Gaioz Sanadze
Grigol Robakidze University
Levan Gvalia
Caucasus Business School

SAVINGS FOR LONG RUN

In the given article we will discuss the savings for long run by viewing the pension funds. There are different types of pensions, including: employment-based pension, social pension and disability pension [2]. Pension is social when the government helps citizens and pays certain amount of money to those people who are retired till their death. Disabilities' pension is when disabled people receive assistance from the state without taking into account the retirement age; and at the time of employment-based pension a citizen finances him/herself (nongovernment pension funds). During following the last type of pension plan are formed private pension funds. According to the newspaper "The Economist", the world's pension funds hold 20 trillion dollars in assets.

Below will be discussed how the employment-based pension works in the USA. We will compare it to Georgia and see how it does or does not work in our country.

* * *

Accumulation of pension funds is as follows: a citizen keeps a certain percentage of his/her income for some time in order to use it at the retirement age. But in reality, it is more complex and in order to make clear, we have to make some assumptions.

First of all, let us assume that a citizen is going to work until he/she is 65, and he will live 25 years after retirement, so he/she "intends" to die at the age of 90; this figure is higher than the average duration of life in the United States [2]. Let us also suppose that the starting salary is 50,000 dollars per year, which is, approximately, equal to the average of the United States [2], while assuming that 15 percent of salary is going to be kept. To see how much people will spend each year, we will have to take into account the **annual increase in salary, inflation rate, taxes and the exemption, interest rates and real consumption** [1]. According to this data, let us draw up **table 1.** The rules of drawing this table will be discussed below.

Table 1

A	B	C	D	E	F	G	H
Age	Salary	Deflator	Exemption	Taxes	Savings	Cumulative Savings	Real consumption
30	$ 50 000	1	$ 15 000	$ 8 750	$ 6 188	$ 6 188	$ 35 063
31	$ 53 500	1,03	$ 15 450	$ 9 605	$ 6 584	$ 13 143	$ 36 224
59	$ 355 713	2,36	$ 35 348	$ 94 835	$ 39 132	$ 1 081 011	$ 94 097
60	$ 380 613	2,43	$ 36 409	$ 102 266	$ 41 752	$ 1 187 624	$ 97 474
61	$ 407 256	2,50	$ 37 501	$ 110 253	$ 44 550	$ 1 303 432	$ 100 978
65	$ 533 829	2,81	$ 42 208	$ 148 611	$ 57 783	$ 1 874 346	$ 116 365

First of all, in this and other tables the numbers are shown in rounded figures, but the formulas are used in the full sense, therefore the direct calculation of the shown numbers may not give accurate answers.

What does column A point to? Let us suppose that a citizen is going to accumulate money from age 30 to age 65, retirement age, in some kind of asset, by which he/she will earn additional interest profit. In order to avoid unnecessary complexities, all the years from 30 to 65 are not shown in the table shown below; the figures are just hidden in Excel file.

A
Age
30
31
59
60
61
65

Let us assume that the salary will grow in constant percentage during the next 25 years. If annual increase in salary is 7 percent, then for the next year the salary will be 50,000*(1+0.07)=53,500. It is written in Table 1 - the B column.

A	**B**
Age	Salary
30	**$ 50,000**
31	**$ 53,500**
59	$ 355,713
60	$ 380,613
61	$ 407,256
65	$ 533,829

As for the C column, it is the deflator, by which can be found how worth is the money for the following year, in today's value. Assuming that the inflation rate is 3% - that is an acceptable level for the US, then the next year deflator will be 1 * (1 +0.03) = 1.03, while the following year's will be 1.03 * (1 +0.03) = 1.06, and so on, which is written in the C column in the table. This tells us that $1.03 of the next year equals to $1 in today's dollars, and in order to find out the value of money for next random year, that amount of money should be divided by the same deflator for the year.

A	**C**
Age	Deflator
30	**1**
31	**1.03**
59	2.36
60	2.43
61	2.50
65	2.81

Let us discuss the F column. Here is the money which is saved by a person at the end of each year. Suppose that a citizen has decided to retain 15%. We should not forget about the fact that a person will be able to save only those parts of salary that remains after paying income tax. Assuming that the first tax is 8,750 dollars per year (the rules for counting taxes and deductions will be discussed later), then he/she will be able to keep (50,000-8,750) * 0.15 = **6,188** dollars. So for the next years, taxes should be deducted from the salary and must be multiplied by 15%, in order to receive savings' amount.

