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The investment strategy and capacity portfolio optimization in the supply chain with spillover effect based on artificial fish swarm algorithm

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ABSTRACT

Spillover effect can lead to the free-riding behavior when joint investment takes place in the supply chain. This study examined the investment strategies of two competitive retailers who considered whether to invest a shared contract manufacturer (CM) or not. The supply chain members' operational decisions in four scenarios were analyzed through a Cournot competition model, and the paths of the retailers' investment strategies were examined. The CM's capacity portfolio optimization was NP-hard in nature, and was modelled by an investment portfolio problem. Results show that both retailers jointly invest the CM only when the difference of production costs is not high, and the intentions of joint investment will decrease when the coefficient of spillover and the degree of substitutability between products increase. The CM always benefits as long as one retailer invests, and allocates more investment on the capacity with highest revenue when he emphasizes more on the profit. For optimizing the CM's capacity portfolio problem, an artificial fish swam algorithm with uniform mutation (AFSA_UM) is developed and it shows better convergent performance and higher robustness than the basic AFSA.

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Izvirni znanstveni članek

Naložbena strategija in optimizacija portfelja zmogljivosti v dobavni verigi z učinkom prelivanja, ki temelji na algoritmu umetne jate rib

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POVZETEK

Ko se v dobavni verigi izvajajo skupne naložbe, lahko učinek prelivanja privede do koristoljubnega vedenja. Ta študija je preučila naložbene strategije dveh konkurenčnih trgovcev na drobno, ki sta preučevala, ali naj vlagata v skupnega pogodbenega proizvajalca (CM) ali ne. S pomočjo Cournotovega modela oligopola smo analizirali operativne odločitve članov dobavne verige v štirih scenarijih in preučili naložbene strategije trgovcev na drobno. Optimizacija portfelja zmogljivosti CM je po naravi računsko zahteven problem in je bila zasnovana kot problem naložbenega portfelja. Rezultati kažejo, da obe maloprodajni podjetji skupaj vlagata v CM samo, kadar razlika v proizvodnih stroških ni velika, skupne naložbe pa se bodo zmanjšale, ko bo koeficient prelivanja in stopnja nadomestljivosti med izdelki večja. CM ima vedno koristi, dokler en trgovec vanj investira, in dodeli več naložb v zmogljivosti z najvišjimi prihodki, ko bolj poudarja dobiček. Za optimizacijo portfelja zmogljivosti CM je razvit algoritem umetne jate rib z enakomerno mutacijo (AFSA_UM), ki ima boljšo konvergenčno zmogljivost in večjo robustnost kot osnovni AFSA.

PODATKI O ČLANKU

Ključne besede:
Dobavna veriga;
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