

COMMENTS ON
“ACTUARIAL MODEL OF THE IMPACT OF LINKING
ECONOMIC VARIABLES TO A LIFE SURVIVAL FUNCTION” BY
DONATE-ARMADA¹

Diego R. Roqué

In order to fully appreciate the significance of the vast contribution this work is making towards providing a clear understanding of the difficult situation traversed by the Cuban nation today, a brief background discussion leading to the introduction of Donate-Armada's theme, development and conclusions is a clear necessity. The commentary will be direct and to the point, hopefully not deviating much from the central point but certainly adding color to the discussions and debate.

COMMENTARY

Almost everybody is familiar with Newton's Laws of Mechanics. One in particular, the Law of Inertia, is very insightful. This law tells us about the natural tendency to resist change as it describes the most natural states of motion. An object at rest will remain at rest or an object moving at a constant velocity will remain moving at that constant velocity unless a force is applied to change the object's state of motion.

Imagine then taking the trouble to forecast that an object at rest will remain at rest or that an object moving with a constant speed and direction will remain moving with the same velocity. From the point of view of the art and science of forecasting there

would be nothing particularly meritorious or intelligent about these predictions. The real challenge in forecasting, requiring insight and analytical skills, would be to as accurately as possible predict the exceptional event, namely when forces will come into play that will change the states in the entity of interest.

Inertia is also applicable in social situations albeit not with the exactitude of physics. This is one of the reasons why most contemporary social scientists that venture forecasts predict no change in Cuba's future. The consensus seems to be that the current hardline Cuban leadership will be allowed to expire naturally. Only then, at their expiration, do the expectations of forces changing the Cuban social scene appear to come alive. Most of these predictions, however, are blind in the sense that no one has been able to determine with any degree of accuracy when the natural expiration of the current Cuban leadership will occur; so in a sense they are predicting that an object at rest will simply remain at rest. Clearly the death of Fidel Castro is viewed by many as the exceptional event that will unleash the forces of change in the island. It is here where Donate-Armada, armed with his vital actuarial statistics, is making one of many

1. Editors' Note: This is a corrected version of Mr. Roqué's paper. Regrettably, the version included in *Cuba in Transition—Volume 9*, contained serious errors. Apologies are hereby extended to Mr. Roqué.

important contributions. There is more than just inertia, however, inducing social scientists to predict no major changes in the Cuban social scene.

From the very beginning of Castro's revolution, intelligent and courageous Cubans, men women and children, ultimately had to opt for the "Strategic Retreat" (see Sun-tzu's *The Art of War*) much in the manner of General MacArthur in the Phillippines or for that matter the Chinese Nationalists fleeing the mainland. Proximity and American policy permitted them to do this possibly avoiding for our own hemisphere another carnage a la Stalin, Hitler or Pol Pot. The momentum that carried Castro to power helped explain why this was the intelligent choice for Cubans. But this explanation seems to have run out of gas when 40 years after the takeover, young Cubans, in defiance of sharks, still jump into rafts headed for the United States. But even worse than this is to hear the explanations given by the recent arrivals as to why they left Cuba.

Asking some of them why they left is quite an eye opener. The responses range from "my husband had to pay thirty pesos for a beer" to "there were no toys for my children" to "I had no access to dollars" and so on. At first glance, they appear to be economic refugees. But this is just an impression. These are the children of the revolution who are fleeing and one must come to the horrible conclusion that there is absolutely no consciousness in Cuba as to what it is that is so terribly oppressing them. In reality, it is impossible not to be a political refugee fleeing Cuba; they just do not know it. Explanations for this abound. They are the subject for another treatise. Suffice to say that ignorance of communism and of the problems communist totalitarianism unleashes in a society is probably the primary reason why the people can not shake off their yoke and why there really seems to be little possibility for change inside Cuba. Social scientists see very little possibility of an open rebellion, much less a successful one, in Cuba. The hard reality seems to be that the possibility of other exceptional events competing with the death of Castro for impact appear remote at best.

Very little has been discussed publicly about the heavy costs incurred by Cuban society throughout its

revolutionary period. Communist ideologues maintain the premise that their system sacrifices traditional Western human rights in order to give priority to their Socialist human rights. They point out their constitution guarantees rights such as education, health care and employment among others. For forty years Cubans have heard nothing but how good they have it in these areas. The international media and academia have echoed these claims. Socialist rights are not known in the West as rights but rather as basic or elementary human needs that must be satisfied as best as is possible. What seems to escape the attention of most is the fact that Western societies can give emphasis to the satisfaction of these basic human needs in a far more constructive manner than communism does. In fact, the communist legacy is in reality a mythological one.