A	B	E	F
Age	Salary	Taxes	Savings
30	**$ 50,000**	**$ 8,750**	**$ 6,188**
31	$ 53,500	$ 9,605	$ 6,584
59	$ 355,713	$ 94,835	$ 39,132
60	$ 380,613	$ 102,266	$ 41,752
61	$ 407,256	$ 110,253	$ 44,550
65	$ 533,829	$ 148,611	$ 57,783

There are cumulative savings in column G. So here is the amount of money that a citizen has accumulated over the years. We should not forget that every year the interest gain is added to accumulated money. Suppose that the nominal interest rate is 6%. So this year, the total amount stored in savings consists of the previous years' cumulative savings, plus interest gain on them, and plus the money he/she has retained this year. For example, in the second year the total saving would be 6,188 * (1 +0.06) +6,584 = 13,143, and then it is calculated the same way for every year.

A	F	G
Age	Savings	Cumulative savings
30	$ 6,188	**$ 6,188**
31	**$ 6,584**	**$ 13,143**
59	$ 39,132	$ 1,081,011
60	$ 41,752	$ 1,187,624
61	$ 44,550	$ 1,303,432
65	$ 57,783	$ 1,874,346

Tax exemption and double taxation should be considered while drawing up a column E. Exemptions are given in column D which means that a person paying the income tax shall be taxable only for that part of the income that equals deduction between income and exemption. Assuming that the exemption equals $**15,000**, while the income tax rate is **25%**, then the tax would be (50,000-15,000) * 0.25 = 8,750. 15,000 is a today's exemption, but the next year for determining the amount of exemption, we shall take into account inflation and in order to get today's value of future money you must multiply it by the deflator. The exemption for the following year will be 15,000 * 1.03 = 15,450. It is written in the column D.

A	C	D
Age	Deflator	Exemption
30	1	**$ 15,000**
31	**1.03**	**$ 15,450**
59	2.36	$ 35,348
60	2.43	$ 36,409
61	2.50	$ 37,501
65	2.81	$ 42,208

As to double taxation, not only the income is taxed, but also the interest gain on savings. So, the taxes for the second year will be (53,500-15,450) * 0.25 +6,188 * 0.06 * 0.25 = 9,605, from which 6,188 * 0.06 * 0.25 = 93 is the tax charged on interest rate on the savings. Since the first year does not have the interest rate accumulation, only the income (minus deduction) will be taxed, but for each subsequent year, we will have to consider double taxation. See the column E.

A	B	D	**E**	G
Age	Salary	Exemption	Taxes	Cumulative savings
30	$ 50,000	$ 15,000	$ 8,750	**$ 6,188**
31	**$ 53,500**	**$ 15,450**	**$ 9,605**	$ 13,143
59	$ 355,713	$ 35,348	$ 94,835	$ 1,081,011
60	$ 380,613	$ 36,409	$ 102,266	$ 1,187,624
61	$ 407,256	$ 37,501	$ 110,253	$ 1,303,432
65	$ 533,829	$ 42,208	$ 148,611	$ 1,874,346

The last column H is real consumption. Real consumption is equal to the nominal consumption brought to today's dollars. Nominal consumption equals income minus taxes and savings. The first year's nominal consumption will equal **50,000-8,750-6,188 = 35,063**. In the first year, the nominal is equal to real consumption, because the inflation is not taken into consideration, and for the next years, it should be considered. This means that some next year's real consumption equals nominal consumption divided by the deflator for that year. For example, in the second year the real consumption will be **(53,500-9,605-6,584) / 1.03 = 36,224**. It is written in the column H.

A	B	C	E	F	**H**
Age	Salary	Deflator	Taxes	Savings	Real consumption
30	**$ 50,000**	1	**$ 8,750**	**$ 6,188**	**$ 35,063**
31	**$ 53,500**	**1.03**	**$ 9,605**	**$ 6,584**	**$ 36,224**
59	$ 355,713	2.36	$ 94,835	$ 39,132	$ 94,097
60	$ 380,613	2.43	$ 102,266	$ 41,752	$ 97,474
61	$ 407,256	2.50	$ 110,253	$ 44,550	$ 100,978
65	$ 533,829	2.81	$ 148,611	$ 57,783	$ 116,365

