A Missile Theory of Annihilation of a Common Target Nation

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Abstract

In this paper, I develop a formal model of strategic annihilation where multiple nations fire missiles at a common target nation over time. Each missile has a probabilistic success rate of destroying the common target nation. I define the eliminant as the survival function of the common target nation and derive its expression using both discrete-event and Poisson-process frameworks. From this, I deduce a natural definition of a risk-free interest rate linked to the existential stability of the common target nation. The model connects stochastic processes, finance, and international conflict theory.

The paper ends with "The End"

1 Introduction

In an era of strategic competition, understanding the dynamics of annihilation events becomes critical in the modeling of conflict economics. I introduce a probabilistic missile attack model targeting a common target nation and define the eliminant as its survival function. I then develop the risk-free interest rate as a function of annihilation risk.

2 Setup

Suppose there are n nations $N_1, N_2, \ldots, N_n$. Each nation N_i exists from time $t = t_i$ to $t = T_i$. One of these nations, say N_j, is the common target nation. Each N_i fires m_i missiles at times $\{\tau_i^1, \tau_i^2, \ldots, \tau_i^{m_i}\} \subseteq [t_i, T_i]$, where each missile has a success probability s_i of annihilating the common target nation N_j.

3 The Eliminant: Survival Function

Define the cumulative hazard function:

$$\Lambda_j(t) = \sum_{i=1}^{n} \sum_{k=1}^{m_i} - \ln(1 - s_i) \cdot \mathbf{1}_{\tau_i^k \leq t}. \tag{1}$$

Then, the eliminant — the probability that N_j survives until time t — is

$$A_j(t) = \exp\left(-\Lambda_j(t)\right) = \prod_{i=1}^{n} \prod_{k:\tau_i^k \leq t} (1 - s_i). \tag{2}$$

For small s_i, this can be approximated by:

$$A_j(t) \approx \exp\left(- \sum_{i=1}^{n} s_i \cdot |k : \tau_i^k \leq t| \right). \tag{3}$$

4 Risk-Free Interest Rate

Define the zero-default discount factor for N_j as $D_j(t) = A_j(t)$.

Then the instantaneous risk-free rate is:

$$r_j(t) = -\frac{d}{dt} \ln A_j(t) = \Lambda'_j(t). \tag{4}$$

In the discrete case:

$$r_j(t) = \sum_{i=1}^{n} \sum_{k=1}^{m_i} s_i \delta(t - \tau_i^k). \tag{5}$$

In a smoothed Poisson framework with firing intensity $\lambda_i(t)$:

$$r_j(t) = \sum_{i=1}^{n} s_i \lambda_i(t). \tag{6}$$

5 Diagrams and Plots

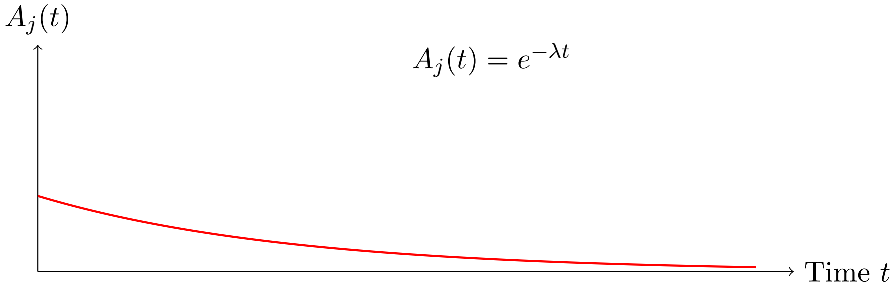

Figure 1: Exponential Decay of Survival Probability (Poisson Approximation)

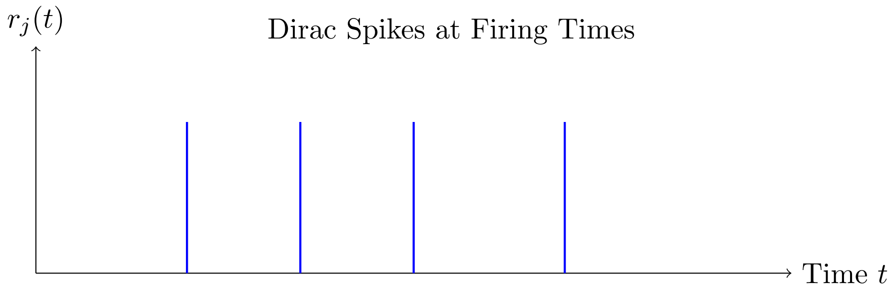

Figure 2: Discrete Risk-Free Rate Spikes at Missile Launches

6 Economic and Financial Interpretation

The risk-free rate $r_j(t)$ encodes the existential threat faced by nation N_j. As missile launches accumulate, the probability of its survival declines and the risk-free rate increases — reflecting the greater discounting of future promises. This can be used to price sovereign bonds, CDS spreads, or geopolitical stability indices.

7 Conclusion

I present a general theory of survival and interest rates for a common target nation under missile threat. The model captures both the instantaneous and smoothed probabilistic dynamics of annihilation. This framework links the theory of stochastic processes to macro-financial risk, offering a new way to model existential threats to sovereign entities.

8 References

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