

ZERO INFLATION AND INTEREST CREDIT OPPORTUNITY (ZICO) WITH
STOCHASTIC RETURNS AND CONTINUOUS TIME MODEL

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ABSTRACT

Using insights from real option theory, Abid (2001) developed a new financial instrument that he called Zero inflation and interest credit opportunity (ZICO) where time is bartered and derived a series of models to value the payoffs of the ZICO's buyer and seller. ZICO is defined as a contract by which an investor lends funds to another investor for a certain predetermined period and acquires the right to borrow from the second investor the same amount of funds and for the same length of time. To value the payoffs of the ZICO buyer, Abid (2001) considered three states of nature determined by the regularity of investment opportunities. The first model explains how the one-ZICO period can be stated as two sub-periods of time referenced by three points of time. Each sub-period is governed by a set of investment opportunities entirely described by different rates of return. The ZICO buyer lends funds to the ZICO seller for the first time sub-period and postpone his investment decision for the second ZICO sub-period. At the end of the first sub-period the ZICO seller reimburses the borrowed funds and lends the same amount to the ZICO buyer for the same length of time. At the end of the second sub-period, which corresponds to the expiration date of the ZICO contract, the ZICO buyer reimburses the funds he has borrowed. At this stage the positions of the buyer and the seller are symmetric and ZICO may be seen as a zero sum game. For the payoffs of the buyer and the seller to be equal to zero, the expected return in the second sub-period must be equal to the half of the expected return in the first sub-period. The second model is derived when the offered investment opportunities are not regular. In that case it is up to the buyer to invest in the second sub-period and wait for only the first sub-period or to continue lending and by the way continue postponing his investment waiting for the opportune moment to invest. The third model is set when investment opportunities are

regular with an option to reinvest the payoff of the preceding ZICO contract (ZICO rolling-over).

The aim of this paper is to extend the discrete ZICO model to continuous time with stochastic returns. The ZICO two sub-periods are decomposed in infinitesimal periods. Returns generated by the first and second ZICO sub-periods respectively are assumed following a Geometrical Brownian motion described by a stochastically differential equation:

The payoff of the ZICO buyer is non linear. It evolves proportionally to time squared and the difference between twice the instantaneous mean second sub-period return and the instantaneous mean of the first sub-period return. As the difference increases as the payoff of the ZICO seller decreases and it becomes difficult for him to honour his commitment by reimbursing the buyer at the end of the ZICO first sub-period and lending him the same amount of funds that he borrowed from the ZICO buyer at the beginning of the first sub-period. In ZICO economy, selection between efficient and inefficient investment decisions is accelerated compared to the standard economy. Acceleration may be measured by the difference of the two instantaneous means' return . The payoff of the ZICO buyer is generated according to simultaneous effect of half time squared and the difference between twice the instantaneous mean return that occur in the second sub-period and the instantaneous mean return or opportunity cost in the first sub-period. As selection in the ZICO investment-financing strategy is function of time squared this may lead to risk default.

To manage the default risk, velocity variation of the payoff must be reduced. There is a probability that investors will be unable to satisfy some or all of the indenture requirement so the risk default must be introduced in the initial model to add guarantee and prudence to the fulfilment of the ZICO contract. The idea is to slow down the time quadratic evolution of the investor's payoff. To dissipate the velocity of payoff changes we introduce a guarantee term proportional to the return generated in the first ZICO sub-period.

The default risk is defined in the first ZICO sub-period. This risk is materialized by the fact that the payoff of the seller is a quadratic function of time and if it is negative the seller goes bankrupt. The guarantee mechanism allows to assess instantaneously the welfare of the seller as a measure of his ability to satisfy his agreement. With guarantee, return is no longer a linearly increasing function of time but it can be stated as a function that does not change for long term. Return is governed by a function that admits an asymptote determined by the instantaneous mean return over the grantee coefficient.