* * *

The table above refers to the years before a person's retirement age. Now we need to present a table which describes the situation after retirement. But before that we need to establish an equal annuity, brought in today's dollars, which will reduce the total stored amount to zero in 25 years (retirement age, duration). It will be easily understandable for students of the Faculty of Finances if we compare it to loan amortization. Financial calculator will aid us in calculating **PMT** [4], for the data: **N = 25, PV=1,874,346/2.81** (the final cumulative saving before retirement brought in today's dollars), **FV = 0**, and **i = 0.0291**. While calculating the i, we should remember that the interest rate above was the nominal interest rate, and we need a real interest rate which will be a nominal rate minus inflation rate, i.e. 6% -3% = 4%. But this is not enough; we must also take into account the deflator [1], so i = (0.06-0.03) / (1 +0.03) = 0.0291. This means that we will get **PMT = 37,882**. We cannot get equal annual amount of money by simply dividing the whole accumulated money by 25, because the interest will be accruing on the left cumulative savings each year after retirement, i.e. the cumulative savings are leveled down by cash withdrawal each year on the one hand, but on the other hand, it is leveled up by interest. PMT is that exact amount which will reduce the whole savings to zero nor more, nor less, exactly in 25 years.

After this it is easier to construct **table 2**. The numbers shown there will be explained below.

Table 2						
A	B	C	D	E	G	H
Age	Nom. Withdrawal	Deflator	Exemption	Tax	Cumulative savings	Real consumption
66	$ 109,792	2.90	$ 43,474	$ 17,247	$ 1,877,014	$ 31,931
67	$ 113,086	2.99	$ 44,778	$ 16,961	$ 1,876,549	$ 32,200
75	$ 143,254	3.78	$ 56,724	$ 12,200	$ 1,721,015	$ 34,656
81	$ 171,053	4.52	$ 67,731	$ 4,411	$ 1,337,279	$ 36,905
85	$ 192,521	5.08	$ 76,232	$ -	$ 883,895	$ 37,882
90	$ 223,185	5.89	$ 88,374	$ -	$ (0)	$ 37,882

The column **A** of age remains, part of which in the table is still hidden, in order to avoid complexity. Columns **C** and **D** are as in Table 1. Here is continued multiplication of exemption and deflator the same way, as already described above.

Column **B** is nominal withdrawal. We should not forget that the amount calculated by PMT is in today's dollars and to calculate what amount will be available for withdrawal in the future, PMT must be multiplied by the deflator for the desired year. For example, at the age of 66 a citizen will withdraw 37,882 * 2.90 = 109,792 dollars. It is written in column B.

A	**B**	C
Age	Nom. Withdrawal	Deflator
66	**$ 109,792**	**2.90**
75	$ 143,254	3.78
81	$ 171,053	4.52
85	$ 192,521	5.08
90	$ 223,185	5.89

In column G is shown the money, the amount of which decreases by nominal withdrawal, but increases by interest gain which is added to the previous year's cumulative savings. We should not forget that there is no every year's saving; that's why there is no column F. Let us recall that the interest rate is equal to 6%. For example, at the end of the age 67 the total saving will be **1,877,014 * (1 +0.06) -113.086 = 1,876,549**, and so on in G column. Look at the end of the age 90 - the cumulative saving is zero.

A	B	**G**
Age	Nom. Withdrawa	Cumulative savings
66	$ 109,792	**$ 1,877,014**
67	**$ 113,086**	**$ 1,876,549**
75	$ 143,254	$ 1,721,015
81	$ 171,053	$ 1,337,279
85	$ 192,521	$ 883,895
90	$ 223,185	$ (0)

Although a citizen does not have a salary, column E of taxes still remains, because tax is charged upon interest gain; also, there remains the exemption which is multiplied by deflator and is deducted from the taxable income. For example, for the age 67, the tax is charged on that amount of money which is calculated by deduction of exemption from the interest gain added to the previous year's cumulative saving. So if tax is 25%, for the age of 67 the tax would be **(1,877,014*0.06-44,778)0.25=16,961.** But look at the age of 85, when there is no tax. That is because the interest gain on the previous year's cumulative saving was smaller than the exemption; so, in that and the following years there are no tax payments.