Western human rights seek to protect the citizenry by rendering the government passive in the face of an active private sector. When basic human needs are declared Socialist human rights guaranteed by the constitution, this de facto creates a very active government that must render the citizenry passive in order to procure these rights. The private sector must be destroyed and along with it goes such rights as those guaranteed by the Bill of Rights in the United States. This is the basic flaw inherent in the structure of communist societies. The government must exercise sovereignty over the citizenry. In free societies, the citizenry exercise sovereignty over their government.

The sacrifice might still be worth it to some if in fact the goals of guaranteeing Socialist human rights were to be attainable and everlasting. But even this is questionable. Here one must make a distinction between the transient and the enduring and between a propagandistic effort and permanent effective institutionalization. It stands to reason that it takes a solid, robust and growing economy for any nation to really be able to meet over the long haul its commitments in terms of the social services provided to the citizenry. This brings us to the second inherent failure of communism, the economy. It is no wonder health care and education are rapidly decaying in Cuba today. Unemployment and subemployment are rampant.

Housing is either non-existent or completely run down, and all of these just scratch the surface. The social and economic costs paid by Cuban society are astronomical. There are only a few romantics left who refuse to recognize this and there are those who think Socialist priorities are worth rescuing and still pay lip service to the Cuban revolution.

Ever since the inception of ASCE, a lot of effort has been devoted towards measuring some of these social and economic costs in the hopes of encouraging and expediting a transition towards a more rational regime in Cuba. Social costs are easy to point out but very difficult to measure. They take a severe toll in terms of human suffering as every aspect of an individual's life is controlled by the state. This is really the realm of psychologists and sociologists. Economic costs, on the other hand, are easier to quantify and analyze. Cuban society (its people) must be made aware of these costs and aware of the inherent flaws of communism as a first step in the road towards their recapturing their sovereignty over their government along with their freedom and rights.

It took an MIT physicist currently practicing as an actuarial scientist to have come up with a very rational methodology to measure the actual costs Cuban society is going to incur in waiting for the natural expiration of the current leadership. The longer it waits, the higher the costs. The analysis assumes, of course, that a transition towards a more viable economic system will commence upon the death of Fidel Castro. It also assumes that Castro will maintain his current hardline stand for as long as he lives as in "Socialism or Death." Herein lies the most valuable contribution Ricardo Donate-Armada makes in his paper. It is a sound and rigorous analysis of a reality many inside and outside Cuba do not want to face up to.

To quote Donate-Armada: "Making a particular economic variable dependent on the survival status of the current Cuban leadership, and making the leadership's survival status a random variable dependent on time elapsed is what defines an actuarial model for that economic variable." Two types of economic variables are discussed. They are those based on annuity payments and those that reflect the relative val-

ues of macroeconomic amounts. Along with mortality tables, one calculated specifically for Cuba, the results of the economic analyses are completely tabulated as well. The most impressive of these by far is in the realm of macroeconomic variables. It is the expected Ultimate Scaled GNP Loss (in units of a projected base GNP) as a result of waiting for the current leadership to expire naturally. The resulting scaled loss depends mostly on the ratio of the GNP growth factor while the leadership survives and the GNP growth factor after the leadership dies. It assumes the current leadership is 73 years old in order to do the calculations.

In a similar vein, the report also gives the expected Scaled GNP Loss as a function of elapsed years assuming the current leadership is 73 years old. It places in evidence that the GNP loss grows to its ultimate value relatively fast for the several scenarios considered. Of course, the calculations cited, both Ultimate and dependent on elapsed time, definitely establish the GNP loss dependence on the assumed leadership mortality. Donate-Armada's paper gives a very refined analysis of this economic reality with good explanations and luxury of detail.

THE MODEL

The actuarial models used depend in turn on the existence of a survival model. The latter is reflected in the use of a fundamental underlying random variable measuring the time until death in the lifetime of an arbitrary Cuban citizen. This random variable is nonnegative, continuous and in units of years. Here it is labeled T . One can construct probability statements with it. Examples are:

$P [T \leq x]$: The probability the citizen dies on or before attaining age x years.

$P [T > x]$: The probability the citizen's life will exceed x years of age.

By using this random variable, one can characterize such things as the life expectancy at birth for an arbitrary citizen. This concept is denoted the expected value of T and labeled $E [T]$. In formal mathematical terms it is given by: $\int_0^{\infty} P [T > t] dt$

Two probabilities in particular play a fundamental role in the development of the theory. They are: First the probability the life will exceed t more years of age after having attained the age of x years given that age x has been attained. This probability may be labeled t_P_x . Then there is its complement labeled t_Q_x which is the probability the life will cease on or before t more years after having attained the age of x years given that age x has been attained. Please note that this two probabilities add up to one. The key probabilities, however, are t_P_x and $1_Q_x(x + t)$ which are described formally as :

$$\begin{aligned} t_P_x &= P [T > x + t | T > x] \text{ and} \\ 1_Q_x(x + t) &= P [T \leq x + t + 1 | T > x + t] \end{aligned} \quad (1)$$

