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Ellina Grigorieva* (egrigorieva@twu.edu), Ellina Grigorieva, PO BOX 425262, Denton, TX 76204. *Optimal Control Theory Applied to a Cooperative Game between Manufacturer and Retailer.*

We consider a process of production, storage and sales of a consumer good as cooperative

$$\begin{cases} \dot{x}(t) = -v(t)x(t) - qx(t) + u(t), \\ \dot{y}(t) = v(t)x(t) - w(t)y(t) - qy(t), \quad t \in [0, T], \\ x(0) = x^0 > 0, \quad y(0) = y^0 > 0. \end{cases}$$

Here $x(t)$ is the amount of goods on the market, $y(t)$ the amount of purchased goods, $u(t)$ is the rate of production, $v(t)$ is the coefficient of the rate of purchasing of a unit of the good, $w(t)$ is the coefficient of the rate of reselling a unit of the good, T the time interval, and q is coefficient of spoilage of the good. Both parties want to choose such a strategy (optimal production, buying and reselling plan) that will maximize their cumulative profits. Therefore, the problem is reduced to the maximizing of the corresponding functionals of profit and solved with the use of the Maximum Principle. The model is completely investigated analytically and numerically. Possible economic applications are discussed.

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