A	D	E	G
Age	Exemption	Taxes	Cumulative savings
66	$ 43,474	$ 17,247	**$ 1,877,014**
67	**$ 44,778**	**$ 16,961**	$ 1,876,549
75	$ 56,724	$ 12,200	$ 1,721,015
81	$ 67,731	$ 4,411	**$ 1,337,279**
85	**$ 76,232**	**$ -**	$ 883,895
90	$ 88,374	$ -	$ (0)

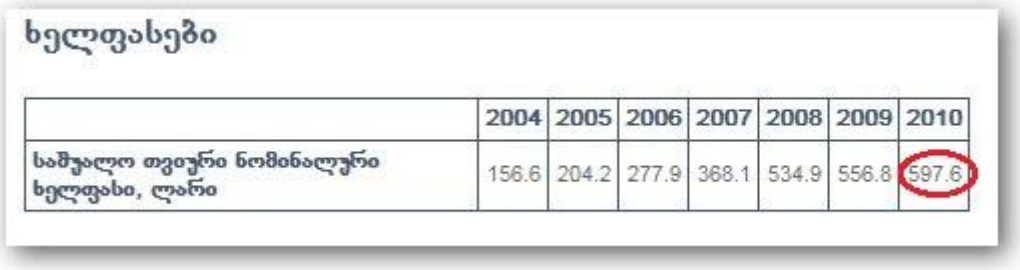
And finally, the most important column H, which shows us the amount of money available to a citizen in retirement years, transformed into today's value. This amount should have been known to us while calculating the PMT, but we have not considered the taxes and exactly in the years, when there are no taxes, the real consumption is equal to PMT. Such is age of 85. But when there is a tax, this tax is deducted from the nominal withdrawal and is brought to today's value; in other words, it is divided by the deflator. For example, at the age of 67, real consumption is calculated: **(113,086-16,961)2.99=32,200.**

A	B	C	E	H
Age	Nom. Withdraw	Deflator	Taxes	Real consumption
66	$ 109,792	2.90	$ 17,247	31,931
67	**$ 113,086**	**2.99**	**$ 16,961**	**32,200**
75	$ 143,254	3.78	$ 12,200	34,656
81	$ 171,053	4.52	$ 4,411	36,905
85	**$ 192,521**	**5.08**	**$ -**	**37,882**
90	$ 223,185	5.89	$ -	37,882

* * *

We have described above how the pension plan works in US. In order to understand how this will work in Georgia, we have to get the local data of the average annual salaries and inflation. This can be acquired from the Web site of Georgian Statistical Service. For some people (including us), this information may be inaccurate, unreliable, but since it is difficult (if not impossible) to find a better source, we must rely on these data.

First of all, let us discuss the average annual salary. According to Geostat (Georgian Statistical Service), in 2010 (information for 2011 is not known yet) average monthly salary is 597.6 GEL [3]. So the annual average would be **597.6*12=7,171.2.** The annual growth would be **(597.6-556.8)/556.8=7%.**


ხელფასები

	2004	2005	2006	2007	2008	2009	2010
საშუალო თვიური ნომინალური ხელფასი, ლარი	156.6	204.2	277.9	368.1	534.9	556.8	597.6

In 2010, the inflation rate is **11.2%** [3] (the data for 2011 has been published already, which is 2%, but we should not use this figure, because we have used the data of 2010 for calculating annual salary; thus, we should use 11.2% for inflation).

სამომხმარებლო ფასების ინდექსი (ინფლაცია)

	2006	2007	2008	2009	2010	2011
საშუალო წლიური წინა წლის საშუალო წლიურთან	109.2	109.2	110.0	101.7	107.1	108.5
დეკემბერი წინა წლის დეკემბერთან	108.8	111.0	105.5	103.0	111.2	102.0
წლიური ინფლაციის დონე	8.8	11.0	5.5	3.0	11.2	2.0

For the interest rate I will use rates of some different banks, which would be approximately **10%** on GEL.

In order to complete the table, we should make clear some details about taxes. Income tax is 20%. And as for the exemption, it is not included in Georgian tax law; so, the salary is charged fully what increases taxes, but Georgian tax law excludes double taxation; thus, the interest gain is not charged. Absence of these two simplifies the calculations.

We have all the required data for the table. Let us again make assumption that a citizen is going to collect money from the age of 30 to 65, every year 15% of salary. After these years, he/she will retire and spend all the money accumulated during 25 years. **Table 3** is constructed in such a way.

