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AN INVESTMENT FUND AS AN ELEMENT OF FINANCIAL EDUCATION IN PERSONAL FINANCE

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Abstract:
This paper develops two scenarios, as part of a proposal that seeks to support decision making, given the notorious absence of financial literacy that have been referenced by institutions like the World Bank (2014; 2015) and the Mexican Ministry of Finance and Public Credit (SHCP, 2013), among others. This proposal is a scheme of advance annuities and a scheme of annuities with arithmetic gradient; all of them with the same interest rate and an equal number of payments. The results allowed observing different increments generated by each of the scenarios, in terms of interest generated. The best choice or at least the most attractive is an investment fund based on a scheme of annuities with arithmetic gradient which generates more profits.

Keywords: annuity, gradient, interest rate, investment fund

AMS: 91B28
JEL: G210

1. Introduction

The culture of saving and financial education are issues that have taken great relevance in the financial sector in recent years, due to various negative factors that have affected the global economy, mainly caused due to the dearth of knowledge about the instruments offered by financial institutions (Leyva, 2014).

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In this regard, a study carried out by Moreno-Garcia, García-Santillán and Munguía (2013), states that the absence of an acceptable financial education is primarily due to the lack of approach to the formal financial system from an early age, coupled with bad information transmitted on these issues through the years.

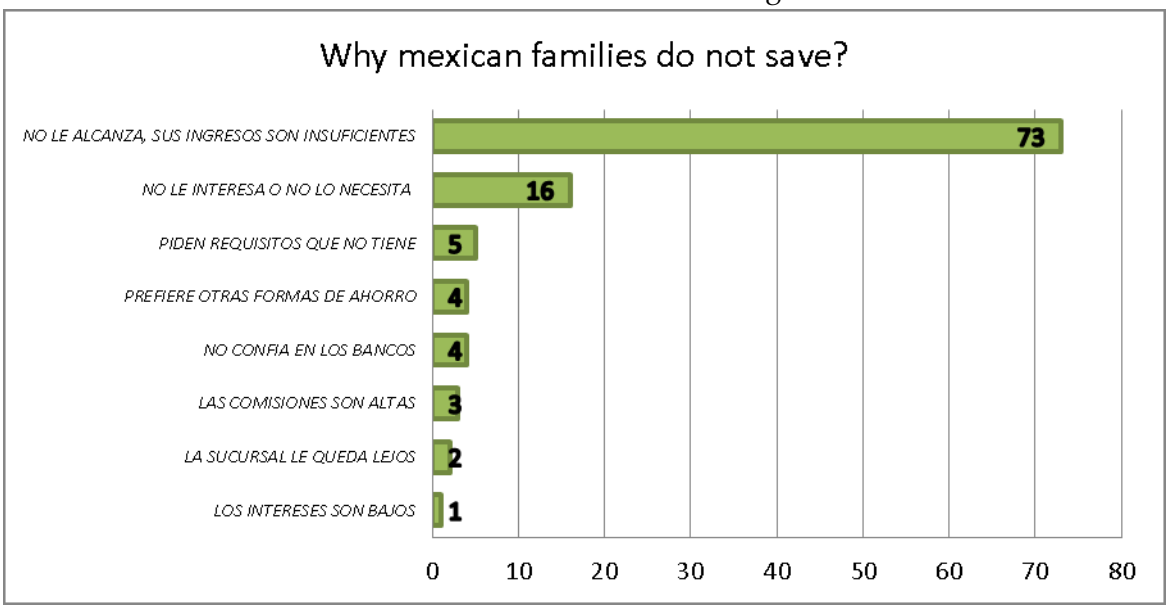
According to the Organization for Economic Co-operation and Development (OECD, 2006), this issue has become important, since not only affects those individuals who wish to invest in financial markets, but also impacts average families at the time for managing their budgets and planning their projects at medium and long term. According to the Mexican Ministry of Finance and Public Credit (SHCP, 2013), financial education is the process that allows the acquisition of knowledge, skills and abilities which ease decision making in the management of financial resources through premises constructed with adequate information on financial products and services that maintain healthy finances and help to meet life goals.

There is no unanimous agreement on the meaning of financial education, because, depending on the institution where it arises, it can have different meanings, but usually involves two basic elements: the stability of the financial system and the stability of households (BBVA, 2010).

Also, Krugman and Wells (2007) argue that savings can be considered as the save of a good or part of it to face a negative future event; therefore, it is considered a healthy activity that should be practiced by all population, since denotes caution and care for the future. In this regard, fields of study are diverse, ranging from how teenagers manage their resources (Morcos and Sebstad, 2011) to its impact on the management of retirement funds (Clark and d'Ambrosio, 2003).

