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Setting self-discipline saving rates for Thai income earners in a risk-management framework

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ABSTRACT

This study proposed a model for setting self-discipline saving rates in a risk-management framework and applied it to Thai income earners. The model involved financial planning, incorporating stochastic lifetime incomes, expenses, savings, and investment returns, together with mortality and morbidity data. The self-discipline saving rate was set so the probability that the bequest was less than the funeral expenses was at a pre-determined, low, acceptable level. The resulting rate was higher for females than for males, and it increased with age. When the rate was possible, the median net bequest of funeral expenses was positive for both females and males of all ages. Therefore, if earners follow the self-discipline saving rule, they are likely to have sufficient funds to cover the expenses of their own funeral.

Introduction

It is important for income earners to set a self-discipline saving rate in their financial plan so that the long-term objective is not compromised by myopic consumption and immediate utility (Thaler & Shefrin, 1981). Alternative saving rates have been advised. For example, Berger (2013) advised a 10-percent rule-of-thumb rate, and the Bank of Thailand (2014) suggested a 25 percent rate. Henna, Fan, and Chang (1995) noted that the advice has no basis in economic theory and proposes that the rate is set based on a rigorous prescriptive model of life cycle savings. However, Henna et al.'s prescribed rates are not very useful because the assumptions are not realistic. The model does not consider the stochastic nature of incomes and expenses, as well as the longevity and health of income earners.

More realistic models for setting saving rates have been proposed. For example, Scholz, Seshadri, and Khitatrakun (2006) solved a life-cycle model backward from death to starting age for optimal saving paths of US households, and this model incorporated uncertain lifetimes, uninsurable earnings, and medical expenses. Despite being more realistic, these models, which are based on the expected discounted utility of consumption and bequest, are difficult, since their implementation requires the estimation of a subjective utility function. With respect to Bayraktar and Young (2007), analyzing the problem in a risk-management framework, e.g. to minimize the probability of lifetime ruin, is much easier and more practical.

In this study, I propose a realistic and practical model for setting a self-discipline saving rate in a risk-management framework and apply it to Thai income earners. The model is modified from Khanthavit (2015). While Khanthavit fixes the financial plan for an income earner and measures the benefits of choosing exercise over a sedentary lifestyle, I fix the lifestyle and determine the self-discipline saving rate for a desirable financial plan.

The model proposed here involves financial planning and it incorporates stochastic lifetime incomes, expenses, savings, and investment returns together with mortality and morbidity data. It sets the self-discipline saving rate such that the probability that the bequest is less than the

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funeral expenses is at a pre-determined, acceptable level. I do not consider the minimization problem of ruin probability as in Bayraktar and Young (2007) because ruin is not the absorbing state. Earners continue to live whether they experience financial ruin or not. Instead, I consider the probability of meeting a bequest target because a person anticipates it (Hurd & Smith, 2001). A zero net bequest of funeral expenses is chosen as the target. This target ensures that a person is not in financial ruin at death and has enough savings to pay terminal funeral expenses. It is important to note that most people die in old age during their retirement years, during which their income is low or nonexistent. Thus, if they do not leave a negative bequest, then it is not likely that these people are in financial ruin during their retirement years either.

The contribution of this study is at least two-fold. First, the model is new and can address the weaknesses of the previous models in the literature. As opposed to Berger (2013) and the Bank of Thailand (2014), the model is based on rigorous economic theory. Unlike those in Henna et al. (1995), the assumptions are realistic in that income, expenses, and investment returns are stochastic and that morbidity and mortality are incorporated. The model is practical. In the risk management framework, the saving rate is independent of utility. Hence, the utility function, as in Scholz et al. (2006), for example, does not need to be estimated or assumed. Moreover, the analysis is simple. It can be conducted using Microsoft Excel. Second, the model is applied to estimate the self-discipline saving rates for Thai income earners. These estimates are Thailand's first from a rigorous model and the actual data set. The estimates are useful. Thai earners may adopt them, and government agencies, such as the National Saving Fund, may recommend them to savers.