Table 3

A	B	C	D	E	F	G
Age	Salary	Deflator	Tax	Savings	Cumulative Savings	**Real consumption**
30	7,171 Lari	1	1,434 Lari	861 Lari	861 Lari	**4,876 Lari**
31	7,673 Lari	1.11	1,535 Lari	921 Lari	1,867 Lari	**4,692 Lari**
32	8,210 Lari	1.24	1,642 Lari	985 Lari	3,039 Lari	**4,515 Lari**
37	11,515 Lari	2.10	2,303 Lari	1,382 Lari	12,202 Lari	**3,724 Lari**
38	12,321 Lari	2.34	2,464 Lari	1,479 Lari	14,901 Lari	**3,584 Lari**
64	71,553 Lari	36.95	14,311 Lari	8,586 Lari	499,843 Lari	**1,317 Lari**
65	76,562 Lari	41.08	15,312 Lari	9,187 Lari	559,015 Lari	**1,267 Lari**

It is very interesting that the real consumption, shown in column G, declines. That is because the inflation rate by the data for 2010 is higher than the same year's income growth. At the end of column F is shown that amount of money which has been collected for these years. This nominal value must be enough for 25 years. In order to find out how much will be available for a citizen annually during retirement, we should calculate PMT again what is shown in **table 4**.

Table 4				
A	B	C	F	G
Age	Nom. Withdrawal	Deflator	Cumulative Savings	Real consumption
66	21,528 Lari	45.68	593,389 Lari	**471 Lari**
67	23,939 Lari	50.80	628,788 Lari	**471 Lari**
68	26,620 Lari	56.49	665,047 Lari	**471 Lari**
69	29,602 Lari	62.82	701,950 Lari	**471 Lari**
76	62,237 Lari	132.07	946,094 Lari	**471 Lari**
89	247,407 Lari	525.03	250,106 Lari	**471 Lari**
90	275,117 Lari	583.83	0 Lari	**471 Lari**

If a citizen pursues the employment based pension plan in Georgia, during the retirement age he/she will be able to spend 1,794 GEL (21,528/12), which in present value is equal to **40 GEL**.

Of course, the inflation rate used by us is highest in the years after 2006 by Geostat, and the salary growth rate is lowest. It means that we have used the most pessimistic variant. Let us see what will happen if we use more optimistic variant: inflation rate - **7.9%,** monthly salary - **423** GEL, salary's annual growth **26.03%** (these figures are calculated by averaging of Geostat's last few years' data. For example, salary's growth rate is calculated by finding out the last year's growth rate and then counting average), let us take **8%** of the interest rate (that is because when the inflation rate is lower, the nominal interest rate is lower too). See **table 5** below.

Table 5				
A	B	C	F	G
Age	Nom. Withdrawal	Deflator	Cumulative savings	Real consumption
66	604,476 Lari	15.44	14,340,704 Lari	**39,139 Lari**
67	652,230 Lari	16.66	14,835,731 Lari	**39,139 Lari**
68	703,756 Lari	17.98	15,318,833 Lari	**39,139 Lari**
69	759,353 Lari	19.40	15,784,987 Lari	**39,139 Lari**
76	1,292,985 Lari	33.04	17,976,593 Lari	**39,139 Lari**
89	3,474,341 Lari	88.77	3,471,124 Lari	**39,139 Lari**
90	3,748,814 Lari	95.78	- 0 Lari	**39,139 Lari**

It means that during such conditions, a retiree will be able to consume monthly **3,300** (39139/12) GEL, in present value.

For those who think that these figures are too optimistic (including us), we will consider the third variant as the more balanced one.

Let us take inflation rate of **8%**, salary annual growth – **11%**, interest rate – **12%**, starting salary monthly **550 GEL** and we will construct a table by leaving other required data unchanged. See the **table 6.**

Table 6				
A	B	C	F	G
Age	Nom. Withdrawal	Deflator	Cumulative savings	**Real consumption**
66	86,568 Lari	15.97	1,360,859 Lari	**5,421 Lari**
67	93,493 Lari	17.25	1,430,669 Lari	**5,421 Lari**
68	100,972 Lari	18.63	1,501,377 Lari	**5,421 Lari**
69	109,050 Lari	20.12	1,572,492 Lari	**5,421 Lari**
76	186,893 Lari	34.47	2,013,356 Lari	**5,421 Lari**
89	508,278 Lari	93.76	490,125 Lari	**5,421 Lari**
90	548,940 Lari	101.26	- 0 Lari	**5,421 Lari**

In the retirement age, a citizen in his/her first year will be able to spend monthly 7,214 GEL (86.568/12), which is in present value of **450 GEL.**

When the reality is the same as these figures shown above, when the inflation rate is lower than the salary growth rate and also is lower than the interest rate, then a citizen will be able to finance his/her older ages and will not rely on the government's pension lower than living minimum.

References

1. Bodie, Kane, Marcus. *Essentials of Investments.* 5th edition.
2. Wikipedia - The Free Encyclopedia.
3. National Statistics Office of Georgia.
4. Brigham E. F., Ehrhardt Michael H. *Financial Management: Theory and Practice.*