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■ *Does the understanding of compound interest influence people's retirement savings?*

SUPPOSE you deposit \$1,000 as a certificate of deposit this year at a constant interest rate of 9 per cent per year. Interest is compounded annually. How much money could you receive in 30 years?

- 1) Less than \$3,000
- 2) \$3,000-\$5,000
- 3) \$5,000-\$10,000
- 4) \$10,000-\$15,000
- 5) More than \$15,000.

The reader can try to answer the question without using a calculator.

Compound interest means that when interest is earned, it is left in the account. In future years, interest accumulates on the full amount that is in the account, so you earn interest on the interest as well as on the original principal amount.

For example, if you just calculate the simple interest from the principal, you earn \$90 per year, or \$2,700 over 30 years; the total in the account is only \$3,700. Under compound interest, however, you have a much larger sum – \$13,268.

In a study involving 1,104 Chinese farmers, 56 per cent of the subjects in our sample were unable to provide a response to this compound interest question (after repeated prompting) and 73 per cent of those who answered the question underestimated the com-

ound interest. Only 12 per cent of rural households correctly estimated or overestimated the compounded interest sum. The pattern of underestimating compound interest is present not only in rural areas in China, but also in many developed countries.

For example, only 18 per cent of subjects in the Health and Retirement Study in the US answered a similar compound interest question correctly. This evidence suggests that financial illiteracy is widespread in the world.

More importantly, the consequences of underestimating compound interest are not negligible.

Studies in the US show that those who underestimate compound interest have less savings and more debts, compared with those who do not underestimate compound interest.

Our study in China also shows the understanding of compound interest influences retirement-savings decisions.

In 2009, the Chinese government introduced the New Rural

Social Pension Insurance Programme, which is voluntary and highly subsidised.

Rural households can choose from a menu of five annual contribution levels: 100, 200, 300, 400, or 500 yuan, ranging from 2 per cent to 8 per cent of rural annual per capita net income in 2010.

Pensioners start to receive their pension at age 60, and the annual payout includes a share from individual pension accounts plus a 960-yuan (S\$212) subsidy. Given the high subsidy, the pension appears to be an attractive product at first glance.

Indeed, 93 per cent of rural households in the study areas participated in the pension plans, but 88.5 per cent of households contributed at the lowest level, 100 yuan.

Moreover, we find that the lower the underestimation of compound interest, the lower the pension contribution in each year. This shows that underestimating compounding has significant consequences in important household

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The power of compounding confounds

financial decisions.

This then gives rise to a related question of whether we can teach people about compound interest and help them to make better financial decisions.

In our study in China, we conducted a randomised trial to test whether teaching compound interest can improve the pension contributions. We randomly assigned some households to a financial education (treatment group), emphasising the concept of compound interest. The pension contribution of this group was then compared with the contribution of the control group, which did not receive the financial education.

We find that the financial education increased the annual contribution from 133 yuan to 182 yuan, resulting in an increase of 40 per cent relative to the average contribution in the control group.

We also conducted a separate calculation, in which we calculated for the respondents the expected pension benefit levels they can get after age 60 if they contribut-

ed at various levels, starting at age 30.

We find that just doing the calculations and explaining the benefits without teaching compound interest increased the contribution by 20 to 25 yuan, relative to the control group. This suggests that farmers indeed have less information about the future benefits of pension plans.

The phenomenon of underestimating compound interest is widespread both in developed and developing countries.

Our study shows that when we make long-term investments, such as those involving retirement savings, life insurance, bond or stock market investment, we should ask ourselves whether we underestimate the future benefit of interest and thus invest less.

On the other hand, when we take a long-term loan, such as a housing mortgage, we should ask ourselves whether we underestimate the future cost of interest and borrow too much. This might cause a huge debt burden.

■ *Can education on compound interest be used to improve people's decisions, such as those related to retirement and voluntary CPF contributions in Singapore?*

ALTHOUGH there is evidence suggesting that individuals with low levels of financial literacy are less likely to participate in financial markets, plan for retirement or transact in low-cost ways, the evidence on the effectiveness of financial education is mixed.

Recent studies suggest that the effectiveness depends on what is taught and when. For example, financial education in high school is less likely to have an impact than that provided around the time when people are making financial decisions. Lessons that address individual mistakes are more likely to be effective than those that impart general financial knowledge. Information on intuitive rules of thumb is also more likely to have an impact.

That suggests that when designing financial products, financial institutions and policymakers should first identify potential mistakes people might make, then provide education around the time of decision-making on choices people tend to make intuitively.

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