Materials and Methods

The Model

The study analyzed the stochastic behavior of saving over the lifetime of an income earner and assessed the probability that the bequest, i.e. saving at death, was less than the funeral expenses. Because saving largely depends on the saving rate to income, the self-discipline saving rate is the rate to equate that probability with a pre-determined, low, acceptable threshold.

Let $S^*_{t_0}$ be the initial saving level of the representative t_0-year-old income earner. The saving level $\tilde{S}_{t_0+1}$ in the following year when the income earner turns t_0+1 must equal the starting level $S^*_{t_0}$ plus $\tilde{r}_{t_0+1}$-percent investment return and income $\tilde{I}_{t_0+1}$ net of personal expenses $\tilde{P}_{t_0+1}$. That is Equation (1),

$$\tilde{S}_{t_0+1} = S^*_{t_0} e^{\left\{\tilde{r}_{t_0+1}\right\}} + \tilde{I}_{t_0+1} - \tilde{P}_{t_0+1}, \tag{1}$$

so that Equation (2),

$$\tilde{S}_{t_0+j} = \tilde{S}_{t_0+j-1} e^{\left\{\tilde{r}_{t_0+j}\right\}} + \tilde{I}_{t_0+j} - \tilde{P}_{t_0+j}. \tag{2}$$

The symbol "$\sim$" labels stochastic variables. I assumed that the investment return $\tilde{r}_{t_0+j}$ is age-specific in order to reflect the fact that earners may adjust investment strategies along their glide path (Budsaratrakul, 2014). It is assumed that the return is normally distributed with a μ_{t_0+j} mean and a σ_{t_0+j} standard deviation when $\tilde{S}_{t_0+j-1} \geq 0$. I assumed a fixed negative return of the lending rate if $\tilde{S}_{t_0+j-1} < 0$, i.e. the earner is in debt.

In Equations (3) and (4), because income $\tilde{I}_{t_0+j}$ is age-specific and rises with inflation for j years from its initial level $I^*_{t_0}$, the income must be inflation-adjusted. In addition, it must be scaled to reflect the actual working days in the year. Finally, it must be adjusted downward for decreasing productivity from sickness.

$$\tilde{I}_{t_0+j} = I^*_{t_0} e^{\left\{\sum_{h=1}^{j} \tilde{\pi}^I_h\right\}} \times \left(1 - \frac{\sum_{d=1}^{4} L_d \tilde{\gamma}_{d,t_0+j}}{252}\right) \times \left(1 - \tilde{F}_{t_0+j}\right), \tag{3}$$

where $\tilde{\pi}^I_h$ is the stochastic inflation rate for income in year h. Because nominal income grows with inflation, I assumed the income inflation follows a mean-reversion process, as does the country's inflation rate under the Bank of Thailand's inflation targeting policy (Goncalves & Salles, 2008).

$$\tilde{\pi}^I_h = \theta\left(\overline{\pi} - \pi^I_{h-1}\right) + \tilde{\varepsilon}^I_h, \tag{4}$$

where θ is the convergence rate, $\overline{\pi}$ is the long-run mean, and $\tilde{\varepsilon}^I_h$ is the normally distributed error of $\tilde{\pi}^I_h$.

