New York, 1968), pp.243.

payments paid in for the sceond and the twelfth positions by the defaulter.[10] This loss would be smaller than the loss he would have incurred by a defaulter holding the second position only (smaller by the sum of monthly payments paid in for the 12th position up the time of default).

To reduce risk further from the organizer's standpoint, the organizer may reduce also monthly payments of the last few positions to enhance their profitability and to offset this by pairing them with middle positions. Hence, that monthly payments of the last few positions in the actual *kye* are smaller than in the theoretical *kye* is not only due to risk premium relevant to the late position-holders, but also due to the pairing practice aimed at reducing risks to the organizer. Therefore, recognition of risks associated with different sequence positions and the organizer's special entrepreneurial functions may lead to the monthly payment scheme of the actual *kye*: the first and last few positions pay smaller monthly payments than in the theoretical *kye*, while middle positions pay greater monthly payments.

The mode of pairing in the actual *kye* is as follows: (1) the early positions are paired with the late middle positons, (2) the last few positions are paired with the early middle positions. This procedure is consistent with the fact that security is enhanced by increasing the distance between the positions in a pair without at the same time destroying the distinction between borrowers and lenders. Though the pairing practice is exercised by the organizer to reduce his risks, it also can be acceptable to the members for the following reasons: first, the different rates of return over cost associated with sequence positions can be averaged out through pairing; second, the reduction of risks from the standpoint of the organizer implies also a reduction of risks for the late position-holder (lenders-first); if the organizer cannot bear the loss due to defaults, the lenders-first may have to bear the loss ultimately; finally, the time interval between positions in a pair can be long enough to accommodate periodic or different future needs for lump-sum funds. The pairing practice does not necessarily mean that an individual should hold all the paired positions himself. He can share them with others, but he must assume a primary responsibility for recruiting the sharers and possible defaults made by them. The organizer, thus, can share responsibilities for organizing and managing

10) For simplicity we disregarded the interest earnings.

Table 3 Relative Frequency Distribution of *Kye* Members by the Number of Positions Held in the Same *Kye*

Number of position held in the same *kye*	Relative frequency (%)
One	57.3
Two	29.6
Three	12.2
Four & over	.9
Total	100.0

Source: The author's sample survey in Seoul, 1971.

a *kye* with other members through pairing practice. Table 3 shows relative frequency distribution of *kye* members by the number of positions held in the same *kye*.

The observation that 57.3 percent of all *kye* members are holders of a single position in the same *kye* does not contradict the proposition. There must be many members who have chosen a single position in the middle or late positions due to their anticipated needs for funds materializing at that moment in addition to single position-holders who might have recruited the former under their responsibility.

In general, it has been well recognized that rates of return over cost on middle positions are lower than the other positions. This clearly implies that most *kyes* have the U-shape sequence structure of rates of return over cost. Table 4 shows the relative frequency distribution of positions considered yielding higher return by *kye* members.

Table 4 Relative Frequency Distribution of Positions Considered Yielding Higher Returns

Position	Relative frequency(%)
Early positions	44.6
Middle positions	6.3
Late positions	35.1
No difference	14.0
Total	100.0

Source: The author's sample survey in Seoul, 1971.

The fact that only 6.3 percent of *kye* members consider the middle positions yielding higher returns implies that individuals have been well aware of the low

rates of return on middle positions. Individuals, however, select middle positions when access-to-fund consideration overrule small differentials in cost of borrowing between positions.

Table 5 presents relative frequency distribution of middle position-holders by motive to hold. The fact that 50.0 percent select their positions to possess access to funds is consistent with our explanation. From the observation of 23.5 percent due to pairing we may conjecture that less than 10 percent of all *kye* positions

Table 5 Relative Frequency Distribution of Holders of the Middle Position by Motive to Select

Motives	Relative frequency (%)
Access to funds	50.0
Tied in with other positions in pairs	23.5
Only middle positions available	21.5
Other	5.0
Total	100.0

Source: The author's sample survey in Seoul, 1971.

are allocated through pairing. The selection of middle positions by 21.5 percent of *kye* members due to nonavailability of other choices, may be partly because of pairing. However, these individuals are basically investors in the *kye*: if they have to finance their future expenditures at specific time by the *kye* funds, they could find other *kyes* which will provide the necessary funds. They select some middle positions because the cost of searching high-yielding late positions in other *kyes* is expected to be more than being offset by additional returns.

In brief, these observations can be interpreted as evidence supporting our proposition in explaining the U-shape sequence structure of rates of return over cost in the observed sequence *kyes*.

Auction *Kye*

The majority preference theory of term structure of interest rates says that uncertainty regarding the course of future prices of securities is an increasing function of term to maturity and, therefore, differences in market yields reflect

premium for risk-bearing of investor's associated with different term to maturity.[11] Before turning to auction *kyes*, it may be pointed out that the U-shape sequence structure of rates of return over cost in the actual sequence *kyes* derived from the interaction of maturity preference behavior of the members and security-enhancing behavior (pairing practice) of the organizer. In the absence of pairing practice, therefore, we can expect that the sequence structure behave as the maturity preference theory predicts. Early borrowers of *kye* funds pay higher price for the funds as reflected by the negative rates of return over cost, whereas lenders receive risk premiums as reflected by positive rates of return over cost at the constant discount rate.

The sequence structure of rates of return over cost in the auction *kye* derives from the actual bidding processes. Table 6 shows one of the actual auction *kyes* observed. The positive lump-sum cash flow stands for the *kye* fund received by the winner at the corresponding monthly *kye* meeting, while the negative cash flow represent the monthly payments by the winner of the corresponding monthly meeting. The difference between the stated *kye* fund 200,000 wons and the *kye* fund actually received by the winner is equal to the discount which the winner was willing to forego.