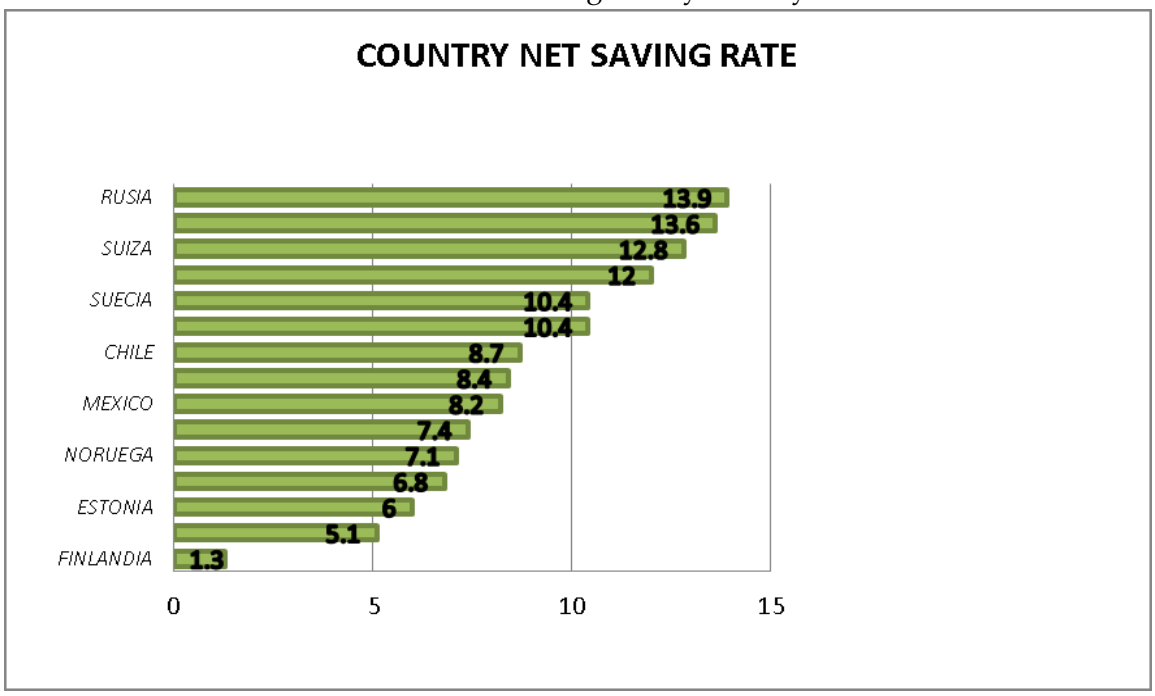
Chart 1 data, obtained from the SHCP online database, the National Banking and Securities Commission (CNBV), the National Institute of Statistics and Geography (INEGI) and the OECD, presented in a study by Leyva in 2014, show the current landscape of savings culture in Mexico; as chart 1 shows, it is argued that most of the population does not save because their income is low; plus the savings rate in Mexico compared to other countries has declined through years (chart 2).

Chart 1: Causes for not saving



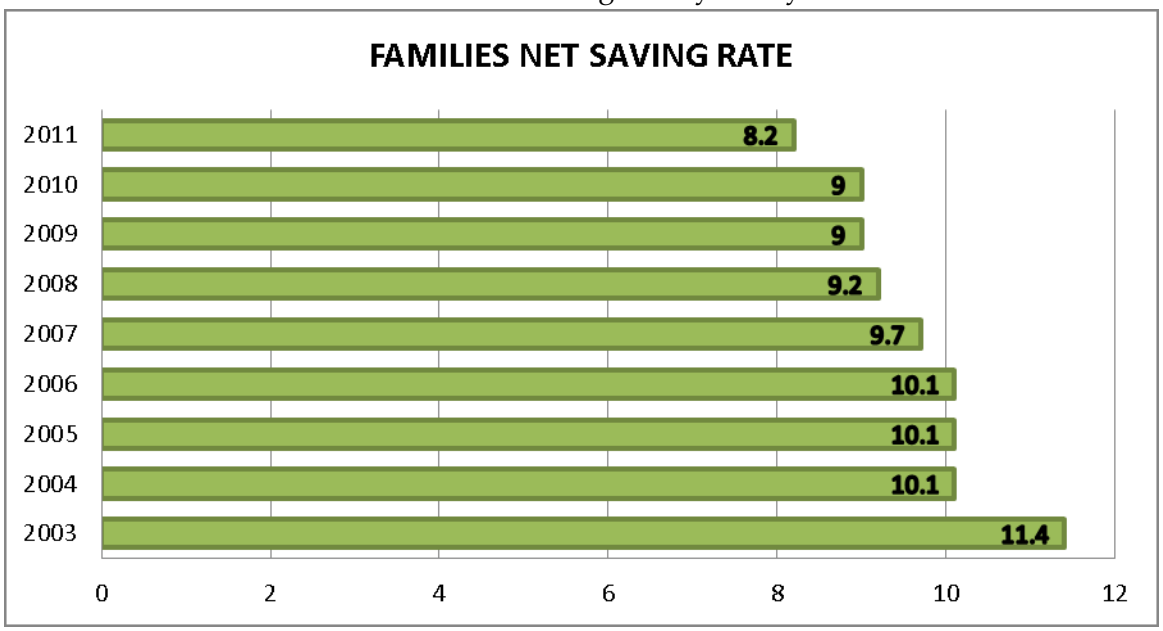
Sources: SHCP, CNBV, INEGI and OCDE, Leyva (2014).