L_d is the number of lost working days resulting from disease d. $\tilde{\gamma}_{d,t_0+j}$ is the disease d indicator variable. $\tilde{\gamma}_{d,t_0+j} = 1$ if the earner experiences disease d at age t_0+j. Otherwise, it is zero. I followed Khanthavit (2015) to limit the interest to only four important, non-communicable diseases (NCDs), namely, (1) diabetes, (2) heart disease, (3) stroke and (4) cancer, because these four NCDs are chronic and are leading causes of death worldwide (World Health Organization, 2009). Chronic NCDs imply $\tilde{\gamma}_{d,t_0+j} = 1$ if $\tilde{\gamma}_{d,t_0+j-1} = 1$. However, if $\tilde{\gamma}_{d,t_0+j-1} = 0$, $\tilde{\gamma}_{d,t_0+j}$ is a (1, 0) Bernoulli with probability of the disease-d incidence rate. The incidence rate corresponds with age and sex. The term $1 - \frac{\sum_{d=1}^{4} L_d \tilde{\gamma}_{d,t_0+j}}{252}$ scales the income proportionately with actual working days in the year. $\tilde{F}_{t_0+j}$ is the productivity adjustment variable. $\tilde{F}_{t_0+j}$ necessarily equals the NCD-induced productivity loss rate if $\tilde{\gamma}_{d,t_0+j} = 1$.

I assumed the personal expense $\tilde{P}_{t_0+j}$ depends on the subsistence level and income level as in Equations (5) and (6). The expenses exclude medical costs because the costs are absorbed by the universal health coverage scheme of the Thai government.

$$\tilde{P}_{t_0+j} = Max\left[P^*_{t_0} e^{\left\{\sum_{h=1}^{j} \tilde{\pi}^P_h\right\}}, (1-\Omega)\tilde{I}_{t_0+j+1}\right], \tag{5}$$

$$\tilde{\pi}^P_h = \theta\left(\overline{\pi} - \pi^P_{h-1}\right) + \tilde{\varepsilon}^P_h. \tag{6}$$

$P^*_{t_0}$ is the present time's subsistence personal expenses for the t_0-year-old earner. It must rise with inflation, constituting a level of $P^*_{t_0} e^{\left\{\sum_{h=1}^{j} \tilde{\pi}^P_h\right\}}$ when the earner turns

$t_0 + j$. If more is earned, the earner naturally spends more. Ω is the saving rate. The earner manages savings by choosing Ω so that the terminal level of saving, i.e. bequest, meets the desired target.

$\tilde{\pi}_h^I$ and $\tilde{\pi}_h^P$ share the same θ and $\overline{\pi}$ parameters because they track the country's general inflation. However, their errors $\tilde{\varepsilon}_h^I$ and $\tilde{\varepsilon}_h^P$ are uncorrelated because incomes and expenses of Thai households have low correlation (Kinnan, 2014).

By definition, bequest is the saving $\tilde{S}_{\tilde{T}}$ at age $\tilde{T}$ at death. Funeral expenses $(\tilde{C}_{\tilde{T}})$ are the last sum of money a person pays in life. So, the bequest in this study will be the one after funeral expenses, amounting to $\tilde{S}_{\tilde{T}} - \tilde{C}_{\tilde{T}}$. Let $C_{t_0}^*$ be the funeral expenses if the earner dies today at age t_0. The expenses $\tilde{C}_{\tilde{T}}$ if the earner dies at age $\tilde{T}$ will have to grow with inflation. That is, $\tilde{C}_{\tilde{T}} = C_{t_0}^* e^{\left\{\sum_{h=1}^{\tilde{T}-t_0} \tilde{\pi}_h^C\right\}}$, where $\tilde{\pi}_h^C$ is the inflation rate for funeral expenses. Similar to $\tilde{\pi}_h^I$ and $\tilde{\pi}_h^P$, I assumed $\tilde{\pi}_h^C$ randomly moves with respect to a mean-reversion process $\tilde{\pi}_h^C = \theta(\overline{\pi} - \pi_{h-1}^C) + \tilde{\varepsilon}_h^C$. Because funeral services can be considered consumption goods, their inflation $\tilde{\pi}_h^C$ should track the country's general inflation too.

