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Towards a logistics cash-flow theory – is it possible to maximise the net present value of the firm using the models and algorithms we know?

Abstract : Many optimisation models of logistics have not been constructed with the aim to maximise the net present value (NPV) of the future profits of the firm(s) involved. The parameters used in these models are placeholders for (unit) costs and revenues, and which values they should receive in any particular application of the model is not at the forefront of our mind. A principle of corporate finance, however, is that shareholders expect managers to optimise the NPV of the firm's activities, and the question is how we can be assured, and give assurance to others, that our optimisation model will meet this criterion? It would be somewhat undesirable if this would require us to abandon the wealth of existing models, and the algorithms to solve them, and would have to start solving more complex, non-linear models. The use of NPV Equivalence Analysis (NPVEA) (Beullens and Janssens, 2013) seems able to provide satisfactory answers. Its application can either lead to a valid interpretation of the model and an accurate specification of its parameters, or to non-equivalence and the identification of corrections to the model. I will guide us through a brief history, going back about fifty years, on the use of the Laplace transform for this purpose. I discuss, using a series of representative models, how a consistent application can help us to identify some new principles and foundations towards an improved theory of modelling systems of logistics for situations where monetary flows over time are of importance. I will end with an outline of the potential impact on inventory-routing models and their application.

Note : Dr Patrick Beullens is reader/senior lecturer at Mathematical Sciences and the Southampton Management School of the University of Southampton (UK). He obtained his PhD in 2001 from the Katholieke Universiteit Leuven (Belgium) with a dissertation on location, process selection and vehicle routing models for reverse logistics. He has held research positions at INSEAD (France) and the Erasmus University Rotterdam (Netherlands), and was senior lecturer and later reader at the Department of Mathematics of the University of Portsmouth (UK). He was visiting professor in Integrated Logistics and Supply Chain Management at the University of Hasselt (Belgium) from 2009 to 2011. He has participated in various international research projects sponsored by the European Commission in the areas of logistics and reverse logistics, in the role of researcher or principal investigator for his University. He has published more than 30 articles in international peer-reviewed journals, including Operations Research, Production and Operations Management, European Journal of Operational Research, and the International Journal of Production Economics.

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