Table 7 shows rates of return over cost of the monthly payment-receipt scheme of the auction *kye* shown in Table 5 evaluated at the discount rate of 3.6 percent per month. The sequence structure, represented by a monotonically increasing function of sequence, is thus consistent with our expectation. The market forces materializing this sequence structure derive from the fact that merchants and businessmen are dominant members, and they borrow *kye* funds for their unanticipated outlays. If so, the potential early borrowers are more likely to bid high prices for the funds, and this may lead to higher rates of return to the lenders-first.

The rate of return accruing to the organizer is much lower than in the sequence *kyes* as shown in Table 2. The borrowers-first pay higher prices for the funds

11) J.R. Hicks, *Value and Capital* 2nd ed., (London, 1946), pp. 145—6, R. A. Kessell, *The Cyclical Behavior of the Term Structure of Interest Rates* (New York, 1965), Ch. II, J. M. Culbertson, "The Term Structure of Interest Rates," *Quarterly Journal of Economics* (November, 1957), pp. 485—517, and R. Turvey, *Interest Rates and Asset Prices* (London, 1960), pp. 95.

Table 6 Results of Monthly Payments and Recipts in 200,000 Won-15 Position Auction *Kye*

Month	Sequence position														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	**200000**	−14286	−14286	−14268	−14286	−14286	−14286	−14286	−14286	−14286	−14286	−14286	−14286	−14286	−14286
2	−20000	**142550**	− 9427	− 9427	− 9427	− 9427	− 9427	− 9327	− 9427	− 9427	− 9427	− 9427	− 9427	− 9427	− 9427
3	−20000	−20000	**152600**	− 9383	− 9383	− 9383	− 9383	− 9383	− 9383	− 9383	− 9383	− 9383	− 9383	− 9383	− 9383
4	−20000	−20000	−20000	**157650**	− 8877	− 8877	− 8877	− 8877	− 8877	− 8877	− 8877	− 8877	− 8877	− 8877	− 8877
5	−20000	−20000	−20000	−20000	**154000**	− 7400	− 7400	− 7400	− 7400	− 7400	− 7400	− 7400	− 7400	− 7400	− 7400
6	−20000	−20000	−20000	−20000	−20000	**164000**	− 7111	− 7111	− 7111	− 7111	− 7111	− 7111	− 7111	− 7111	− 7111
7	−20000	−20000	−20000	−20000	−20000	−20000	**158400**	− 4800	− 4800	− 4800	− 4800	− 4800	− 4800	− 4800	− 4800
8	−20000	−20000	−20000	−20000	−20000	−20000	−20000	**166750**	− 3821	− 3821	− 3821	− 3821	− 3821	− 3821	− 3821
9	−20000	−20000	−20000	−20000	−20000	−20000	−20000	−20000	**169100**	− 1517	− 1517	− 1517	− 1517	− 1517	− 1517
10	−20000	−20000	−20000	−20000	−20000	−20000	−20000	−20000	−20000	**180000**	0	0	0	0	0
11	−18200	−18200	−18200	−18200	−18200	−18200	−18200	−18200	−18200	−18200	**182000**	0	0	0	0
12	−16820	−16820	−16820	−16820	−16820	−16820	−16820	−16820	−16820	−16820	−16820	**185000**	0	0	0
13	−15667	−15667	−15667	−15667	−15667	−15667	−15667	−15667	−15567	−15567	−15667	−15667	**188000**	0	0
14	−14808	−14808	−14808	−14808	−14808	−14808	−14808	−14808	−14808	−14808	−14808	−14808	−14808	**192500**	0
15	−14285	−14286	−14286	−14286	−14286	−14286	−14286	−14286	−14286	−14286	−14286	−14286	−14286	−14286	**200000**
Total payments[a]	259781	254067	243236	232977	221754	209154	196265	181065	164886	146403	128203	111333	95716	80908	66622

Source: The author's sample survey in Posung-gun, Jeonnam, 1970.

[a]The sum of monthly payments in current wons (undiscounted).

Table 7 The Sequence Structure of Rates of Return over Cost in the Auction *Kye*

Sequence	Rate of return over cost (%) (discount rate=3.6%/month)
1	− .089
2	−1.092
3	− .885
4	− .756
5	− .768
6	− .508
7	− .518
8	− .210
9	.032
10	.564
11	.978
12	1.465
13	2.016
14	2.700
15	3.630

Source: The author's sample survey in Seoul, 1971.

than the corresponding prices in the sequence *kye*. On the other hand, the lenders-first receive greater returns. However, it should be stressed that the actual auction *kye*'s payments and receipts, and thus rates of return over cost shown in Tables 5 and 6, respectively, do not tell a typical story. There exist variances in bidding between *kye*s and between time periods reflecting different economic conditions of the members and of time periods. The first position-holder, thus, may not always come out less well off as in a sequence *kye* and the last person may not come out better than in the sequence *kye*.

Conclusion

In this paper we proposed a possible explanation for the U-shape sequence structure of rates of return over cost observed in most actual sequence *kye*s. The shape is not due to errors, but it is based upon deliberate calculation of the organizer. Recognition of risks associated with different sequence positions and the

organizer's special entrepreneurial functions lead to the monthly payment-receipt scheme of the actual *kye*: the first and last few positions pay smaller monthly payments than in the theoretical *kye*, while middle positions pay greater monthly payments. There is no particular problem to be explained in the sequence structure in the actual auction *kye*, which is found to behave as the maturity preference theory predicts.

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