I identified age $\tilde{T}$ at death based on the fact that death is an absorbing state and the earner may die at age $t_0 + j$ with probability of the age-, sex- and disease-specific mortality rate. Next, consider the disease-specific death indicator variable $\tilde{x}_{t_0+j}^d$ for disease d. $\tilde{x}_{t_0+j}^d$ is a (1, 0) Bernoulli with probability of the disease-d specific mortality rate. And consider another (1, 0) Bernoulli $\tilde{x}_{t_0+j}$ with probability of the general, NCD-free mortality rate. I constructed a mortality-incidence variable

$$\tilde{X}_{t_0+j} = \tilde{x}_{t_0+j} \times \left\{1 - Max\left(\tilde{\gamma}_{1,t_0+j}, .., \tilde{\gamma}_{4,t_0+j}\right)\right\} + \sum_{d=1}^{4} \tilde{x}_{t_0+j}^d \tilde{\gamma}_{d,t_0+j}$$

Because I have the realizations of $\tilde{X}_{t_0+j}$ in all the years $t_0 + j \le 100$ over the earner's life path in the Monte Carlo analysis, I can identify age $\tilde{T}$ at death by $\tilde{T} = Min\{t_0 + j \le 100 \,|\, \tilde{X}_{t_0+j} > 0\}$. The condition $t_0 + j \le 100$ is imposed in accord with the 100-year maximum age in the Office of Insurance Commission's 2008 mortality table.

I assumed the earner chooses a zero, relative target for the bequest over inflated funeral expenses rather than an absolute target of, for example, a 1,000,000-baht bequest, as in Hurd and Smith (2001). Due to inflation, the inflation-adjusted, relative target is more relevant in reality.

The net bequest $\tilde{S}_{\tilde{T}}(\Omega) - \tilde{C}_{\tilde{T}}$ is stochastic. I replaced $\tilde{S}_{\tilde{T}}$ by $\tilde{S}_{\tilde{T}}(\Omega)$ to make it clear that saving depends on how high the earner sets Ω. A high Ω lessens the probability $Pb\{\tilde{S}_{\tilde{T}}(\Omega) - \tilde{C}_{\tilde{T}} < 0\}$. Hence, the minimization problem in a risk management framework for $Pb\{\tilde{S}_{\tilde{T}}(\Omega) - \tilde{C}_{\tilde{T}} < 0\}$ is not interesting. I proposed an alternative for the analysis. Because the event in which $\tilde{S}_{\tilde{T}}(\Omega) - \tilde{C}_{\tilde{T}} < 0$ is undesirable, the earner will have to pre-determine the acceptable threshold Ψ for $Pb\{\tilde{S}_{\tilde{T}}(\Omega) - \tilde{C}_{\tilde{T}} < 0\}$. The undesirable event should be unlikely, implying Ψ is low. Given Ψ, the earner chooses the self-discipline saving rate Ω^* to satisfy the condition $Pb\{\tilde{S}_{\tilde{T}}(\Omega^*) - \tilde{C}_{\tilde{T}} < 0\} = \Psi$. I followed Khanthavit (2015) to relate the probability $Pb\{\tilde{S}_{\tilde{T}}(\Omega) - \tilde{C}_{\tilde{T}} < 0\}$ with indicator variable $\tilde{\beta} = \{ 1 \text{ if } \tilde{S}_{\tilde{T}}(\Omega) - \tilde{C}_{\tilde{T}} < 0\; 0 \text{ if } \tilde{S}_{\tilde{T}}(\Omega) - \tilde{C}_{\tilde{T}} \ge 0$. The probability $Pb\{\tilde{S}_{\tilde{T}}(\Omega) - \tilde{C}_{\tilde{T}} < 0\}$ equals expected $\tilde{\beta}$.

Monte Carlo Simulations

Because the distribution of the net bequest $\tilde{S}_{\tilde{T}}(\Omega) - \tilde{C}_{\tilde{T}}$ is unknown, it is not possible to analytically solve for Ω^* in the equation $Pb\{\tilde{S}_{\tilde{T}}(\Omega^*) - \tilde{C}_{\tilde{T}} < 0\} = \Psi$. Thus, I numerically obtained Ω^*, using a Monte Carlo analysis. I simulated variables based on the specification described above for income earners in 5,000 scenarios. The interesting variables are age $\tilde{T}$ at death, net bequest $\tilde{S}_{\tilde{T}} - \tilde{C}_{\tilde{T}}$ and negative net-bequest status $\tilde{\beta}$.