Chart 2: Net saving rate by country



Sources: SHCP, CNBV, INEGI y OCDE, Leyva (2014).

Chart 3: Net saving rate by family



Sources: SHCP, CNBV, INEGI y OCDE, Leyva (2014).

In the past fifty years, the saving rate in Mexico had a positive trend compared to other countries in Latin America. Nevertheless According to the World Bank (2014-2015), the saving trend began to decline sharply since 2013.

Also, a study included in FORBES Magazine (2013) revealed that only 7.2% of Mexican population in that year saved in order to face any economic contingency or taking considerations for retirement. This trend continued during the following year, so Leyva (2014) qualifies as worrying the low level of savings nationwide.

Based on these facts, financial education can be summarized as a process in which knowledge, skills and abilities that enable appropriate decision making in the management of economic resources are developed, thereby achieving financial and personal stability, and through this raise the level of welfare. In this paper mathematical models will be displayed and compared as scenarios to identify the feasibility of these for the creation of an investment fund, as an element in personal finance.

2. Problem statement

According to the above mentioned, the main problem in financial education today arises due to the lack of income in households and the lack of information regarding the proper use of financial instruments. From this, and taking into account the shortcomings of the current culture of savings and lack of implementation of sound financial education; this study seeks to show three proposals for the creation of an investment fund. With the results, we may identify which choice is the most suitable. Therefore, the main objective will be to compare the models in order to identify the best alternative of investment.

3. Case development

This study aims to design two scenarios to create an investment fund. The first of them, in a modality of anticipated annuity, the second one in a modality of annuity with arithmetic gradients series. The data gathering are: One year period (365 days) with an interest rate of 3.8% obtained from the rate offered by financial institutions with monthly compounding period. It is important to remember that gradients, like annuities, are a series of installments or payments, however, the first do not remain fixed, on contrary are increasing or decreasing, in the payment amount (arithmetic) as mentioned by García-Santillán (2014) and Newman, Lavelle and Eschenbach (2016).

3.1 Scenario 1 (Advanced Annuity)

For the creation an investment fund with an anticipated annuity scheme, we start from the following data:

In theory we know that:

$$VF = Rp\left(1+ {}^{i}\!/\!_{m}\right)\frac{\left(1+\frac{i}{m}\right)^{n}-1}{{}^{i}\!/\!_{m}} \tag{1}$$

Where:

FV: Accumulated future value; *Rp*: Payment; *i:* Interest rate; *n:* Time; *m*: Compounding period

$$FV = \$1,000.00\left(1+{}^{.038}\!/\!_{12}\right)\frac{\left(1+\frac{.038}{12}\right)^{12}-1}{{}^{.038}\!/\!_{12}} \tag{1.1}$$

$$FV = \$1,000.00\left(1.00316667\right)\frac{\left(1.00316667\right)^{12}-1}{.00316667} \tag{1.2}$$

$$FV = \$1,000.00\left(1.00316667\right)\frac{\left(1.03866887\right)-1}{.00316667} \tag{1.3}$$

$$FV = \$1,000\left(1.00316667\right)\frac{\left(.03866887\right)}{\left(.00316667\right)} \tag{1.4}$$

$$FV = \$1,000.00\left(1.00316667\right)\left(12.2112093\right) \tag{1.5}$$

$$FV = \$12,249.89 \tag{1.6}$$

The composition of the investment fund may be observed in the following table 1.