These two probability statements are used to relate the two events in question. The two conditional events themselves deserve notice. They are:

$$\begin{aligned} \text{Event 1} &: \{ T > x + t | T > x \} \text{ and} \\ \text{Event 2} &: \{ T \leq x + t + 1 | T > x + t \} \end{aligned} \quad (2)$$

By virtue of the conditioning (reduction in the respective sample spaces) the two events are statistically independent and hence their joint probability is given by the product of the two probabilities. This product is denoted $(t_P_x)(1_Q_x(x + t))$ and it represents the probability that the life will exceed t more years after having attained the age of x years and that the life will cease on or before one more year after having attained the age of $x + t$ years. That the two events are statistically independent can be shown in more general terms. Consider the following proposition:

Proposition: Events 1 and 2 are statistically independent.

Proof: Let event 1 be $\{ A | B \}$ (read A given B)

and let event 2 be $\{ C | A \}$ (read C given A),

where A is a subset of B and hence it is the case that given $A \implies$ given B

and for any set X it is also the case that given $X \implies$ given X .

One may then use the general probability rule:

$$P [A | B] P [B] = P [A \text{ and } B].$$

Consider the following product:

$$P [C | A] P [A | B] \quad (3)$$

$$= P [C | A | A] P [A | B] \text{ since given } A \implies \text{given } A \quad (4)$$

$$= P [C | A | A | B] P [A | B] \text{ since given } A \implies \text{given } B \quad (5)$$

$$= P [(C | A) | (A | B)] P [(A | B)] \text{ by organizing or simply} \quad (6)$$

given $A \implies$ given A given B

$$= P [(C | A) \text{ and } (A | B)] \text{ by the general rule.} \\ \text{QED} \quad (7)$$

It is then possible to define the discrete curtate survival random variable T_x with

$\{(t_P_x)(1_Q_x(x + t))\}$ as its probability mass function for some age $x > 0$ and $t = 0, 1, 2, \dots$.

This random variable represents, in a discrete scale, the residual lifetime of a life already shortened by x years. One can then calculate the residual life expectancy of someone who has attained the age of x years by taking the expected value $E [T_x]$. As pointed by Donate-Armada, one can also define economic variables dependent on the survival after age x , $f (T_x)$, and obtain their expected value $E [f (T_x)]$. He also shows us how one can project at age x the value of an economic variable n years into the future and even obtain a projected expected value useful for comparison purposes and in assessing how rapidly the economic variable reaches its ultimate value.

CONCLUSIONS

The quantification of the economic costs incurred by Cuban society while it waits for the natural expiration of its current leadership is based on very realistic scenarios reflecting the possibility of economic recovery once a real transition to a more viable system commences in Cuba (see for example the work by Alonso and Lago in previous editions of *Cuba in Transition*). This work constitutes clear evidence that the woes afflicting the Cuban nation today have very

little or nothing to do with American foreign policy and a lot to do with Cuba's own internal structure and management.

If Fidel Castro had been the CEO of an American firm, he would have already been forced to resign in the decade of the sixties. Unfortunately, he is also the Chairman of the Board and he owns all the stocks. It is rare to see a nation for so long led by such an incompetent, misguided and arrogant figure. The cult to his personality and the man's own delusions of grandeur as reflected in his still firmly held belief of his own inevitable triumph over Capitalism continues to blind him and prevents him from doing what is right and best for the Cuban nation and its people.

According to the mortality tables compiled by Donate-Armada for Cuban society, the residual life expectancy of an arbitrary Cuban citizen who has attained the age of 73 years is approximately 10 years. The implications of this statistic are enormous. It represents bad news for the Cuban nation. It could be a while longer before responsible Cuban citizens are able to put their house in order. This statistic may

or may not be valid for the person of Fidel Castro. He is not an arbitrary citizen. Yet it is an indicator that can not be ignored by planners both inside and outside Cuba. It appears that the Cuban nation will continue to pile up immense costs while Fidel continues to wage his one man war against the Yankees. If it were not such an irresponsible act to give this man (Fidel) any kind of resources he could manipulate, one would almost be tempted to suggest that the best American policy under the circumstances would be to bow to the tyrant and capitulate even if Jefferson turns in his grave. But steady as she goes continues to be the best American response to his madness. The payoff and return for this patience will some day be enormous because the changes will be swifter and Cuban culture and values will be restored on a much healthier foundation. The one fact that is certain is that the natural expiration of the current Cuban leadership will occur in the very near future. If one considers all the costs incurred and all the suffering and sacrifice, it is well worth the wait for such an event to take place. It will be most welcomed by everyone.