I wrote the computer program in Microsoft Excel 2010 for the analyses. In Equations (1) and (2), I set the investment return $\tilde{r}_{t_0+j}$ equal to minus the lending rate if the saving $\tilde{S}_{t_0+j-1}$ in the previous period is negative. If the saving $\tilde{S}_{t_0+j-1}$ is non-negative, I drew an independent standard normal variable, multiply it with the standard deviation σ_{t_0+j} and added the product to the expected return μ_{t_0+j} to obtain the return $\tilde{r}_{t_0+j}$.

The inflation rates $\tilde{\pi}_h^I$, $\tilde{\pi}_h^P$ and $\tilde{\pi}_h^C$ for incomes, personal expenses, and funeral costs follow mean-reversion processes. I set the rates for year 0 equal to the 2014 inflation rate. Then, I drew independent standard normal variables $\tilde{\varepsilon}_h^I$, $\tilde{\varepsilon}_h^P$ and $\tilde{\varepsilon}_h^C$ to construct Year 1's rates from Equations (4) and (6), and $\tilde{\pi}_h^C = \theta(\overline{\pi} - \pi_{h-1}^C) + \tilde{\varepsilon}_h^C$. The steps repeat until the income earner turns 100.

I generated Bernoulli variables $\tilde{\gamma}_{d,t_0+j}$, $\tilde{x}_{t_0+j}^d$ and $\tilde{x}_{t_0+j}$ for morbidity and mortality statuses by first drawing independent [0.00, 1.00] uniform variables and then comparing them with morbidity and mortality rates. The Bernoulli variables are 1 if the drawn uniform variables are not larger than the referenced rates; otherwise, they are 0.

All the standard normal and uniform variables were selected using Excel's random number generation function. I identified age T at death by the age at which the first 1 for the mortality Bernoulli variable is realized in the life path. The bequest $\tilde{S}_{\tilde{T}}$ is defined by the saving at age T, and the net bequest $\tilde{S}_{\tilde{T}} - \tilde{C}_{\tilde{T}}$ is the bequest $\tilde{S}_{\tilde{T}}$ minus the inflated funeral expenses $\tilde{C}_{\tilde{T}}$.

I assumed normality for the investment return because the assumption is common in financial and retirement planning literature (Hallman & Rosenbloom, 2015). I assumed morbidity and mortality incidence is Bernoulli distributed because the incidence has only two possible outcomes. Finally, I assumed mean-reversion processes for the inflation rates because the Bank of Thailand follows the inflation-targeting policy.

I repeated these activities 5,000 times, therefore constituting 5,000 joint scenarios for these interesting variables for statistical analyses. Because the generated random numbers are kept fixed, I could vary Ω to obtain the probability $Pb\{\tilde{S}_{\tilde{T}}(\Omega) - \tilde{C}_{\tilde{T}} < 0\}$ from the average negative net-bequest status $\tilde{\beta}$. I stopped when

$Pb\{\tilde{S}_{\tilde{T}}(\Omega) - \tilde{C}_{\tilde{T}} < 0\} = \Psi$. At that level, Ω is the self-discipline saving rate Ω^*.

Data

In the analysis, I needed data on annual incomes, mortality and morbidity rates, mean investment returns and standard deviations, lost workdays, productivity losses, funeral expenses, and inflation. I collected the data for Thai income earners from various sources. Table 1 reports an extract of the age-specific data and their sources. Readers may obtain the full table from the author upon request. The average annual incomes across age groups from 21 to 100 years for females and males were 105,410 and 124,119 baht, respectively. The female general and disease-specific mortality rates for females, except for stroke, were lower than those of males. As for the NCD risk, the diabetes-incidence rate was higher for females. However, for heart disease, stroke, and cancer, the incidence was higher for males. I assumed the same glide path for females and males. Therefore, the expected returns and standard deviations are the same in both panels.

