Risk Attitudes and Time Preferences in Rotating Saving Credit Associations

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Abstract

A Rotating Saving Credit Association, popularly known as Rosca, is a financial mechanism functioning over a fixed period of time. It involves formation of a group of people contributing fixed amounts of money to a pre-determined pool every period. Each participant either through draw of lots or bidding is entitled to the rosca pot in a given round. The rosca cycle ends when each person in the group has received the pot. The uniqueness of rosca as a financial instrument lies in its dual role of a saving and a credit instrument.

This paper analyzes the role of risk attitudes and time preferences in discount bidding roscas. The data for the study comes from roscas organized in two urbanized villages of the national capital territory of Delhi. Using a risk-time preference experiment on rosca participants, the paper employs non-linear least squares estimation to elicit risk and time preference parameters for participants of discount bidding roscas in the sample.

Keywords: *Roscas, risk, time preference, experiments, non-linear.*

Introduction

Credit markets universally are characterized by the presence of informational asymmetry. Lenders face problems of screening, incentive and enforcement. These problems bother both informal lenders and formal institutional lenders but with varying degree of magnitude. A peculiar form of credit market institution is the Rotating Saving Credit Association, more generally known as Rosca. A Rosca is a unique financial instrument as it combines the features of both an investment instrument as well as a credit instrument. Different people join rosca with different motivations. While some join rosca to borrow, others join rosca to lend and earn interest on their savings.

A rosca is a revolving financial scheme where a group of individuals comes together to borrow and invest funds. Roscas serve the role of financial intermediation for those who need money for exigencies and for those who are in search of a financial vehicle to park their savings and earn returns. The people in a rosca group contribute fixed amounts of money to a pre-determined pool every period. This pool of funds is called a rosca pot. The rosca pot gets allocated to one of the rosca participants in each period either through a lottery or by bidding. The frequency of meetings could be daily, weekly or monthly as agreed upon by members. The duration of the rosca is determined by the number of participants in a rosca. The rosca cycle ends once each person in the group has received the pot.

The focus of this paper is discount bidding rosca. In a discount bidding rosca, the rosca pot is allocated through a process of bidding. Rosca members desirous of taking the pot bid for the pot. The bid is the amount of discount that the member is willing to offer to other members of the rosca

in terms of a reduction she is willing to accept in the total amount of rosca pot that she would get upon winning. The winning bid discount is equally distributed among all rosca members in the form of a dividend. Thus, rosca is a zero-sum game: Savers' returns in a rosca depend upon what borrowers pay on their borrowings from rosca.

Literature Review

The interest of economists in roscas developed in the early 1990s with the work of Besley, Coate and Loury (1993). Using a theoretical model, Besley, Coate and Loury (1993) showed that individuals participate in rosca because rosca enables them to buy an indivisible durable good earlier than if they were to save on their own. Calomiris and Rajaraman (1998) argued that not all people joined rosca for buying durable goods. They highlighted the existence of bidding roscas as evidence to this and suggested that a more important insurance role is provided by roscas, particularly amidst the poor in developing countries.

Aliber (2001) explored the possibility of people joining rosca to overcome their self-control problems. He argued that individuals are time-inconsistent and find it difficult to save alone. Rosca serves as an effective saving-commitment arrangement by way of which individuals can save and restrict themselves from unnecessary spending. These findings are corroborated by several other studies like Gugerty (2007), Peterlechner (2009), Dagnelie and Boucher (2012) etc.

Klonner (2003), emphasizing the insurance role of bidding rosca, demonstrates that bidding rosca acts as a risk sharing mechanism when participants are risk averse and face idiosyncratic risks. Tanaka and Nguyen (2009) examine issues related to participation in roscas. More specifically, they study participation in different types of roscas in Vietnam. They find that more patient and less risk averse individuals have a greater likelihood of participation in roscas.

Research Objective and Hypothesis

The review of literature above suggests that risk attitudes and time preferences play an important role in case of rosca. Individual risk aversion and time preference parameters are expected to affect bidding behavior of members and consequently the returns attained by participants. The objective of this paper is to deduce risk and time preference parameters for participants of discount bidding roscas.

The paper hypothesizes that participants in a discount bidding rosca are risk-neutral. Moreover, it is hypothesized that there is no difference in risk attitudes and discount rates based on gender, age, education and occupation.

Research methodology

The literature on elicitation of risk preferences through experiments delves upon three main methods: The first is an investment task, in which subjects are asked to make choice regarding alternative divisions of money between a mean preserving asset and a risky asset.[1] A variant of this is the probability choice menu which consists of a structured set of binary choices between safe and risky alternative. The latter requires varying probabilities of the high pay-off in either one or both of the binary choices.[2] The second is a pricing task, in which money values for a risky option are elicited or a set of binary choices between the risky alternative and a price list comprising possible

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[1] See Binswanger (1980), Gneezy and Potters (1997) and Eckel and Grossman (2002).