Table 1: Model based on Advanced Annuity

Payment (deposit)	Monthly installment	Interest earned	Balance	Average of interest rate
1	$ 1,000.00	$ 3.17	$ 1,003.17	0.31700%
2	$ 1,000.00	$ 6.34	$ 2,009.51	0.63400%
3	$ 1,000.00	$ 9.53	$ 3,019.04	0.95300%
4	$ 1,000.00	$ 12.73	$ 4,031.77	1.27300%
5	$ 1,000.00	$ 15.93	$ 5,047.70	1.59300%
6	$ 1,000.00	$ 19.15	$ 6,066.85	1.91500%
7	$ 1,000.00	$ 22.38	$ 7,089.23	2.23800%
8	$ 1,000.00	$ 25.62	$ 8,114.85	2.56200%
9	$ 1,000.00	$ 28.86	$ 9,143.71	2.88600%
10	$ 1,000.00	$ 32.12	$ 10,175.83	3.21200%
11	$ 1,000.00	$ 35.39	$ 11,211.22	3.53900%
12	$ 1,000.00	$ 38.67	$ 12,249.89	3.86700%
Total	$ 12,000.00	$ 249.89	$12,249.89	2.08242%

Source: Author's research

During one year deposits by $12,000.00 which generate an interest for the amount of $249.89 are realized. Therefore, considering a savings scheme, which also include performing equal payments over a period of 1 year at a fixed rate, the investor could be obtain more or less an average of 2.08% interest rate.

3.2 Scenario 2: Annuity - arithmetic gradient

In this scheme, 12 payments will be simulated, but these are not fixed; then, has consider that the payments will increase every period. The data are

Rp=	**$ 1,000.00**
i=	3.80%
n=	365 days
m=	monthly
Ga=	$ 50.00

For the development of this model, we will use the following formula:

$$Mag = \left(Rp_1 + \frac{Ga}{i/m} \right) \left[\frac{\left(1 + i/m\right)^n - 1}{i/m} \right] - \frac{n * Ga}{i/m} \tag{2}$$

Where:
Mag: The accumulated amount with arithmetic gradient
Rp_1: The first deposit made
Ga: arithmetic gradient
i: Interest rate
n: Time
m: Compounding period

Therefore, we have:

$$Mag = \left(\$1,000.00 + \frac{\$50.00}{0.003166667} \right) \left[\frac{(1+0.003166667)^{12} - 1}{0.003166667} \right] - \frac{12 * \$50.00}{0.003166667} \quad (2.1)$$

$$Mag = \left(\$1,000.00 + \frac{\$50.00}{0.003166667} \right) \left[\frac{(1.03866887) - 1}{0.003166667} \right] - \frac{\$60.00}{0.003166667} \quad (2.2)$$

$$Mag = (\$1,000.00 + \$15,789.47) \left[\frac{.03866887}{0.003166667} \right] - \$189,473.66 \quad (2.3)$$

$$Mag = (\$16,789.47) \left[\frac{(.03866887)}{0.003166667} \right] - \$189,473.66 \quad (2.4)$$

$$Mag = (\$16,789.47)[12.21122082] - \$189,473.66 \quad (2.5)$$

$$Mag = \quad \$205,019.93 - \$189,473.66 \quad (2.6)$$

$$Mag = \quad \$15,546.27 \quad (2.6)$$

The composition of the investment fund may be observed in the following table 2.

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Table 2: Annuity - arithmetic gradient

Payment (deposit)	Monthly installment	Interest earned	Balance	Average of interest rate
1	$1,000.00	$3.17	$1,003.17	0.3170%
2	$1,050.00	$6.50	$2,059.67	0.6190%
3	$1,100.00	$10.01	$3,169.67	0.9100%
4	$1,150.00	$13.68	$4,333.35	1.1896%
5	$1,200.00	$17.52	$5,550.88	1.4600%
6	$1,250.00	$21.54	$6,822.41	1.7232%
7	$1,300.00	$25.72	$8,148.13	1.9785%
8	$1,350.00	$30.08	$9,528.21	2.2281%
9	$1,400.00	$34.61	$10,962.82	2.4721%
10	$1,450.00	$39.31	$12,452.12	2.7110%
11	$1,500.00	$44.18	$13,996.30	2.9453%
12	$1,550.00	$49.23	$15,595.53	3.1761%
Total	$15,300.00	$295.55		1.8108%

Source: Author's research

During one year, deposits by $15,300.00 which generate an interest for the amount of $295.55 are realized. Therefore, considering a savings scheme, which also include performing arithmetic gradient payments over a period of 1 year at a fixed rate, the investor could be obtain more or less an average of 1.81% interest rate.

4. Conclusions

From the results obtained in the simulation of each case proposed, it is concluded that performing gradual increases as a raise in the amount of payments made it more convenient to achieve an increased amount of interest earned with an arithmetic gradient.

Using gradient arithmetic models, it is equally suitable for the amount of interest however the amount of deposits is considerably higher, so the savers should consider their ability to increase the periodic payments to take advantage of this model.

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