Table 2 reports the disease-specific data consisting of lost workdays and the productivity loss rate. If the earner is sick, then the earner's net incomes are adversely affected from the loss of workdays and productivity. It is assumed the subsistence personal expenses are 108,000 baht per year or 9,000 baht per month. This level is the national minimum wage rate. I followed previous studies, e.g. Henna et al. (1995), to set the initial saving at zero baht. Further, I set today's funeral expenses equal to 40,000 baht. This amount is what the Social Security Office pays its members when they die. I used maximum likelihood estimation to estimate the convergence rate θ, the long-run mean $\overline{\pi}$ and the standard deviation of inflation errors from the annual headline-inflation data from 2001 to 2014. The inflation data are from the Bureau of Trade and Economic Indices, Ministry of Commerce. The estimates for the convergence rate, the long-run mean and the standard deviation are 0.7655, 0.0256 and 0.0133, respectively. Finally, I followed Barber and Laimon (2006)

Table 2
Disease-specific data

Disease	Lost work days[1]		Productivity loss (%)[2]
	Female	Male	
Diabetes	10.82	11.75	11.00
Heart Disease	6.23	5.90	
Stroke	10.96	10.66	
Cancer	8.85	9.37	

Data Sources: [1] = Thavorncharoensap et al. (2011), [2] = Alavinia, Molenaar, and Burdorf (2009)

Table 1
Age specific data

Age	Annual income (Baht)[1]	Mortality rate (%)[a]					Incidence rate (%)				Investment return (%)[7,b]	
		General[2]	Diabetes[3]	Heart[3]	Stroke[3]	Cancer[4]	Diabetes[5]	Heart[5]	Stroke[5]	Cancer[6]	Mean	SD
Panel 1.1 Females												
21	100,872.01	0.08	1.96	3.89	6.20	4.43	0.10	0.01	0.01	0.02	8.57	12.82
31	145,831.68	0.09	1.96	3.89	6.20	4.45	0.10	0.01	0.01	0.06	8.57	12.82
41	167,360.52	0.15	1.82	4.55	7.70	4.50	0.63	0.03	0.03	0.18	8.57	12.82
51	248,671.20	0.30	2.85	5.09	8.90	4.64	1.43	0.10	0.08	0.29	6.68	7.40
61	81,840.37	0.98	9.89	13.05	18.73	5.29	2.12	0.36	0.27	0.40	4.53	2.98
71	62,462.15	3.06	9.89	13.05	18.73	7.28	2.12	0.36	0.27	0.52	4.53	2.98
81	54,119.65	7.03	9.89	13.05	18.73	11.08	2.12	0.36	0.27	0.52	4.53	2.98
91	12,000.00	19.30	19.30	19.30	19.30	22.82	2.12	0.36	0.27	0.52	4.53	2.98
100	12,000.00	100.00	100.00	100.00	100.00	100.00	2.12	0.36	0.27	0.52	4.53	2.98
Age	Annual income (Baht)[1]	Mortality rate (%)[a]					Incidence rate (%)				Investment return (%)[7,b]	
		General[2]	Diabetes[3]	Heart[3]	Stroke[3]	Cancer[4]	Diabetes[5]	Heart[5]	Stroke[5]	Cancer[6]	Mean	SD
Panel 1.2 Males												
21	124,737.84	0.23	3.25	5.02	7.68	4.57	0.07	0.01	0.01	0.02	8.57	12.82
31	151,328.88	0.26	3.25	5.02	7.68	4.60	0.07	0.01	0.01	0.04	8.57	12.82
41	165,066.84	0.37	3.65	4.97	8.98	4.71	0.43	0.04	0.05	0.10	8.57	12.82
51	210,959.76	0.68	4.84	6.30	9.48	5.01	1.02	0.14	0.13	0.26	6.68	7.40
61	180,646.68	1.66	12.43	13.92	17.62	5.94	1.61	0.41	0.37	0.52	4.53	2.98
71	79,634.28	4.31	12.43	13.92	17.62	8.48	1.61	0.41	0.37	0.81	4.53	2.98
81	9,600.00	10.18	12.43	13.92	17.62	14.09	1.61	0.41	0.37	0.85	4.53	2.98
91	12,000.00	20.46	20.46	20.46	20.46	23.92	1.61	0.41	0.37	0.85	4.53	2.98
100	12,000.00	100.00	100.00	100.00	100.00	100.00	1.61	0.41	0.37	0.85	4.53	2.98