[2] See Holt and Laury (2002), Tanaka et al (2010), Brauw et al (2011).

monetary values is provided.[3] The third is a price task in which a survey is used to ask the respondent to rank on a scale of 1 to 10, his or her willingness to take risks in general, or in specific domains such as health, leisure, finance, education and career.[4] None of these methods is appropriate for measuring time preferences.

There is a separate literature on time preferences that has followed two different approaches to elicit individual discount rate: In some studies, individual discount rates are estimated based on the consumer's observed choice behavior. Generally, the discount rates are assessed by examining occupational, educational and financial and health choices of individuals since these decisions involve tradeoffs between present and future. Examples of such trade-offs are better wage compensation for a more risky occupation, higher wage for higher education and expenditure on medical care for avoiding health problems.[5] In the stated preference approach, individuals are asked to choose between a smaller reward today versus a larger reward tomorrow. Alternatively, they are asked to state an equivalent amount they are willing to pay to trade one or the other.[6] In all these, risk considerations are either ignored, or risk-neutrality assumed.

The experiment design used in this paper falls under the stated preference approach to discounting. Before describing the experiment for elicitation of risk preference and discount rates, it is useful to understand the underlying theory.

Consider a rosca member's time preference over pairs of monetary reward and time denoted by (y, t). (y, t) may be interpreted as y units of money obtained t periods from now. Suppose that agent is risk neutral. This means that the member's preference over monetary rewards is linear. $D^i(y,t)$ is the discount function of member i such that she is indifferent between the pair (y, t) and the pair $(y\, D^i(y,t), 0)$. The value of y units of money at time t is given by $yD^i(y,t)$. The discount factor $D^i(y,t)$ depends on delay t as well as on the amount of money to be discounted.

$D^i(y,t)$ represents exponential discounting if $D^i(y,t) = \exp\{-rt\}$ where $r > 0$ is the discount rate of individual i. Exponential discounting is a time-consistent discounting model which assumes that the rate at which individuals discount future pay-offs remains constant overtime.

To estimate the risk aversion and time preference each rosca participant replied to a set of 30 questions. The questions were asked in the following form: "What amount of money y will make you indifferent between an amount x paid to you today and an amount y paid t days from now?"

The amount x used in the questions was derived from the type of monetary choices over which rosca members usually decide. The x amounts are equal to either monthly rosca contributions or total rosca denomination. The amount of x varied from Rs. 1000 to Rs. 10 lacs and the duration of delay spanned over 3 days to 20 months.

These questions were asked hypothetically. Given the amounts involved, it was not possible to provide real incentives. Offering small sums or asking questions over small x amounts would have diluted the purpose.

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[3] See Tversky and Kahneman (1992), Dohmen et al (2005).

[4] See Weber et al (2002).

[5] See Moore and Viscusi (1990), Enemark et al (1998), Warner and Pleeter (2001), Hausman (1979), Prestemon and Wear (2000) for more details.

[6] See Kirby et al (2002), Harrison et al (2002)

For each individual i, there were a series of 30 observations in the form of pairs (y, t), $(x, 0)$ which leave the individual indifferent. This means

$$x = y(x,t).D^i(y(x,t),t)$$

For econometric estimation, the above equation was suitably modified as follows to account for risk aversion (CRRA)[7]:

$$x^\beta = y^\beta(x,t).D^i(y(x,t),t) \tag{1}$$

where β is the coefficient of risk aversion. $\beta < 1$ implies risk aversion, $\beta = 1$ implies risk neutrality and $\beta > 1$ implies risk seeking.

Since equation (1) is intrinsically non-linear, it was estimated using non-linear least squares.[8] Exponential discount rate and risk parameter were estimated for each individual in the sample. The discount rate estimates generated from the regression were daily rates. These were converted into effective annual rates. The formula used for this purpose was $R = ((1 + r)^{365} - 1) \times 100$.

Data Set & Data Analysis

This study is an attempt to learn about the functioning of informal bidding roscas. The data for this study is based on a field experiment in two villages in the Union Territory of Delhi. These two villages were selected through purposive sampling, based on availability of informants and willingness to participate in the survey.

Informal roscas, popularly known as '*kameti*' in Delhi, are required to be registered under Section 4 of the Chit Funds Act 1982. The Act specifically prohibits the conduct of chits that do not have prior sanction and are not registered under the Act with the Registrar of Chit Funds. The Chit Funds Act 1982 provides the following definition of a 'chit':

["chit" means a transaction whether called chit, chit fund, *chitty, kuri* or by any other name by or under which a person enters into an agreement with a specified number of persons that every one of them shall subscribe a certain sum of money (or a certain quantity of grain instead) by way of periodical installments over a definite period and that each such subscriber shall, in his turn, as determined by lot or by auction or by tender or in such other manner as may be specified in the chit agreement, be entitled to the prize amount.] (The Chit Funds Act 1982, Sec.2)

In practice, however, most kametis operate informally and are not registered, despite the penalty they may attract for contravening the provision of mandatory registration under the Chit Funds Act 1982, which include a relatively modest fine of Rs. 5000, but can extend to imprisonment for upto 2 years. The rosca organizers as well as members bear full cognizance to their illegal status; but continue to operate and participate in roscas.

A complete enumeration of all rosca organizers in the two villages was done. The sample consists of 36 concluded roscas till December 2013. These 36 roscas comprise 572 rounds covering 456 individuals. Of the 456 rosca participants across 36 rosca organizers interviewed, 68% were from village 1 and 32% were from village 2. About 70% of the rosca membership was male.

More than 41% of rosca membership is held by businessmen and self-employed persons, followed by persons in private job (13%) and next by government job (9%). There are differences by village:

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[7] The utility function assumed here is $u(x) = x^\beta$, where $u' > 0$. It belongs to the class of CRRA utility functions.

[8] We converted all delay periods into days.

Rosca membership is spread uniformly among different occupational categories in village 2, while in village 1, most rosca members are either self-employed or into business.

The mean age of a rosca participant is around 42 years; the youngest member being 19 years old and the oldest being 80 years old. Nearly 70% of the members fell in the age group of 30-50 years[9].

Roscas are popular among people with different levels of education. While 29% of rosca members have completed education up to class 10, around 35% have passed class 12, and more than 12% are graduates and above. The average number of years of education completed by a rosca participant is more than 10 years.

The average monthly household expenditure of rosca members is over Rs. 16000, but the differences between villages the two villages is not significant. 91% of the rosca members live in owned houses while 9% are on rent.

Using the technique of non-linear regression, we find that in our sample, about 74% of rosca members are risk loving, 25% are risk averse and 1% are risk neutral. We find that the average annual discount rate for rosca participants is 22.7%. We do not find any statistically significant difference in risk attitudes of rosca members belonging to different age groups and education levels, occupation and gender. Also, there is no statistical difference in discount rates with respect to age and education. However, discount rates are found to statistically vary with respect to gender and occupation.

More specifically, female rosca members are found to be more patient than their male counterparts. The discount rate for women is 20.7% which is lower than 23.5% for men indicating that males are more likely to pick rosca pots in the beginning and use them for business purposes. Females, on the other hand, would like to pick the pot later and earn interest on the amount saved through rosca.

In case of occupation, the average effective annual discount rate for non-working men of working age is about 16%. For persons retiring from a government job, it is 25.6% while housewives have an average effective annual discount rate of 20.7%. Among working persons, landlords have an average effective annual discount rate of 23.7%, government employees 21%, privately employed 25.3%, businessmen 23%, self-employed 24%.

It seems that unemployed persons (other than retired) and housewives are relatively more patient than the working persons. This indicates that the former are using rosca essentially as a saving vehicle to park their fund. The finding with regard to retired persons is surprising. In fact, the discount rates for the elderly show that they are most impatient.

Conclusion

In this paper, we have attempted to infer the risk attitudes and time preferences of people who participate in rotating saving credit associations, a unique financial instrument carrying features of both a saving and a credit instrument. We find that rosca participants are more likely to be risk-loving in nature conforming to the speculative nature of rosca. Although there are no significant differences in risk attitude of members with respect to differences in gender, age, education and employment, with regard to discount rates we do find certain differences that are statistically significant.

In particular, we find that males have a higher disount rate as compared to female implying that they are more likely to pick rosca pots in earlier rounds and use them for further investment in

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[9] See Choudhary (2022) for a detailed discussion.

productive return-generating activities. An analysis of discount rates with respect to occupation shows that employed people particularly those in private service have a higher likelihood of picking early pots in a rosca. This is not surprising since these people are generally in search of other avenues to raise their aggregate earnings as the private jobs in which the village people are typically employed are not high paid ones. Therefore, like many other studies, our study too endorses that different individuals join rosca with different motivation.

References

1. Aliber, M. (2001) `Rotating savings and credit associations and the pursuit of self-discipline.' *African Review of Money Finance and Banking* (2001), 51-72.

2. Besley, T., Coate, S. and Loury, G. (1993). The Economics of Rotating Savings and Credit Associations. *American Economic Review*, 83, 792-810.