Note: [a] = I adjust the disease-specific mortality rates to their corresponding general mortality rates if the disease-specific rates are lower than the general rates. [b] = The return for negative saving is −20 percent−the lending rate for clean loans in 2014.
Data Sources: [1] = Computed by Supachai Srisuchart, Faculty of Economics, Thammasat University, using the National Statistical Office's labor force survey data for quarter 1, 2013. I adjusted the incomes of those aged 60 years and older to age-specific senior allowances if their survey incomes were lower than the allowances. [2] = 2008 Mortality Table for General Population by the Office of Insurance Commission, [3] = Computed using 2013 case fatality data from the Bureau of Epidemiology, [4] = Computed based on the formula in Cho, Howlader, Mariotto, and Cronin (2011), using the mortality rate for general population from the Office of Insurance Commission, together with the average cancer mortality rates from 2008 to 2012 reported by the Bureau of Epidemiology, [5] = Computed using the 2013 new patients data of the Bureau of Epidemiology, together with the 2011−2012 average population data from the National Statistical Office, [6] = Sriplung (2010), [7] = Computed based on investment strategies on the gliding path being used by Government Pension Fund members (Budsaratrakul, 2014)

Table 3
Self-discipline saving rates and median bequest net of funeral expenses (initial debt = 0 baht)

Age	Female		Male	
	Saving rate (%)	Net bequest (baht)	Saving rate (%)	Net bequest (baht)
20	12.19	4,285,753	8.35	2,753,193
30	14.29	2,775,305	8.65	1,627,226
40	24.77	1,965,488	15.57	1,239,644
50	57.85	1,534,042	29.18	925,886

Table 4
Self-discipline saving rates and median bequest net of funeral expenses (initial debt = 50,768 baht)

Age	Female		Male	
	Saving rate (%)	Net bequest (Baht)	Saving rate (%)	Net bequest (Baht)
20	29.36	8,827,631	N.A.	N.A.
30	16.94	2,820,208	11.73	1,752,645
40	27.54	2,002,983	17.18	1,253,002
50	N.A.	N.A.	33.58	985,545

to set the acceptable threshold probability of the bequest being less than inflated funeral expenses at 10 percent.

Results

I estimated self-discipline saving rates in year 2014 for both female and male income earners of ages $t_0 = 20, 30, 40$ and 50 years. I did not consider 60-year-old or older retirees because their incomes precipitously fall, and they tend to live on their savings. Table 3 reports the self-discipline saving rates for Thai female and male earners, together with the median net bequest of inflated funeral expenses. The 10 percent rule-of-thumb saving rate was not applicable to Thai females. A 40-year-old female would have to save approximately the Bank of Thailand's recommended 25 percent rate, while a 50-year-old female would have to save much more at a 57.85 percent rate if she has not done so earlier. For male earners, the self-discipline saving rates were small or less than 10 percent for the 20 and 30 year olds. They would have to save more at 15.57 and 29.18 percent if they started to save when they were 40 and 50 years old.

I chose to report the median rather than the average bequest net of inflated funeral expenses because the distributions of net bequests were extremely negatively skewed. From Table 3, the median bequest nets are positive for the earners of all ages and sexes. The levels are falling with ages because earners have fewer years left for earning and saving if they decide to start to save later in life. Despite their higher income and shorter life expectancy, male earners had lower bequest nets than do females. These results can be principally explained by their much lower saving rates.