3. Binswanger, H. P. (1980). Attitudes toward risk: Experimental measurement in rural India. *American Journal of Agricultural Economics*, *62*(3), 395-407.

4. Calomiris, C. W., & Rajaraman, I. (1998). The role of ROSCAs: lumpy durables or event insurance? *Journal of Development Economics*, *56*(1), 207-216.

5. Chit Fund Act, 1982. Government of India.

6. Choudhary, I. (2022). An Anatomy of the Small: A Study of Rotating Saving Credit Associations in Delhi Villages. *International Journal of Trend in Scientific Research and Development*, 6(7), 172-181.

7. Dagnelie, O., & Lemay-Boucher, P. (2012). Rosca Participation in Benin: A Commitment Issue*. *Oxford Bulletin of Economics and Statistics*, *74*(2), 235-252.

8. Davidson, R., & MacKinnon, J. G. (2004). Econometric theory and methods (Vol. 21). New York: Oxford University Press.

9. De Brauw, A., Eozenou, P., Gilligan, D., & Meenakshi, J. V. (2011). Measuring risk attitudes among Mozambican farmers (No. 6). International Food Policy Research Institute (IFPRI).

10. Dohmen, T. (2005). Individual risk attitudes: New evidence from a large, representative, experimentally-validated survey (No. 1730). IZA Discussion Papers.

11. Eckel, C. C., & Grossman, P. J. (2002). Sex differences and statistical stereotyping in attitudes toward financial risk. *Evolution and Human Behavior*, *23*(4), 281-295.

12. Enemark, U., Lytkens, C. H., Troeng, T., Weibull, H., & Ranstam, J. (1998). Implicit discount rates of vascular surgeons in the management of abdominal aortic aneurysms. *Medical decision making*, *18*(2), 168-177.

13. Gneezy, U., & Potters, J. (1997). An experiment on risk taking and evaluation periods. *The Quarterly Journal of Economics*, *112*(2), 631-645.

14. Greene, W. H. (2003). Econometric analysis. Pearson Education India.

15. Gugerty, M. K. (2007). You can't save alone: Commitment in rotating savings and credit associations in Kenya. *Economic Development and Cultural Change*, *55*(2), 251-282.

16. Harrison, G. W., Lau, M. I., & Williams, M. B. (2002). Estimating individual discount rates in Denmark: A field experiment. *American Economic Review*, 1606-1617.

17. Hausman, J. A. (1979). Individual discount rates and the purchase and utilization of energy-using durables. *Bell Journal of Economics*, *10*(1), 33-54.

18. Holt, C. A., & Laury, S. K. (2002). Risk aversion and incentive effects. *American Economic Review*, *92*(5), 1644-1655.

19. Klonner, S. (2003). Rotating Savings and Credit Associations When Participants are Risk Averse*. *International Economic Review*, *44*(3), 979-1005.

20. Kirby, K. N., Godoy, R., Reyes-Garcıa, V., Byron, E., Apaza, L., Leonard, W., & Wilkie, D. (2002). Correlates of delay-discount rates: Evidence from Tsimane'Amerindians of the Bolivian rain forest. *Journal of Economic Psychology*, *23*(3), 291-316.

21. Moore, M. J., & Viscusi, W. K. (1990). Models for estimating discount rates for long-term health risks using labor market data. *Journal of Risk and Uncertainty*, *3*(4), 381-401.

22. Myerson, J., & Green, L. (1995). Discounting of delayed rewards: Models of individual choice. *Journal of the Experimental Analysis of Behavior*, *64*(3), 263-276.

23. Peterlechner, L. (2009). Roscas In Uganda-Beyond Economic Rationality?-. *African Review of Money Finance and Banking*, 109-140.

24. Prestemon, J. P., & Wear, D. N. (2000). Linking harvest choices to timber supply. *Forest Science*, *46*(3), 377-389.

25. Tanaka, T., & Nguyen, Q. (2009). Committing the uncommitted: ROSCA as a saving commitment device for sophisticated hyperbolic discounters: Field experiment from Vietnam. George Mason University Interdisciplinary Center for Economic Sciences working paper.

26. Tanaka, T., Camerer, C. F., & Nguyen, Q. (2010). Risk and time preferences: linking experimental and household survey data from Vietnam. *The American Economic Review*, *100*(1), 557-571.

27. Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, *5*(4), 297-323.

28. Warner, J. T., & Pleeter, S. (2001). The personal discount rate: Evidence from military downsizing programs. *American Economic Review*, *91*(1), 33-53.

29. Weber, E. U., Blais, A. R., & Betz, N. E. (2002). A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of Behavioral Decision Making*, *15*(4), 263-290.