Discussion

Two important questions need be further explored. First, what is the oldest age a Thai earner can start saving so that the net bequest target is still satisfied? Second, almost 90 percent of Thai households are in debt. In 2013, the average debt per person was 50,768 baht, calculated from 64,785,909 Thais living in 20.1675 million households with an average 163,087-baht debt. Therefore, if Thai have debt when they start self-discipline saving, how high will the rate be?

To answer the first question, I looked for the youngest age for a person, from 51 years old onward, whose self-discipline saving was not possible. The oldest age a Thai earner can start late saving is that youngest age minus one. From the search, the oldest ages for female and male are 50 and 53 years, respectively. Their saving rates (median net bequests) are 57.85 percent (1,534,042 baht) and 43.08 percent (902,005 baht), respectively.

To answer the second question, I re-estimated the saving rates for the earners, assuming they had a debt of 50,768-baht. The results are shown in Table 4.

For female earners, the rate substantially increases for a 20-year-old earner from 12.19 to 29.36 percent. The large increase can be explained by the low income of the 21- to 30-year-old earners and the high borrowing costs. For the 30- and 40-year-old earners, the saving rates rise only approximately 2.70 percent. However, for 50-year-old earners, the threshold cannot be satisfied. Despite high income, they have few years to work and hardly earn enough to pay off the debt.

For male earners, it is interesting to find that a 20-year-old earner cannot achieve the net bequest target if they start out with debt. Their early income is low. It is 92,667 baht when they are 22 and 99,383 baht when they are 23. The average income for 21- to 30-year-old males is 117,915 baht, which is lower than the 123,308-baht average for female. When they are in debt early in life, while they still earn little, their debt grows from borrowing costs too quickly for them to be able to pay it off. The 30- to 50-year-old earners have much higher incomes. After consumption, they can quickly pay off debt. The debt leads to an approximately 3 percent increase in the saving rates.

Conclusion

It is important for income earners to set and adhere to self-discipline saving rates so that the objectives of their long-term financial plans are not compromised by myopic consumption and immediate utility. In this study, I modified the Khanthavit (2015) model to analyze and set the rates for Thai earners. The model involves financial planning and is realistic and practical. The saving rate is set in such a way that the probability that the bequest is less than the funeral expenses is at the 10 percent acceptable level. In a risk management framework, a 10 percent probability describes an unlikely event.

The study used the data gathered from various sources for Thai earners. The findings offer important policy implications. First, there is no single self-discipline saving rate that is applicable to everybody. The earners must set their own rates. These rates are, at least, sex and age specific. Conservative rates are approximately 25 percent for 40-year-old or younger females and 15 percent for 40-year-old or younger males. Second, initial debt is not very dangerous if the earners have self-discipline. When self-discipline saving is possible, those earners with initial debt end up with much higher net bequests due to their higher revised saving rates. It is interesting and important to note that the revised rates are less than 35 percent. Therefore, they are practicable. Third, if Thai earners follow the resulting self-discipline rules, then a negative net bequest or financial ruin will be unlikely. Fourth, government agencies may consider recommending the saving rates from this study to Thai earners to help them design their saving and retirement plans. For example, recently on August 20, 2015 the Thai government launched the National Saving Fund to provide a retirement safety net for approximately 30 million self-employed and non-formal workers. The membership workers save with the Fund and the government contributes up to 1,200 baht per year to match up to 100 percent of their total savings. The Fund does not fix annual saving amounts, but recommended saving rates should help.

A self-discipline saving rate is not possible for 51-year-old and older females or for 54-year-old and older males due to their short remaining lives and low future income. To meet the net-bequest target, initiatives must be designed. For example, they may try physical exercise to raise their work productivity and to reduce their health risk. I leave the designs for future research.

Conflict of interest

There is no conflict of interest.

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